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INFORMS Cincinnati Spring 1999, May 2-5, 1999

FINAL PROGRAM

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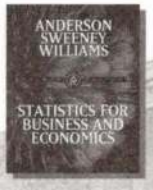
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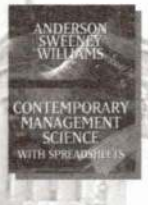
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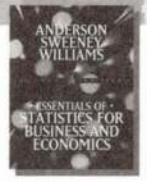
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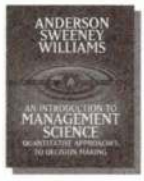
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Welcome

Spring 1999

INFORMS Conference



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Copies of papers abstracted in the Conference Program are available only from the authors. Requests for papers should be directed to the authors at the addresses shown in the Program. Published twice a year prior to each meeting by the Institute for Operations Research and the Management Sciences. Individual issues of the Program are available for $15 US per copy. Orders must be prepaid and sent to INFORMS, PO Box 64794, Baltimore, MD 21264-4794.

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City of Cincinnati

Roxanne Qualls
Mayor

Office of the Mayor

Room 150, City Hall
801 Plum Street
Cincinnati, Ohio 45202

Phone (513) 352-3250
Fax (513) 352-5201

March 1, 1999

Dear INFORMS Attendees:

On behalf of the citizens of Cincinnati, I am privileged to welcome the Institute for Operations Research and the Management Sciences (INFORMS) to Cincinnati. I am pleased and honored that you have picked America's Most Livable City to hold your conference.

During your visit, I encourage you to discover and explore the many attractions that make the "Queen City" such a popular place to visit and live. From our museums and galleries to our sports and recreational activities, Cincinnati is a truly unique city. Our residents and visitors alike mingle on Fountain Square, dine in our top-notch restaurants, and shop in our safe, vibrant, and lively downtown area.

A stay in Cincinnati is the beginning of a lifetime relationship with the finest city in America. We are happy to have the INFORMS Conference in our area.

Again, I welcome you to Cincinnati and extend my best wishes for a wonderful convention and phenomenal future!

Sincerely,

Roxanne Qualls
Mayor

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Department of Quantitative Analysis & Operations Management
College of Business Administration
University of Cincinnati
PO Box 210130
Cincinnati, OH 45221-0130

University of Cincinnati

May 2, 1999

David.Rogers@UC.edu

Dear INFORMS Cincinnati Attendees:

Welcome to the Queen City of Cincinnati, Ohio and one of the most innovative INFORMS conferences to date. I am confident that you will leave with a newly found appreciation of a city that you may have never visited before. I am likewise confident that you will leave with a renewed sense of the diverse and excellent programming that INFORMS offers its members.

Downtown Cincinnati and Northern Kentucky, on the banks of the Ohio River, are vibrant! Among dozens of attractions, you'll find the Cincinnati Art Museum, Tower Place Mall and the longest running 5-star restaurant in North America, the Maisonette, one of a wide collection of eclectic and diverse international and domestic restaurants. The dining and entertainment of the Backstage District with the fabulous new Aronoff Center for the Arts as its centerpiece, the 12th & Main Street area microbreweries and night spots and the Kentucky Riverfront District's montage of floating food and fun are but a few of the attractive areas you can discover. Want classic and profound? Try the Cincinnati Dance Artists on May 1 or Maya Angelou on May 3. Want music? Try the Starling Chamber Orchestra with Alyssa Park, Violin, on May 2 or Jonny Lang on May 4 - highlights of a wide variety of musical styles available. Want sports? Try Major League Baseball action with the Arizona Diamondbacks vs. the Cincinnati Reds on May 3-5 and the Harlem Globetrotters vs. the '99 College All-Stars on May 2. And guess what – it is all in walking distance!

INFORMS Cincinnati has been the most unique INFORMS conference to date. Firsts are abundant and include the First Teaching Effectiveness Colloquium, the First Student Consortium for Placement in Industry, Business and Consulting, the First CIST and MAS Plenary Speakers and the First IFORS Distinguished Lecture, and we are the first conference to eliminate printing of the preliminary program, which has resulted in drastically reduced lead times for submission processing. Special Tutorial Sessions await you – dedicated hours for which only tutorials are being presented. Join us for the First INFORMS Baseball Outing on Tuesday night and don't miss the fabulous Monday night reception at the Cincinnati Museum Center – the Omnimax, museums, an upgraded menu and relaxing music await you there! The return of the Saul Gass 10K Run and the Knowledge Bowl and an expanded set of workshops, plant tours, job placement opportunities and exhibitors are other enhancements. More than 1,525 presentations, including the CIST conference and the Spring Edelman competition, are highlights for a unique offering of invited and sponsored clusters.

Procter and Gamble, headquartered in Cincinnati, has supported this conference financially and we are all indebted to CIO Todd Garrett for this generosity. With this support, you will find that both your professional and personal experience will be greatly enhanced. The INFORMS Cincinnati Local Committee and the INFORMS staff have done an excellent job. Please join me in thanking them at all opportunities during the conference. Please enjoy Cincinnati and Northern Kentucky and the most comprehensive and unique INFORMS experience yet.

Sincerely,

David F. Rogers

David F. Rogers
General Chair, INFORMS Cincinnati

INFORMS Cincinnati, May 2-5, 1999
"Delivering to the Global Consumer"

GEORGE V. VOINOVICH
GOVERNOR

BOB TAFT

STATE OF OHIO
OFFICE OF THE GOVERNOR
COLUMBUS 43266-0601

FROM THE OFFICE OF GOVERNOR BOB TAFT MAY 1, 1999

I want to extend my warmest greetings to the organizers and participants of the Institute for Operations Research and the Management Sciences (INFORMS) National Convention to be held in Cincinnati, Ohio from May 1 - 5, 1999.

First, I would like to express a special welcome to all visitors to the State of Ohio. We are truly proud of our great state and are delighted to have you here. During your stay, I hope that you will take the time to explore Cincinnati, and to take advantage of all this great city has to offer.

INFORMS was established in January 1995 by the merging of the Operations Research Society of America and The Institute of Management Sciences. I am honored to recognize INFORMS as an international scientific society dedicated to improving operational processes, decision-making, and management through the application of methods from science and mathematics. Your contributions to the quality of life in the State of Ohio are appreciated by all of us.

On behalf of all Ohioans, best wishes for an enjoyable and productive convention.

On this 1st day of May, 1999;

Bob Taft

Bob Taft
Governor

informs *Institute for Operations Research and the Management Sciences*
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Merger of Operations Research Society of America (ORSA) and The Institute of Management Sciences (TIMS)

Thomas L. Magnanti
President
1999

Dean of Engineering, MIT
Room 1-206
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Cambridge, MA 02139-4307
Phone: 617-253-6604
Fax: 617 253-8549
magnanti@mit.edu

Dear Colleagues,

Being a guest in a city far from home becomes special when the host extends a hearty welcome. At this year's INFORMS spring conference, one of Cincinnati's leading companies has rolled out the red carpet for us. I want to extend my thanks.

Many of us remember the outstanding OR research conducted by Procter and Gamble and the University of Cincinnati during the 1996 Franz Edelman Award Competition. Now, if it's possible to say so, our friends at P&G have topped themselves.

Procter and Gamble has underwritten a significant portion of our conference with a generous $125,000 grant. I think you'll find that the result is a conference that not only contributes to the betterment of our profession, but makes this convention especially memorable. Thanks in part or in full to Procter and Gamble, we will enjoy lots of great features at this convention, including:

1. Sponsorships of key speakers.
2. A great tour of the P&G Archives/Historical Site.
3. Support for the Conference on Information Systems & Technology (CIST).
4. Enormous support for improvements to video production of the 28th Franz Edelman Competition.
5. The first INFORMS Teaching Effectiveness Colloquium.
6. An enhanced teacher training workshop for educators from local high schools, middle schools and community colleges.
7. The first Graduate Student Consortium for Placement in Industry, Business & Consulting.
8. The return of the Saul Gass 10K Run, sponsored by Sunny Delite®.
9. Expanded online email services.
10. Lots of bright decorations and giveaways.
11. A wonderfully rounded Monday night reception that includes classical music.
12. Additional coffee breaks for meeting colleagues, permitting enhanced interactions and collaboration as well as the opportunity to taste Millstone, one the of tastiest coffees in the Midwest.

I want to take this opportunity to thank some of the wonderful people at Procter and Gamble who worked so tirelessly on our behalf. First and foremost, we couldn't have accomplished all that we have without P&G Chief Information Officer, Todd Garrett, who recognizes the contributions of our profession. We'll all have a chance to thank Todd personally at his plenary. Thanks, also, to P&G's Ted Newton, Glenn Wegryn, Franz Dill, Lisa Rogers (who doubles as David Rogers' wife), Bob Sturm, Brad Metzger and Jeff Goldman.

I'm sure we'll all learn from and enjoy this conference more due to the generosity of our good friends at Procter and Gamble. We also hope that P&G will accrue significant benefits from its involvement in the conference. I sincerely hope that this initial collaboration between P&G and INFORMS is only the beginning of a relationship that will be lasting and mutually beneficial.

Once again, thanks, P&G.

Yours truly,

Thomas L. Magnanti

Thomas L. Magnanti
President, INFORMS

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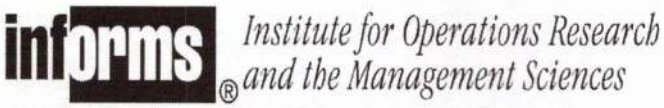
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Ali A. Houshmand
Jeffrey D. Camm

Guest Program
Karen G. Camm
Lisa P. Rogers
Webmaster

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min.li@uc.edu

CIST Co-Chairs
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Ohio State University
rolland.1@osu.edu

N. S. Umanath
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uma.umanath@uc.edu



INFORMS gratefully acknowledges the generous support of the Procter & Gamble Company for the INFORMS Cincinnati Spring 1999 Meeting. Their support has helped to create a diverse, exciting and memorable technical program and an outstanding array of special events.

The Procter & Gamble Company has provided support for:

- The Monday night General Reception in the Grand Rotunda of the Cincinnati Museum Center, highlighting jazz music and local cuisine
- The Saul Gass 10k Race
- The email center
- Enhanced video quality of the Franz Edelman Competition
- The 4th Conference on Information Systems & Technology
- The First INFORMS Graduate Student Consortium for Placement in Industry, Business & Consulting
- The First INFORMS Teaching Effectiveness Colloquium
- Extra coffee breaks featuring P&G's own Millstone coffee
- The Teacher Program

Thank you, Procter & Gamble!



Procter&Gamble

SPECIAL EVENTS

FRIDAY, APRIL 30	LOCATION	FROM TO
Teaching Effectiveness Colloquium	Caprice 1 - 4 (O)	6:30pm 9:30pm
SATURDAY, MAY 1		
Teaching Effectiveness Colloquium	Caprice 1 & 4 (O)	8:00am 3:00pm
Computational & Mathematical Org. Theory Workshop	Salon F & G (O)	8:00am 6:00pm
Edelman Rehearsal	Hall of Mirrors (O)	8:00am 6:00pm
IFORS Administrative Committee	Room 652 (O)	8:30am 6:00pm
Student Consortium	Julep (O)	11:00am4:30pm
Conference on Information Systems & Technology	Room 302 (C)	12:30pm6:00pm
INFORMS Executive Committee Meeting	Salon A (O)	1:00pm 5:00pm
Teaching Effectiveness Breakout 1	Salon B & C (O)	3:15pm 5:15pm
Teaching Effectiveness Breakout 2	Salon D & E (O)	3:15pm 5:15pm
Teaching Effectiveness Breakout 3	Caprice 2 & 3 (O)	3:15pm 5:15pm
Conference Registration	Ballroom Lobby (C)	4:00pm 8:00pm
INFORMS Membership Meeting	Rooms 300-301 (C)	5:00pm 6:00pm
CIST Business Meeting & Reception	Room 302 (C)	6:30pm 7:30pm
Teaching Effectiveness Colloquium/Consortium Dinner	Rosewood (O)	7:00pm 8:00pm
SUNDAY, MAY 2		
Conference Registration	Ballroom Lobby (C)	7:30am 5:00pm
Software Workshop 1: Crystal Ball	Julep (O)	8:00am 12noon
Software Workshop 2: Taylor II	Mayflower I (O)	8:00am 12noon
Teaching Effectiveness Colloquium	Caprice 1 & 4 (O)	8:00am 5:30pm
Computational & Mathematical Org. Theory Workshop	Salon F & G (O)	8:00am 6:00pm
Franz Edelman Award Competition	Hall of Mirrors (O)	8:00am 6:00pm
Conference on Information Systems & Technology	Room 302 (C)	8:30am 5:00pm
Guest Breakfast	Palm Court Restaurant (O)	9:00am 10:00am
INFORMS Board Meeting	Salon H & I (O)	9:00am 5:00pm
Nicholson Student Paper Prize I & II	Room 200 (C)	9:30am 2:00pm
IFORS AC Meeting	Room 652 (O)	10:15am12:15pm
Teaching Effectiveness Breakout 4	Caprice 2 & 3 (O)	10:45am12:45pm
Teaching Effectiveness Breakout 5	Salon B & C (O)	10:45am12:45pm
Teaching Effectiveness Breakout 6	Salon D & E (O)	10:45am12:45pm
Teaching Effectiveness Breakout 7	Salon M (O)	10:45am12:45pm
Job Fair	Ballroom B (C)	12noon 2:00pm
OR/MS in the News Session	Room 267 (C)	12:30pm2:00pm
Software Workshop 3: AMPL	Salon B & C (O)	1:00pm 5:00pm
Software Workshop 4: SIMUL8	Mayflower I (O)	1:00pm 5:00pm
RASIG Roundtable	Room 301 (C)	1:00pm 5:00pm
CIST/INFORMS Plenary	Ballroom C (C)	4:00pm 5:00pm
IFORS Business Meeting	Room 652 (O)	4:00pm 7:00pm
Subdivision Nominating Assembly	Room 758 (O)	5:00pm 6:00pm
MAS Council	Meetings Suite (O)	5:00pm 7:30pm
Roundtable Reception/Dinner	Julep (O)	5:30pm 8:00pm
Aviation Applications/RASIG/TSS Reception	Room 301 (C)	6:00pm 7:30pm
MSOM Reception	Room 262 (C)	6:15pm 7:45pm
DAS Council	Room 209 (C)	6:30pm 9:30pm
Advanced AMPL Tutorial	Salon D & E (O)	6:30pm 9:30pm
Forum on Women in OR/MS Reception	Rosewood (O)	7:00pm 9:00pm
Student Reception	Rookwood (O)	7:00pm 9:00pm
Roundtable Meeting	Mayflower I & II (O)	8:00pm 11:00pm

MONDAY, MAY 3	LOCATION	FROM TO
Board/Editors/Committee Chair Breakfast	Salon B & C (O)	7:00am 8:00am
Conference Registration	Ballroom Lobby (C)	7:30am 5:00pm
Wagner Prize Session	Room 202-212 (C)	8:00am 9:30am
Teacher Program	Pavilion (O)	8:00am 4:00pm
INFORMS Board Meeting	Salon H & I (O)	8:00am 5:00pm
Roundtable Meeting/Lunch	Mayflower I & II (O)	8:00am 5:00pm
Guest Breakfast	Palm Court Restaurant (O)	9:00am 10:00am
INFORMS Plenary	Ballroom C (C)	9:45am 10:45am
Opening Ceremony	Ballroom C (C)	11:00am12noon
Transportation Science Lunch	Salon F (O)	12noon 1:00pm
Section Subcommittee Lunch	Salon G (O)	12noon 1:00pm
Omega Rho Committee Lunch	Salon E (O)	12noon 1:00pm
MSOM Lunch	Salon M (O)	12noon 1:00pm
OR Area Editors Lunch	Salon D (O)	12noon 1:30pm
ACORD Lunch	Salon B & C (O)	12noon 2:00pm
Franz Edelman Award Luncheon	Room 301 (C)	12noon 2:00pm
INTERFACES Editors Meeting	Room 658 (O)	1:00pm 2:00pm
Military Applications Society/INFORMS Plenary	Ballroom C (C)	2:45pm 3:45pm
IFORS Distinguished Lecture	Room 202-212 (C)	4:00pm5:30pm
Section/Society/Fora Meeting	Salon B & C (O)	5:15pm 6:15pm
CPMS Isolated Practitioners Forum	Julep (O)	5:45pm 6:45pm
INFORMS Online Reception	Salon D (O)	6:00pm 7:30pm
INFORMS General Reception	Cincinnati Museum Center	7:30pm 9:30pm
TUESDAY, MAY 4		
Chapter Breakfast	Salon B & C (O)	7:00am 8:00am
Roundtable Breakfast	Suite 710 (O)	7:00am 8:00am
Saul Gass 10K Race	Lunken Airfield Bike Path	7:15am 10:00am
Editors Breakfast	Room 752 (O)	7:30am 9:00am
Conference Registration	Ballroom Lobby (C)	7:30am 5:00pm
Chapter Subcommittee Meeting	Salon B & C (O)	8:00am 9:00am
CPMS Council Meeting	Salon A (O)	8:00am 11:00am
Guest Breakfast	Palm Court Restaurant (O)	9:00am 10:00am
Omega Rho Distinguished Lecture	Ballroom C (C)	9:45am 10:45am
Speaker Showcase	Salon F & G (O)	11:00am4:00pm
Subdivision Committee Meeting	Salon E (O)	11:30am5:00pm
Third OR/MS Knowledge Bowl	Room 206 (C)	1:00pm 2:30pm
Cincinnati Reds vs. Arizona Diamondbacks	Cinergy Field	7:05pm
WEDNESDAY, MAY 5		
Conference Registration	Ballroom Lobby (C)	7:30am 10:00am

LEGEND:

C = Cincinnati Convention Center
O = Omni Netherland Plaza Hotel

SECTION BUSINESS MEETINGS

SUNDAY, MAY 2	LOCATION	FROM TO
RASIG	Room 301(C)	5:00pm 6:00pm
College on Simulation	Room 204 (C)	6:15pm 7:15pm
Consulting Forum Organizational Meeting	Room 208 (C)	6:15pm 7:15pm
Section on Location Analysis	Room 264 (C)	6:15pm 7:15pm
Section on Logistics	Room 261 (C)	6:15pm 7:15pm
Section on Management Control Systems	Room 238 (C)	6:15pm 7:15pm
Minority Forum Organizational Meeting	Room 239 (C)	6:15pm 7:15pm
Quality, Statistics & Reliability Section	Room 244 (C)	6:15pm 7:15pm
Revenue Management Section	Room 240 (C)	6:15pm 7:15pm
Technical Section on Telecommunications	Room 237 (C)	6:15pm 7:15pm
MONDAY, MAY 3		
Forum on Women in OR/MS	Room 267 (C)	12noon 1:00pm
Applied Probability Society	Room 260 (C)	5:45pm 6:45pm
Section on Aviation Applications	Room 238 (C)	5:45pm 6:45pm
Computing Society	Room 230 (C)	5:45pm 6:45pm
Decision Analysis Society	Room 209 (C)	5:45pm 6:45pm
Financial Services Section	Room 240 (C)	5:45pm 6:45pm
Section on Group Decision & Negotiation	Room 214 (C)	5:45pm 6:45pm
Manufacturing & Service Operations Society	Room 262 (C)	5:45pm 6:45pm
College on Marketing	Room 207 (C)	5:45pm 6:45pm
Military Applications Society	Room 210 (C)	5:45pm 6:45pm
College on Organization Science	Room 208 (C)	5:45pm 6:45pm
Technology Management Section & Management of Productivity & Technology Section	Room 239 (C)	5:45pm 6:45pm
Transportation Science Section	Room 241 (C)	5:45pm 6:45pm
TUESDAY, MAY 4		
Section on Accounting, Auditing & Tax	Room 267 (C)	6:15pm 7:15pm
College on Artificial Intelligence	Room 239 (C)	6:15pm 7:15pm
Section on Energy, Natural Resources & Environment	Room 236 (C)	6:15pm 7:15pm
Optimization Section	Room 234 (C)	6:15pm 7:15pm
Section on Public Programs & Processes	Room 206 (C)	6:15pm 7:15pm
Forum on Education	Room 208 (C)	6:15pm 7:15pm

LEGEND:

C = Cincinnati Convention Center
O = Omni Netherland Plaza Hotel

BASIC INFORMATION

Audio/Visual Requests – An overhead projector and screen will be provided at no cost in every session room. Arrangements for all other A/V equipment must be made in advance at the speaker's expense – **ON-SITE LCD REQUESTS WILL NOT BE HONORED.** For information and prices, contact Cheryl Clark at cheryl.clark@informs.org or 401-274-2525/800-343-0062, ext. 211.

Book & Literature Display – Visit the book and literature display table in the Exhibit Hall for the latest offerings from Marcel Dekker, Inc., Baltzer Science Publishers and others.

Business Meetings and Technical Sessions – All technical sessions and section business meetings will be held on the second level of the Cincinnati Convention Center. This level has an enclosed pedestrian skywalk system that spans 13 city blocks, linking hotels, retail shops, restaurants, nightclubs, banks and more.

Coffee Breaks – Featuring Procter & Gamble's own Millstone Coffee, coffee breaks will be held Sunday - Wednesday at the following times at these locations:

Sunday, May 2

7:30am	Convention Center, Level 2 & Lobby Ballroom, Level 3
9:30am	Convention Center, Level 2 & Lobby Ballroom, Level 3
2:00pm	Exhibit Hall, Level 3

Monday, May 3 & Tuesday, May 4

7:30am	Exhibit Hall, Level 3
9:30am	Exhibit Hall, Level 3
2:30pm	Exhibit Hall, Level 3
3:45pm	Exhibit Hall, Level 3

Wednesday, May 5

9:30am	Convention Center, Level 2 & Lobby Ballroom, Level 3

Thirty-minute coffee breaks supported P&G.

Email Center – INFORMS will have email set up for meeting attendees in Ballroom A on the third floor of the Cincinnati Convention Center. Procter & Gamble has provided funding for the email center. Name badges are required for admittance. Email will be available during the following hours:

Sunday, May 2	12noon – 5:00pm
Monday, May 3	9:00am – 5:00pm
Tuesday, May 4	9:00am – 5:00pm

Exhibit Hall – The Exhibit Hall will be located in Ballroom B on the third floor of the Cincinnati Convention Center. Leading database service firms, computer hardware and software vendors, publishers and others will display their latest materials, products and services. Come by the Exhibit Hall for demonstrations of new and developing technology and to see the most recent OR/MS educational materials. Name badges are required for admittance. The Exhibit Hall will be open during the following hours:

Sunday, May 2	12noon – 5:00pm
Monday, May 3	9:00am – 5:00pm
Tuesday, May 4	9:00am – 5:00pm

Hotel Accommodations – The Omni Netherland Plaza will host the INFORMS Cincinnati Spring 1999 Meeting. Many special events will be held there and ALL technical sessions will be held at the Cincinnati Convention Center. Blocks of rooms have been reserved for attendees at the Omni and at the Hyatt Regency Cincinnati. Rates at the Omni are $109 single or double and $129 double/double, triple or quad. At the Hyatt Regency, rates are $104 single, $114 double, $124 triple and $135 quad. Rates do not include applicable taxes.

INFORMS Online – The preliminary program will be available online ONLY and will be updated regularly until the meeting. Go to www.informs.org, highlight sessions of interest to you and print your own customized program. Contact authors directly at their addresses as listed online to receive complete copies of any papers abstracted in the program.

Job Placement Center – The INFORMS Job Placement Service (JPS) helps OR/MS professionals locate employment opportunities in academia, government and private industry. Employers from a wide variety of professional interest areas participate in the program regularly. JPS runs on a semi-annual basis: January – June and July – December. JPS is now available on INFORMS Online for the Spring Cincinnati meeting at http://www.informs.org/JPS/ You can find: online registration for applicants and employers; 24-hour access to job listings and applicant files; on-site interviewing facilities at meetings; hard copy booklets of all active participants; low fees (free for student members).

For additional information on JPS, on-site interviewing arrangements or to obtain a paper copy application, contact our Customer Service Department at 800-446-3676 or 410-850-0300 or via email at jps@mail.informs.org.

Presentation Withdrawals – All abstract/session withdrawals must be received in writing at the RI Business Office; please email ginni.mcgee@informs.org, fax 401-274-3189 or mail to 2 Charles St., Ste. 300, Providence RI 02904.

Transportation – The Greater Cincinnati/Northern Kentucky International Airport is served by 13 major regional and commuter airlines and is approximately 15 - 20 minutes from downtown Cincinnati. Taxis are available and Jetport Service is also available. Rental car agencies

are located in the baggage claim area of each of the 3 terminals and coach service is also offered.

Travel Arrangements – Travel to Cincinnati for less! Call Conventions in America (CIA) at 800-929-4242 and ask for Group # 560 to receive 5% - 10% off the lowest applicable fares on Delta Air Lines, or the lowest available fare on any other carrier. Reach CIA at 800-929-4242 and ask for Group #560 or by fax at 619-453-7976. For calls outside the 800 area, call 619-453-3686.

EXHIBITORS

ALPHATECH, Inc. - Booth 4
50 Mall Rd.,Burlington, MA 01803;
alpha.sim@alphatech.com
***ALPHA*/Sim** is a general-purpose discrete-event simulation tool based on Petri nets. The graphical modeling environment provides a simple, yet powerful set of model building blocks, making it easy to learn and use productively. Platforms include PCs (NT) and Sun Workstations (SunOS or Solaris). ALPHATECH offers training, consulting and technical support.

Applied Decision Analysis LLC Booth 9
2710 Sand Hill Rd., Menlo Park, CA 94025; www.adainc.com
ADA is a member of the PricewaterhouseCoopers organization. Pricewaterhouse-Coopers, www.pwcglobal.com, the world's largest professional services organization, helps its clients build value, manage risk and improve their performance. ADA publishes DPL, decision analysis software for Windows. DPL integrates influence diagrams, decision trees, spreadsheets and strategy tables for professional decision analysis modeling.

Dash Optimization Inc. - Booth 20
115 River Rd., Ste. 1203, Edgewater, NJ 07020;
www.dashopt.com
Dash Optimization Inc. provides the most advanced modeling and optimization software. Our products and services allow our clients to significantly enhance their productivity by quickly and reliably solving their hardest optimization problems. The integrated modeling and optimization capabilities of our XPRESS-MP software make it easy for companies to develop, test and solve complex models arising from a wide variety of applications.

Decisioneering, Inc. - Booth 29
1515 Arapahoe St., Ste. 1330
Denver, CO 80202;
sales@decisioneering.com
Decisioneering is proud to introduce CB Predictor to its arsenal of risk analysis products. CB Predictor incorporates the most advanced methods of Time-Series Forecasting (TSF) into an easy-to-use Microsoft Excel add-in. TSF techniques analyze historical data to predict future performance. Decisioneering's other risk analysis products include Crystal Ball, Crystal Ball Pro and CB Turbo.

Duxbury Press - Booths 1 & 2
10 Davis Dr., Belmont, CA 94002;
www.duxbury.com
Duxbury is an imprint of Brooks/Cole Publishing, an International Thomson Publishing Company. Duxbury is an educational publisher focusing exclusively in the fields of statistics and quantitative methods in all disciplines and at all levels of learning. Come by our booths and review recent works by Chris Albright, David Bell, Bob Clemen, Bob Fourer, David Gay, Ed Kao, Craig Kirkwood, Larry Lapin, Sam Savage, Art Schleifer, Linus Schrage, Wayne Winston and special student edition software by ADA, ILOG, LINDO Systems, MathSoft Inc., Palisade Corp. and SAS Institute.

Elsevier Science - Booths 16 & 17
655 Avenue of the Americas,
New York, NY 10010
The OR/MS publication program by Elsevier Science offers comprehensive international coverage of the latest research and developments in the field. Topical handbooks and a wide range of journal publications cover a wide spectrum of topics. Check us out at the booth or see a preview at: www.elsevier.com/locate/orms

eSocrates - Booth 28
425 Pheasant Ridge Rd., Lewisburg, PA 17837;
socrates@esocrates.com
eSocrates, a division of Environmental Intelligence, Inc., is a value-added education company helping clients in 15 countries to develop web-based education and training programs. We offer a complete technology infrastructure to launch your web-based courses, online course content to supplement existing texts, and complete online courses, instructor training and marketing support to create effective online and distance education and training.

GAMS Development Corp. - Booth 34
1217 Potomac St. NW, Washington, DC 20007
www.gams.com
GAMS is the leading tool to develop models for mathematical programming problems. It is currently used in nearly every country in the world for modeling large, complex optimization problems in academia, industry and government. GAMS allows the flexibility to develop several model types and has excellent documentation and debugging features.

IBM Supply Chain Optimization Solutions - Booths 39 & 40
522 South Rd., MS P356
Poughkeepsie, NY 12601;
kenruss@us.ibm.com
IBM, a provider of world class solver software, will demonstrate new products in the Optimization Solutions and Library family, with focus on new stochastic programming functions, parallel solver support and support for new hardware and software platforms. A GUI and new programming

interfaces will also be demonstrated.

ILOG, Inc. - Booth 10
1080 Linda Vista Ave., Mountain View, CA 94043; info@ilog.com
ILOG is leading a revolution in optimization. You probably already use ILOG's powerful CPLEX LP, MIP and Parallel Optimizers. ILOG also provides the world's leading constraint programming and scheduling tools. New from ILOG: CPLEX 6.5 with stunning MIP innovations and ILOG OPL Studio, the next-generation modeling language and environment bridging both LP/MIP and constraint programming technologies.

INFORMS – Membership - Booths 13 & 14
901 Elkridge Landing Rd., Ste. 400, Linthicum, MD 21090; informs@informs.org
Created in 1995 through the merger of ORSA and TIMS, INFORMS is offering exciting new services to its members. Visit the INFORMS booth and pick up complimentary copies of our 9 prestigious journals and *OR/MS Today*.

INFORMS-KORMS International Korea - Booth 23
We invite you to learn more about this exciting international conference to be held in Seoul in late June 2000. The conference theme is *"Information & Knowledge Management in the 21st Century."*

INFORMS Philadelphia Fall 1999 - Booth 35
OR/MS and the Quality of Life: the conference theme addresses the phenomenon of rapid globalization. Meet with local committee members who can answer your questions and tell you about the meeting.

INFORMS Salt Lake City Spring 2000 - Booth 31
Stop by our booth for information on the city and meeting preparations.

Irwin/McGraw-Hill - Booths 26 & 27
2 Penn Plaza, New York, NY 10121-2298;
mary_donnelly@mcgraw-hill.com
Irwin/McGraw-Hill is the leading college publisher for business textbooks. Our market position is the result of our world-renowned authorship, unique product development model and strong relationship with customers. This, combined with innovative technology solutions, helps Irwin/McGraw-Hill to offer products of the highest quality for students worldwide.

Ivey Publishing - Booth 7
Richard Ivey School of Business, University of Western Ontario, London, Ontario, N6A 3K7 Canada; info@ivey.uwo.ca
Ivey publishing manages and distributes the case collection of the Richard Ivey School of Business. After Harvard Business School, Ivey is the second largest producer of business cases in the world. The collection consists of more than 1,800 case studies, approximately 25% of which have teaching notes. The case collection is kept current by the Ivey faculty, who add approximately 150 new case studies each year.

John Wiley & Sons, Inc. - Booths 18 & 19
605 3rd Ave.,New York, NY 10158-0012; www.wiley.com
Founded in 1807, John Wiley & Sons, Inc. is an independent global publisher of print and electronic products. Wiley specializes in scientific and technical books, journals, textbooks and educational materials for colleges and universities and professional and consumer books and subscription services.

Ketron Management Science - Booth 36
1744 Jefferson Davis Hwy., #901, Arlington, VA 22202; jcreegan@ketronms.com
Ketron Management Science concentrates on mathematical programming products and consulting. Products include C-WHIZ, linear simplex optimizer, MIPIII, mixed-integer optimizer, OML, callable library of optimization and modeling functions and DATAFORM, modeling language. A user interface supplies access to all stand-alone components including a very useful matrix editor.

Kluwer Academic Publishers - Booth 21
101 Philip Dr., Norwell, MA 02061; kluwer@wkap.com
Kluwer Academic Publishers will exhibit the latest research books and journals in the areas of OR and MS. Titles include: *Large Scale & Integer Optimization* by Richard Kipp Martin, *Project Scheduling* by Jan Weglarz and *Quantitative Models for Supply Chain Management* edited by Sridhar Tayur et al. Also on display will be sample copies of Kluwer's renowned research journals including the new journal *Information Systems Frontiers*.

LINDO Systems Inc. - Booth 15
1415 North Dayton St., Chicago, IL 60622; www.lindo.com
LINDO Systems will highlight recent speed enhancements to our LP solver and demonstrate our line of popular mathemati-cal modeling packages, including: LINDO, our powerful linear and integer programming engine, LINGO, our integrated modeling language with linear/nonlinear solvers and What'sBest!, our large scale linear/nonlinear spreadsheet solver.

Maximal Software, Inc. - Booth 11
2111 Wilson Blvd., Ste. 700
Arlington, VA 22201
www.maximal-usa.com
Maximal Software will be introducing the new release MPL for Windows 5.0 that will revolutionize how optimization modeling is applied to solve business problems. This new release includes, among other notable enhancements, the highly anticipated OptiMax 2000 Component Library (API) that can be called seamless, from both *Visual Basic* and *C/C++*, to create customized end-user applications to solve real-world optimization problems.

Palisade Corp. - Booth 38
31 Decker Rd., Newfield, NY 14867; www.palisade.com
Palisade Corporation offers advanced software for risk and decision analysis. Our products include @RISK (Monte Carlo simulation), RISKOptimizer™ (optimiza-tion that includes uncertain variables) and the Decision Tools® Suite, an integrated set of risk and decision analysis programs. Contact us for a free catalog and demo CD.

Paragon Decision Technology - Booth 37
PO Box 3277, 2001 DG Haarlem The Netherlands; www.paragon.nl
Paragon Decision Technology introduces its brand new AIMMS 3.0 system. AIMMS 3.0 is an all-round development environment for creating fully functional decision support applications. The unique combination of advanced features and design tools within AIMMS allows you to build complex applications that are easily maintainable.

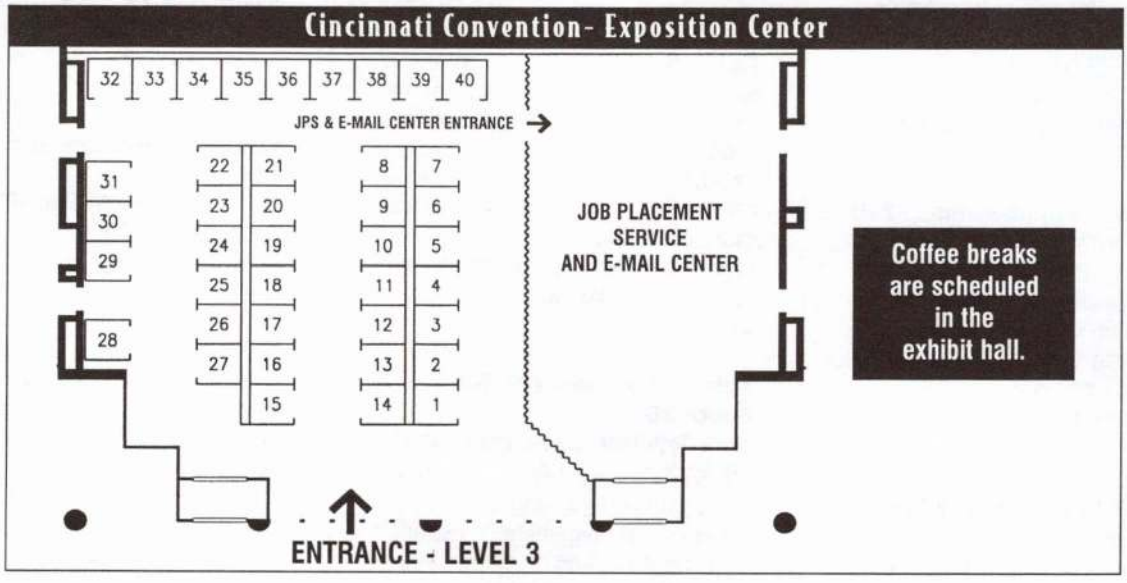
The Procter & Gamble Company - Booth 6
2 Procter & Gamble Plaza, Cincinnati, OH 45202-0599

Sage Publications, Inc. - Booth 5
2455 Teller Rd., Thousand Oaks, CA 91320; lisa.lamont@sagepub.com
Sage features a comprehensive publishing program of books and journals in management, marketing and research methodology. Stop by our booth to inspect or latest offerings and to discuss your future writing plans with our Acquisitions Editor.

SIAM - Booth 8
3600 University City Science Ctr., Philadelphia, PA 19104; www.siam.org
Visit the SIAM booth to check out our new publications. There are new books in almost every SIAM series. Recently published books and the first few books in our discrete math series will be on display. See sample issues of SIAM's renowned journals. Membership information and applications will be available. Plenty of information is available to take with you, too. Pick up a copy of *SIAM News* for the road.

South-Western College Publishing - Booth 3
5101 Madison Rd., Cincinnati, OH 45227; www.swcollege.com
Welcome to South-Western College Publishing. Our position as a market leader in decision sciences and business statistics higher education is built on time-tested values and adaptability to changing market needs. Stop by our booth to find a wealth of information on the latest South-Western texts, like those by Anderson/Sweeney/Williams, Gaither/Frazier, Peter Bell and James Evans! South-Western is part of the International Thomson Publishing (ITP) family of publishers.

Springer-Verlag New York, Inc. Booth 12
175 Fifth Ave., New York, NY 10010; www.springer-ny.com
For more than 155 years, Springer-Verlag has published high quality books and journals covering a wide array of topics. Stop by our booth to see our very latest titles (all discounted by 20%) in pure and applied probability, combinatorics, DA, IS, LP, statistics/quality control and stochastic processes. Also available are sample copies *of Mathematical Programming*, a publication of the Mathematical Programming Society, now published with Springer.



GUEST PROGRAM

Breakfast – The guest program includes a continental breakfast Sunday through Tuesday mornings from 9:00 – 10:00am and the General Reception at the Cincinnati Museum Center Monday evening for a $25 registration fee. Registered guests only may attend the breakfasts and must wear their name badges for admittance. *Registered guests may not attend any of the technical sessions.*

Tours

Monday, May 3 – $31

Cincinnati Zoo & Botanical Gardens

The Cincinnati Zoo and Botanical Gardens is just north of downtown Cincinnati. The botanical collection, with plants from around the world ranging from hardy bamboo trees to rare shrubs, enhances the zoo's naturalistic outdoor animal enclosures. The Cincinnati Zoo has garnered national attention through an on-site breeding program of rare species. Begin your journey around the globe at the Cincinnati Zoo and Botanical Gardens and discover rare wild animals and a remarkable variety of plants.

The bus will leave from the Omni at 10:00am and will return at approximately 3:00pm.

Tuesday, May 4 – $45

Riverboat Luncheon Cruise

Before boarding the riverboat for your luncheon cruise, you'll have the opportunity to see the magnificent French Gothic Cathedral Basilica of the Assumption, built to resemble Paris' Notre Dame. After reaching the Ohio River, you'll board the riverboat and head up the lazy river. Listen to the melodies of a sing-along with a Dixieland banjo player. During the cruise, enjoy a delicious buffet luncheon, then relax and view the ever-changing vistas from the picturesque Ohio Bluffs to the historic homes of Kentucky's rolling hills.

The bus will leave from the Omni at 10:30am and will return at approximately 2:30pm.

PLANT TOURS

The following tours have been organized for INFORMS participants. Each tour will consist of a 20-30 minute overview, followed by a 1-hour customized plant tour and a question-and-answer period. Participants are encouraged to wear casual clothes, no loose clothes or high heels. **Cameras are prohibited on all tours.**

Sunday, May 2

Toyota – $40

This advanced manufacturing facility makes the Camry and Sienna automobiles with a cycle time of 55 seconds. The tour guide will explain the advanced robotic line and the Toyota production system. Including a 75-minute ride to the plant, the tour may take as long as 4 hours. **The bus will leave from the Convention Center at 10:00am.**

GAP – $25

The GAP's Kentucky Distribution Center services 3 of the corporation's 5 divisions. The distribution of GAP, GAPKIDS and BANANA REPUBLIC apparel is serviced nationwide from this 724,000 square foot facility. This automated facility consists of over 6 miles of conveying equipment and utilizes various material handling processes in supporting distribution to over 1,790 stores. **The bus will leave from the Convention Center at 2:00pm.**

Monday, May 3

Cintas – $25

When it comes to delivering customized uniforms, nobody in the world is better than Cintas. The facility demonstrates the complexities in automated cutting, stitching and assembly that allow Cintas to deliver a customized uniform in a day. **The bus will leave from the Convention Center at 9:00am.**

Mazak – $25

This highly efficient and productive facility assembles complex machine tools with the latest and best technologies available. Innovative scheduling systems and modular product design allows Mazak to deliver some amazing benefits to the customer: speed of changeover and flexibility. **The bus will leave from the Convention Center at 1:00pm.**

Tuesday, May 4

Hudson – $25

This amazing facility produces and ships perishables (specialty foods) with amazing speed. The scheduling challenges in a JIT shipment environment become "real" challenges when the shelf life of the product may be 2-3 days. Eight custom-designed lines feed an amazingly complex and quick distribution network. **The bus will leave from the Convention Center at 1:00pm.**

REGISTRATION

Advance Registration (*Deadline April 1*) – Advance registration is less expensive, quicker and easier than on-site registration. Print out the registration form and fax to 401-274-3189 or mail to INFORMS Cincinnati, 2 Charles St., Ste. 300, Providence RI 02904 by **April 1**. Registration fees can be paid by check or money order made payable to INFORMS Cincinnati '99 or by credit card (American Express, MasterCard or VISA only). It is also possible to register via the Web using your credit card. The deadline for advance registration will be strictly

enforced; all payments postmarked after **April 1** will be charged the full, on-site registration fee. Registration materials will be available in the registration area.

On-Site Registration – Located in the Lobby Ballroom on Level 3 of the Cincinnati Convention Center:

Saturday	4:00pm – 8:00pm
Sunday	7:30am – 5:00pm
Monday	7:30am – 5:00pm
Tuesday	7:30am – 5:00pm
Wednesday	7:30am – 10:00am

The registration fee includes admittance to all technical sessions, to the General Reception at the Cincinnati Museum Center on Monday evening and to the exhibit area. Name badges MUST be work to all INFORMS sessions, functions and events. Misplaced badges may be replaced at the registration desk; your receipt must be shown for verification. If you attend workshops or special paid events, an additional fee is required. **ALL ATTENDEES, INCLUDING CLUSTER AND SESSION CHAIRS AND SPEAKERS MUST REGISTER AND PAY THE REGISTRATION FEE.**

Rates

Deadline Dates	**On/Before 4/1**	**After 4/1**
INFORMS Members	$210	$235
Nonmembers	$250	$275
Students/Retired	$65	$65
Guests	$25	$25

Refund & Cancellation Policy – Registration payments will be refunded only if a written cancellation is received in the Rhode Island office no later than **April 28**. Cancellations may be faxed to 401-274-31289 or emailed to meetings@informs.org and must meet this deadline.

Video – The INFORMS Public Awareness Committee is giving a free copy of the new video, "Operations Research: Science & Technology for Informed Decision Making," to everyone who registers for the INFORMS Cincinnati Spring Meeting. Pick up your copy of the new video with your registration materials!

SPECIAL EVENTS

Advanced AMPL Tutorial - The annual Advanced AMPL tutorial has been scheduled for AMPL users and those interested in the AMPL Modeling Language. Reservations are required and may be made by contacting the ILOG staff in the Exhibit Area (Booth 10) or by sending an email to info@modeling.com or info@cplex.com. The session will be held in Salon D & E at the Omni and will begin at 6:30pm with refreshments, with the formal program beginning at 7:00pm. Topics to be covered include: what's new with AMPL/AMPL Plus (Sanjay Saigal), complementarity problems with AMPL and standard AMPL database features (Robert Fourer) and ILOG positioning for AMPL vis-à-vis OPL(Irvin Lustig). The session will conclude with an open discussion and questions.

Baseball Game – The Cincinnati Reds are playing at home and INFORMS has tickets available for a game against the Arizona Diamondbacks on Tuesday, May 4, at 7:05pm for $15. Cinergy Field is approximately 8 blocks from the hotels and is an easy, pleasant and safe walk. The seats are on the left-field line on the field level – the level closest to the playing field. Will Mark McGwire hit a home run for the Reds during the game? Will a lucky INFORMS fan catch it? Buy a ticket, bring your glove and find out!

CPMS Isolated Practitioner Workshop – CPMS, the Practice Section of INFORMS, sponsors workshops on topics of interest to isolated practitioners, i.e., Lone Rangers, of OR/MS. The 14th workshop in this series will address timely issues that affect the growing isolated practitioner community. All are welcome to attend the workshop and participate in the discussion to be held Monday evening, 5:45 – 6:45pm in the Julep Room. Wine and cheese will be served.

Forum on Women in OR/MS

- **Business Meeting & Luncheon –** Everyone interested in issues related to women professionals in OR/MS is invited to attend the business meeting and luncheon in Room 267 in the Convention Center on Monday, May 2 from 12noon – 1:00pm.

- **Reception –** The reception for the Forum on Women in OR/MS will be held on Sunday from 7:00 – 9:00pm in the Rosewood Room of the Omni Netherland Plaza. This is an ideal opportunity to meet other women practitioners and researchers of OR/MS, network with colleagues and renew acquaintances! We thank the Optimization Center at the IBM T. J. Watson Research Center for their generous sponsorship.

General Reception – The General Reception will be held Monday, May 3 in the Grand Rotunda of the Cincinnati Museum Center from 7:30 – 9:30pm. This nationally acclaimed landmark has been revitalized to become the new home for the Museum of Natural History & Science, the Cincinnati History Museum and the Robert D. Lindner Family OMNIMAX Theater. The museums and giftshop will be open for everyone to enjoy during the reception and the Omnimax Theater will be running shows. Music will be provided during the reception. Procter & Gamble has provided funding for the General Reception. Bus transportation will leave from the Convention Center beginning at 7:15 and will return from the museum. ***Please present the ticket included with your registration materials for admittance.***

INFORMS Membership Meeting – Please come to the INFORMS Membership Meeting on Saturday, May 1 in Rooms 300-301 of the Convention Center, 5:00 – 6:00pm. Meet Thomas Magnanti, the new President of

INFORMS and the incoming Board Members. Wine and cheese will be served.

Job Fair – The INFORMS Job Placement Service will hold its spring Job Fair in Ballroom B on 3rd third level of the Conference Center on Sunday, 12noon – 2:00pm.

• **Employers** – The Job Fair will provide a venue for you to meet and collect resumes from many job-seekers in a short period of time early in the conference, giving you the opportunity to set up interviews during the conference. We will provide a table on which you can display informational material and a sign with the name of your organization. Participation is limited to firms with job listings in the INFORMS Job Placement Service. For more information on the Job Placement Service, including fees, see the INFORMS website at www.informs.org or send e-mail to member.services@informs.org. Sign-ups for the Job Fair will be taken on a first-come, first-served basis. To sign up, contact Tina Watkins via e-mail at tina.watkins@informs.org or by phone at 410-691-7850.

• **Job Seekers** - The Job Fair is open to all members who have signed up with the Job Placement Service. The Job Placement Service provides on-line job listings for you to peruse and provides employers with on-line access to your resume. The service is FREE for all members of INFORMS; there is a nominal charge for non-INFORMS members. You may sign up via the INFORMS website at www.informs.org.

1999 George E. Nicholson Student Paper Prize Competition – In 2 back-to-back sessions, selected finalists in the Nicholson Student Paper Prize Competition will be featured. These sessions represent an opportunity for faculty, professionals and other students to see some of the best research being performed by students. Everyone is welcome to see the presentations on Sunday from 9:30 – 11:45am and from 12:30 – 2:00pm in Room 200 of the Convention Center. Winners will be announced at the Opening Ceremony on Monday from 11:00am – 12noon in Ballroom C of the Convention Center.

Opening Ceremony – Join us for the official start of the INFORMS Cincinnati Spring 1999 Meeting on Monday from 11:00am – 12noon in Ballroom C of the Convention Center. The members of the Cincinnati Local Committee will be present and David Rogers, the Cincinnati General Chair, will make welcoming remarks. Thomas Magnanti, the new President of INFORMS, will also speak.
If recipients have been determined, the following will be awarded: the George E. Nicholson Student Paper Prize, the Philip McCord Morse Lectureship Award, the INFORMS Prize for the Teaching of OR/MS Practice and the von Neumann Theory Prize. The winners of Sunday's 28th Annual Franz Edelman Award for Achievement in OR/MS Competition will also be announced. And, the 1998 INFORMS President's Award will be presented at the Spring 1999 meeting since the recipient was unable to attend the ceremony in Seattle. Karla Hoffman, Past President from 1998, will make this special presentation. Please attend this exciting ceremony!

OR/MS in the News - The media spotlight has found OR/MS, making news from topics ranging from strategies for R&D to strategies for finding a parking spot. Plan to attend this exciting session on Sunday in Room 267 of the Convention Center from 12:30 - 2:00pm. Find out about the studies that recently caught the attention of ABC News, the Washington Post, National Public Radio and others. Researchers from Harvard, the University of North Carolina, Virginia Institute of Technology and Yale present the latest developments in their work.

Saul Gass 10K Race – Attention runners! The Saul Gass 10K Race is back! All meeting registrants and their guests are invited to enter (no minors – all runners must be over 18 years of age or older). The race will take place on Tuesday, May 4 – the bus will leave for the course at Lunken Airfield Bike Path at 6:30am from the Convention Center and the race will start promptly at 7:15am. A continental breakfast will follow the race; winners will be announced and prizes awarded at that time. The Cincinnati Saul Gass 10K Race is sponsored by Sunny Delight®.

Speakers Showcase – Come hear how INFORMS' most prominent speakers present OR/MS to the "outside world"! The INFORMS Speakers Program is expanding this year to market some of our best speakers to meeting planners outside OR/MS. To promote this new service, we will have several of these speakers presenting in a session which will be professionally videotaped so we can get promotional videos, 8 to 10 minutes long, to send to prospective buyers. Doug Samuelson, "The ORacle", Dick Larson, queueing guru from MIT and Tom Spencer, management science maven from AT&T, are among the speakers. We have tentative commitments from several other well-known leaders of the profession; watch the on-line updates for additional information. The session will begin at 11:00am on Tuesday, May 4, in Salon F & G of the Omni Netherland Hotel. Come see how the pros do it!

Student Reception – All student attendees are invited to attend the Student Reception on Sunday from 7:00 – 9:00pm in the Rookwood Room of the Omni Netherland Plaza. Food and drinks will be served. ***Please present the ticket included with your registration materials for admittance.***

The Daniel H. Wagner Prize for Excellence in Operations Research Practice – CPMS, the Practice Section of INFORMS, established the Daniel H. Wagner Prize for Excellence in Operations Research Practice with a cash award in memory of Daniel H. Wagner. This prize emphasizes the quality and coherence of the analysis used in practice. The first competition was held at the INFORMS Seattle meeting and the winning presentation, "Cooperative Multiobjective Decision Support for the Paper Industry," will be reprised at the INFORMS Cincinnati Meeting on Monday, May 1 from 8:00 – 9:30am in Room 202-212 of the Convention Center.

PEDAGOGICAL PROGRAM

Beginning with welcoming remarks by James Cochran, the Cincinnati Pedagogical Development Chair, during a kick-off buffet dinner on Friday, April 30, the Cincinnati Local Committee has organized 2 full days of pedagogical-related sessions and workshops, including the First INFORMS Teaching Effectiveness Colloquium and the First INFORMS Student Consortium for Placement in Industry, Business & Consulting.

Friday, April 30 – Sunday, May 2, 1999 Teaching Effectiveness Colloquium

The first INFORMS Teaching Effectiveness Colloquium is a series of pedagogically oriented sessions and workshops. Twenty respected and innovative instructors from INFORMS constituent disciplines will present and demonstrate their methods. Many sessions will provide lively demonstrations that offer the audience an opportunity to actively participate. The Colloquium will be similar in format to the annual PhD Student Colloquium held in conjunction with the INFORMS Fall meetings. Its purpose is to expose INFORMS members to a wide variety of creative approaches to teaching OR/MS. Topics include effective management of large classes, use of active learning techniques and games in the classroom, integration of cases into OR/MS courses, facilitation of distance learning and recognition of various cognitive styles and their implications.

On Saturday, we have 3 2-hour concurrent breakout sessions as part of the colloquium. These breakout sessions will cover the integration of spreadsheets into statistics, mathematical programming and simulation courses. On Sunday, 4 additional concurrent breakout sessions are planned. Concepts from marketing, engineering, finance and information systems will be discussed. Another workshop on effective classroom presentation techniques is planned for Sunday afternoon.

FRIDAY, APRIL 30		
6:30-7:30pm	*Buffet Dinner*	
7:30-8:30pm	*Welcome & Introduction*	Jim Cochran
8:30-9:30pm	Educational Musings	Tom Magnanti

SATURDAY, MAY 1		
8:00- 8:30am	*Continental Breakfast*	
8:30- 9:30am	Cognitive Psychology & Learning Styles	Judith Liebman
9:30-10:30am	Facing the Challenges of Large Classes	Erhan Erkut
10:30-10:45am	*Break*	
10:45-11:45am	Using Cases To Enrich the OR/MS Course	Peter Bell
11:45am-1:00pm	*Lunch*	
1:00-2:00pm	Using Projects to Teach OR/MS	Tom Grossman
2:00-3:00pm	Teaching Operations Analysis Using	
	Experiential Learning Concepts	Jack Muckstadt & Peter Jackson
3:00- 3:15pm	*Break*	
3:15- 5:15pm	*Colloquium Breakout Session Choices:*	
	1. Spreadsheet Implementation: Math Programming	Jeff Camm
	2. Simulation & Risk Analysis on Spreadsheets	Jim Evans
	3. Statistical Thinking with Spreadsheets	Malcolm Getz
5:15-7:00pm	*Break*	
7:00-8:00pm	*Dinner & Guest Speaker*	Franz Dill
SUNDAY, MAY 2		
8:00-8:30am	*Continental Breakfast*	
8:30- 9:30am	Technology-Enabled OR Education: What it may	
	do for Professors & Practitioners	Dick Larson
9:30-10:30am	Teaching Modeling within MS	Steve Powell
10:30-10:45am	*Break*	
10:45am-12:45pm	*Colloquium Breakout Session Choices:*	
	4. Integrating Engineering Material into an OR Course	Donna Llewellyn
	5. Integrating Marketing Concepts into an MS Course	Joel Steckel
	6. Integration of Management Science with Finance	Wayne Winston
	7. From Decision Models to Decision Support: Excel with VBA	Cliff Ragsdale

12:45-2:00pm	*Lunch*	
2:00-3:00pm	Skillful Presentation to Improve Teaching	
	Effectiveness Workshop	Kathleen Slaughter
3:00-3:15pm	*Break*	
3:15-4:15pm	Skillful Presentation to Improve Teaching	
	Effectiveness Workshop (cont.)	Kathleen Slaughter
4:15-5:15pm	The Road Warriors: Educating with the	
	Virtual Research Team in Today's Global	
	Environment	Dick Deckro & Jack Kloeber
5:15-5:30pm	*Wrap-Up*	

For a complete schedule and descriptions of presentations, please visit our website at: http://www.sba.muohio.edu/cochrajj/1999TEC.htm. Eligible students must be in good standing in a PhD program emphasizing one of INFORMS constituent disciplines, be within 6 months of completing all degree requirements, have a sincere interest in an academic career and be a member of INFORMS or have applied for membership at the time of registration. A certification of faculty status should be faxed to 401-274-3189 or emailed to meetings@informs.org. Colloquium registrants must also register for the INFORMS Spring Cincinnati meeting in order to participate. Fees include participation in all colloquium sessions, all handouts and materials, dinner on Friday and Saturday and breakfast and lunch on Saturday and Sunday. Registrants must choose one out of three breakout workshops to attend on Saturday afternoon and one out of four breakout sessions Sunday morning. Registrants who do not register for the colloquium may register for any of the 2-hour breakout sessions. The Skillful Presentation to Improve Teaching Effectiveness Workshop on Sunday afternoon is also open to registrants at a reduced fee.

The colloquium is an initiative of the INFORMS Education Committee and has received funding from *Procter & Gamble, South Western Publishing, John Wiley & Sons, Prentice Hall, Irwin/McGraw-Hill, the INFORMS Education Committee* and *the University of Cincinnati.*

Saturday, May 1, The First INFORMS Student Consortium for Placement in Industry, Business & Consulting
Procter & Gamble and the INFORMS Student Affairs Committee are jointly sponsoring the first Student Consortium for Placement in Business, Industry and Consulting. The consortium is scheduled on May 1, 10:45am - 4:30pm in the Julep Room of the Omni Netherland. Lunch and dinner will be held in the Rosewood Room at the Omni.

The consortium will bring together approximately 65 carefully selected students close to graduation in degree granting programs in OR/MS, MS, supply chain management, logistics, transportation and 17 participants representing a wide variety of industries and firms such as IBM, Hewlett-Packard, SABRE, Ernst & Young LLP, Yellow Freight, Citicorp, Dow Chemical, i2, Manugistics and Procter & Gamble.

The specific objectives of the consortium are to expose students to the different kinds of jobs available in OR, supply chain management, logistics, statistics and related fields; and to promote interaction between students and their potential recruiters.

Direct questions to the Consortium Coordinator and organizer, Ram Ganeshan, University of Cincinnati, ML #0130, QAOM Dept, Cincinnati, OH 45221-0130; ram.ganeshan@uc.edu; http://www.econqa.cba.uc.edu/~ganeshr/index.html

SATURDAY, MAY 1	
10:15-10:45am	*Student Consortium Registration*
10:45-11:45am	General Session: What it Takes to be Either Practitioner or Consultant in OR/MS
	Barton Snow, Hewlett-Packard
	Franz Dill, Procter & Gamble
	Sumantra Sengupta, Ernst & Young LLP
12noon-1:00pm	*Lunch & Networking*
1:00-2:00pm	Jobs in Supply Chain Management
	Mary Long, Pillsbury USA
	Amit Garg, TJ Watson Research Center, IBM
	Gerry Feigin, i2 Technologies
	Jodi Bourgoin, Dow Chemical
	Mani Aggrawal, Manugistics
2:00-2:30pm	*Coffee Break and Networking*
2:30-3:30pm	Jobs in Transportation & Distribution
	Praveen Kumar, SABRE Decision Technologies

	Shawn Curran, The GAP
	Jesee Svoboda, Pinacor
	Kris Bjorson, Staubach Company
	Steve Kleinheinz, Yellow Freight
	Tim Dreffer, Cardinal Logistics
3:30-4:30pm	Jobs in Statistics /Military
	Felicien Kanyamibwa, Citicorp
	John Guo, Advanta Corp.
	Jeff Huisingh, Federal Travel Optimization Reinvention Laboratory
7:00-9:30pm	*Dinner & Presentation,* Franz Dill, Procter & Gamble

28th ANNUAL FRANZ EDELMAN AWARD FOR ACHIEVEMENT IN OR/MS COMPETITION PRESENTATIONS

Representing applications from production scheduling, asset-liability modeling, network reliability, workforce scheduling and supply chain management, 7 finalists will vie for the 28th Franz Edelman Award for Achievement in Operations Research and Management Science. Russell Labe, Chair of the 1999 competition, announced the following finalists: AT&T, British Telecommunications, Dana Spicer Clark-Hurth, Ford Visteon, IBM, Towers Perrin and US Department of Energy at Pantex.

Finalist presentations will be made on Sunday, May 2 in the Hall of Mirrors of the Cincinnati Omni Netherland Plaza. All those interested in the practice of OR and MS are invited to attend the day-long presentation session. The registration fee is $95 and includes lunch on Sunday and a luncheon on Monday. The winning presentation will be announced during the Opening Ceremony on Monday, 11:00am-12noon in Ballroom C of the Convention Center.

This is the 28th year the prestigious $15,000 competition has been held. The award is jointly sponsored by INFORMS and CPMS, the Practice Section of INFORMS. The Edelman award recognizes outstanding implemented work that has had a significant positive impact on the performance of the client organization. The top finalist receives a $10,000 first prize. The work presented covers a wide range of OR/MS applications as follows:

Dana Spicer Clark-Hurth: Improved Lead Time & Scheduling Performance at Dana Spicer Clark-Hurth Components, Brugge, Belgium

Rony Cremmery, Nicolas De Schuyter, Marc R. Lambrecht, Nico J. Vandaele

Dana Spicer Clark-Hurth fabricates basic transmission components and assembles shafts, gears, castings and electronic controls into powershift transmissions for off-highway vehicles. They wanted to improve the efficiency of several manufacturing plants. A model was developed employing a queueing network approach. Implementation consists of the following 4 steps: lead time estimation and lot sizing, tuning which requires management intervention, scheduling and execution. The focus of the work is on improving lead times at the aggregate planning level.

Ford Visteon: Using Simulation to Teach & Improve Productivity at Visteon Sterling Plant

Ron Holcomb, Charles T. Muir, George Pfeil, Shahram Taj

In 1996, Ford's Visteon Sterling Plant started to produce front axles for 4-wheel-drive trucks and sport utility vehicles. Growing market demand required greater throughput from the plant. A discrete-event simulation model of the production line was developed and used to evaluate the impact of proposed changes. A simulation model was also used as a training tool for the Front-Axle Team. The team meets weekly to review simulation runs, conduct what-if analysis and prepare action plans to overcome productivity problems.

US Department of Energy at Pantex: Swords into Plowshares: Nuclear Weapon Dismantlement, Evaluation & Maintenance at Pantex

James W. Angelo, Terry Holeman, Richard D. Hopson, John Hudson, Dean A. Jones, Edwin Kjeldgaard, George F. List, Mark A. Turnquist

The Pantex plant in Texas is the US Department of Energy facility responsible for dismantling, evaluating and maintaining the US nuclear stockpile. A team, including Sandia National Laboratories, Cornell University and Rensselaer Polytechnic Institute, developed a model to assist in planning weapon dismantlement and maintenance and stockpile evaluation activities. The overall problem is formulated as a mixed integer-programming problem with the objective of maximizing dismantlement throughput. The model also tracks inventory balances and shipping schedules.

British Telecommunications: Dynamic Workforce Scheduling

Nader Azarmi, David Lesaint, Christos Voudouris

The provision of service to business and residential customers, network maintenance and fault repairs are daily activities for thousands of British Telecommunications (BT) field technicians. Managing this workforce efficiently is a challenge that BT addressed with the introduction of Work Manager. This tool generates long-term work schedules, repairs or improves schedules before dispatch when unexpected events take place and supports what-if scenario testing. The underlying model employs a combination of tree-search techniques, simulated annealing and constraint programming.

AT&T: Optimizing Restoration Capacity in the AT&T Network

Kan Ambs, Sebastian Cwilich, Mei Deng, David Houck, David Lynch, Dicky Yan

Network reliability is crucial to the quality of AT&T services. This work focuses on recovery from failures in the AT&T transport network that arise from construction, natural disasters, equipment failures and so forth. The critical problem is to find a cost-effective placement of spare capacity in the network to restore disrupted services in the event of a failure. A linear programming model was developed, taking into account various technological and operational constraints, to support both incremental planning and total network planning decisions.

IBM: Extended Enterprise Supply Chain Management at IBM Personal Systems Group & Other Divisions

Rob Allan, Sugato Bagchi, Steve Buckley, Markus Ettl, Kerry Kim, Lisa Koenig, Grace Lin, Bret Naccarato, David Yao

In 1994, IBM Corporation started a global supply chain reengineering effort. The goal was to achieve quick customer responsiveness with minimal inventory in the IBM global supply chain. To support this effort, an extended enterprise supply chain analysis tool, the Asset Management Tool (AMT), was developed and implemented. AMT consists of an optimization engine, a simulator and a series of data extraction modules. It has been used to study a wide range of issues including inventory budgets, turnover objectives, customer service level targets, effects of new product introduction and supply-chain scenario analyses.

Towers Perrin: Asset & Liability Management for Pension Plans & Insurance Companies

Clive Morgan, John M. Mulvey, Richard Wendt

Since 1991, the Towers Perrin (TP) company has employed a stochastic planning model for evaluating the actuarial viability of large global pension plans. In addition, the Tillinghast Company, a subsidiary of TP, has begun integrating the model into their analysis. By law, pension plans and insurance companies must conduct these annual studies. The model possesses 3 major components: a stochastic scenario generator, a non-linear optimization/simulation model and a flexible liability financial reporting module. TP is a worldwide organization providing consulting in human resources.

SOFTWARE DEMONSTRATIONS

Monday, May 3 - Tuesday, May 4
Room 300, Convention Center

Attend the software demonstrations and see examples of powerful software products, new releases and tools presented by exhibitors at the INFORMS Cincinnati Spring 1999 Meeting. Learn how these products can benefit your organization.

Monday, May 3
MA37, 8:00–9:30am
Duxbury Press

Sam L. Savage, Stanford University; savage@stanford.edu

INSIGHT.xla

INSIGHT.xla: Excel add-ins and text covering simulation, decision analysis, queueing, Markov chains, optimization and forecasting. Text provides fundamental concepts, tutorials and exercises. INSIGHT.xla is appropriate for courses in OR/MS and for professionals wanting simple analytical tools. The author will demonstrate how he uses INSIGHT in his own classes.

Irwin/McGraw Hill

Mark F. Millsaps, Irwin/McGraw Hill; mark_millsaps@mcgraw-hill.com

Whether your interests lie in creating vibrant customized multimedia presentations for your lectures or developing interactive web pages for your students, McGraw-Hill Higher Education has the right product for you. McGraw-Hill will showcase the latest in web page authoring software, Distributed Learning Courseware, and the much publicized Presentation CD-ROM that enables you to easily create a multimedia classroom presentation.

MC37 1:00–2:30pm
Applied Decision Analysis LLC

Christy Downs, ADA; www.adainc.com

Introducing DPL 4.0, Decision Analysis Software

Applied Decision Analysis LLC, a wholly owned subsidiary of PricewaterhouseCoopers LLP introduces DPL, the professional DA software using influence diagrams, decision trees and spreadsheets. Graphical outputs include Rainbow Diagrams, Tornado Diagrams, Risk Profiles, Policy Trees and Policy Summaries. New in DPL 4.0: a new Win95 interface, strategy tables, graphical value of perfect information and control and more!

IBM

Gyana Parija, IBM Corp., parija@us.ibm.com

Stochastic Programming Applications

IBM will discuss developing stochastic programming applications and the use of the Parallel Extensions product to deliver faster solution times. Installation and configuration of Parallel Extensions will be presented, along with tips and techniques for optimizing stochastic model structure for parallel execution.

MD37 4:00–5:30pm
Maximal Software, Inc.

Bjarni Kristjansson, Maximal Software, Inc.; info@maximal-usa.com

MPL for Windows 5.0 with the OptiMax 2000 Component Library

We will be demonstrating the new release **MPL for Windows 5.0** that will revolutionize how optimization modeling is applied to solve business problems. This new

release includes, among other notable enhancements, a highly anticipated Component Library (API) that can be called seamlessly from both *Visual Basic* and *C/C++,* to create customized end-user applications to solve real-world optimization problems.

Paragon Decision Technology
Johannes J. Bisschop and Marcel Roelofs, Paragon Decision Technology; www.paragon.nl
The New AIMMS 3.0 Modeling System
The new AIMMS 3.0 modeling system will be introduced both conceptually and through examples. Special emphasis will be placed on advanced GUI objects (Gantt chart, network object), advanced language topics (modeling of time, unit conventions), security issues (VAR licensing, user database), and advanced developments (API, code generation, matrix updates).

Tuesday, May 4
TA37 8:00–9:30am
Ketron Management Science
Joe Creegan, Ketron Management Science; jcreegan@ketronms.com
MPSIII Model Management Utilities
MPSII utilities MATEDIT (matrix editor) and TABEDIT (table editor) are demonstrated in a realistic application environment – a logistics optimization application supported by DATAFORM, C-WHIZ, and MIPIII.

ALPHATECH, Inc.
Kendra Moore & Scott Hammer, ALPHATECH, Inc.; alpha.sim@alphatech.com
ALPHA/Sim
ALPHA/Sim is a general-purpose, discrete-event, simulation tool based on Petri nets. The graphical modeling environment provides a simple, yet powerful set of model building blocks, making it easy to learn and use productively. Single-user, site and educational licensing are available. Platforms include PCs (NT) and Sun Workstations (SunOS or Solaris). ALPHATECH offers training, consulting, and technical support.

TC27 1:00–2:30pm
LINDO Systems, Inc.
Mark Wiley, Lindo Systems, Inc.; mwiley@lindo.com
Optimization Modeling with LINDO, LINGO and What'sBest!
LINDO Systems will be highlighting the recent speed enhancements to our LP solver and demonstrating our line of popular mathematical modeling packages including new releases of LINDO, our powerful linear and integer programming engine, LINGO, our integrated modeling language with linear/nonlinear solvers and What'sBest!, our large scale linear/ nonlinear spreadsheet solver.

Dash Optimization, Inc.
Sebastian Ceria, Dash Optimization, Inc.; sceria@dashopt.com
XPRESS-MP: A Fully Integrated Modeling and Optimization System
XPRESS-MP is a state-of-the-art software solution for modeling and optimization. We will show how XPRESS-MP can be used to model and solve complex problems arising from a wide variety of applications. We will introduce our new product EMOSL, which allows users to integrate modeling and optimization into any program, thus exploiting all computational power of our optimization engines while preserving a natural description of the problem.

TD37 2:45–4:15pm
eSocrates
Paul Shrivastava, eSocrates; socrates@esocrates.com
eSocrates Web Learning Environment
This unique software and Web hosting service allows instructors to create and launch their own courses on the Internet in a few hours, without learning programming or Web server maintenance. We will demonstrate how you can create your course websites with a Bulletin Board, Quizzer with Automatic Grading, Chatroom, Class email, Grade Tracker and 800 links to WWW teaching resources – book reviews, newspapers, digital libraries, research tools and jobs.

Decisioneering
Ben Bouillion, Decisioneering; bbouillion@decisioneering.com
CB Predictor
Decisioneering is proud to introduce CB Predictor to its arsenal of risk analysis products. CB Predictor incorporates the most advanced methods of Time-Series Forecasting (TSF) into an easy-to-use Microsoft Excel add-in. TSF techniques analyze historical data to predict future performance. Decisioneering's other risk analysis products include Crystal Ball, Crystal Ball Pro and CB Turbo.

TE37 4:30–6:00pm
ILOG, Inc.
Irv Lustig, ILOG, Inc.; irv@cplex.com
ILOG OPL Studio
ILOG OPL Studio is a new product from ILOG based on the OPL Optimization Programming Language, a new modeling language supporting LP and IP, constraint programming and scheduling, with database connectivity, automatic C++ code generation and a GUI. Come hear about the new revolution in optimization!

TECHNICAL PROGRAM

Conference on Information Systems & Technology
Saturday & Sunday, May 1 – 2
Room 302, Convention Center
The 4th Conference on Information Systems & Technology (CIST) will be held in conjunction with the INFORMS Cincinnati Spring 1999 Meeting. Co-chaired by N. S. Umanath and Erik Rolland, the conference will provide a forum for information systems research to be addressed. A distinctive feature will be to help participants, researchers and practitioners alike leverage

the interdisciplinary connections, both methodological and substantive, that exist in the INFORMS environment. The conference will be anchored around a set of high quality tutorial and keynote presentations, 90 minutes in length, presented by leading experts in academia and industry. Robert L. Glass, president of Computing Trends will make a presentation entitled, "Software Crisis? No!!" and Glenn Swift, general manager of A&T and Paul Lawler, general manager of IBM are two of the featured plenary presenters. Todd Garrett, CIO of Procter & Gamble, will be our final speaker of the conference, giving a joint CIST/INFORMS plenary presentation on Sunday, 4:00 – 5:00pm in Ballroom C in the Convention Center. For further information, please go to http://www.cob.ohio-state.edu/~rolland/cist99.htm/

Attendees are required to pay an extra fee in addition to the meeting registration fee as indicated on the registration form. Attendees can participate in all sessions and activities of the INFORMS Cincinnati meeting. Name badges must be worn for admittance to all CIST/INFORMS sessions, business meetings and events.

IFORS Distinguished Lecture



On Monday, this lecture by William Pierskalla will be the first in a continuing series of Distinguished Lectures sponsored by IFORS, The International Federation of Operational Research Societies. IFORS is an international organization of national OR societies whose primary purpose is the advancement of OR in all nations of the world. These lectures will be held at INFORMS meetings and regional meetings of OR societies in other parts of the world.

Andres Weintraub, President of IFORS, will introduce Professor Pierskalla, a past President of both IFORS and ORSA and former Dean of the Anderson School of Management at UCLA. Everyone is welcome to attend, Monday from 4:00 – 5:30pm in Room 202-212 in the Convention Center.

Teacher Program – The middle/high school/community college math and science teachers program will be composed of introductory OR and computer application presentations, followed by teacher hands-on participation. Probability modeling, computer simulations, queueing (waiting line) models and Teacher Introduction Modules (TIMs) linear programming models will follow an introduction to OR/MS. Attendees, who are also welcome to attend the general conference, will each receive copies of all program materials: videos, software packages with instructions and teacher/student activity guides and TIMs. The program will be held on Monday from 8:00am to 4:00pm in the Pavilion Room in the Omni Netherland Plaza. Procter & Gamble has provided funding for the Teacher Program.

Third OR/MS Knowledge Bowl - Following the "long tradition" of the 1990 (Philadelphia) and 1996 Washington, DC) OR/MS Knowledge Bowls, the Cincinnati INFORMS meeting committee presents the 3rd OR/MS Knowledge Bowl on Tuesday, May 4 from 1:00–2:30pm in Room 206 in the Convention Center. As before, two expert teams - one from the East and one from the West (more or less) - face off to determine which team can answer the most questions about OR/MS knowledge and trivia. Come and cheer (or jeer) your favorite team. The East Team consists of Captain Dick Larson (MIT), Carl Harris (George Mason University), John Jarvis (Georgia Institute of Technology) and Tom Magnanti (MIT). The West Team consists of Captain Steve Pollock (University of Michigan), Judith Liebman (University of Illinois), Bill Pierskalla (UCLA), and Rick Rosenthal (Naval Postgraduate School). The judges are Arjang Assad and Mike Ball (University of Maryland). The scorekeeper is Ariela Sofer (George Mason University) and the chair is Saul I. Gass (University of Maryland).

PLENARY PRESENTATIONS

Joint CIST/INFORMS Plenary
Sunday, May 2, 4:00 – 5:00pm
Ballroom C



Todd A. Garrett, CIO, Procter & Gamble

The Global Impact of Information Technology on Organizations in the Networked Era

Abstract: P&G, like many large organizations, needs to deal with rapid changes in technology in a new, networked era. This new networked economy rewards companies who are quickest to sense changes and first to capitalize on them. Competitors can emerge quickly, and make their presence felt with little capital investment. Soon, computing technology will be fast, ubiquitous, disposable and completely inter-connected. As information technologies continue to emerge and we learn to fully make use of them, the process of linking computation with the gathering and re-use of knowledge will become the principal driver of market value in the networked economy. The INFORMS organization, which links the professional disciplines that deal with applications of information technology for informed decision making, has a unique

opportunity to help companies such as P&G achieve their corporate goals. The winning companies in the new millennium will harness these emerging information technologies and use them to speed communication with their consumers. P&G will use these technologies to meet the accelerating needs and demands of the world's 5 billion consumers.

Biography: Todd A. Garrett was born in Evanston, Illinois on September 28, 1941. He received a degree in Psychology/Sociology from the University of Rochester in 1963 and his MBA from Xavier University in 1968. From 1963 until 1969, he worked for Procter & Gamble as an Assistant Brand Manager, then as Brand Manager. He left to work for Richardson-Vicks Inc. from 1970 until 1985 and held a series of marketing positions leading to Marketing Director of Toiletries Division. He was also the Managing Director of RVI Australia and the President of RVI Mexico.

On November 1, 1985, Mr. Garrett returned to Procter & Gamble as the President and General Manager, Americas/Far East Division. He became Division Manager-Asia/Pacific in 1987, then Vice President of that region in 1988. He became Vice President-Beauty Care Division in 1990, Vice President-Beauty Care Products, P&G USA in 1991, Vice President-Worldwide Strategic Planning, Health and Beauty Care Products P&G Worldwide in 1992, Vice President-Worldwide Strategic Planning, Beauty Care Products P&G Worldwide in 1993, Group Vice President, The P&G Company, President-Worldwide Strategic Planning, Beauty Care Products, P&G Worldwide in 1995, Senior Vice President (Chief Information Officer) in 1996 and in 1999, became Chief Information Officer.

INFORMS Plenary
Monday, May 3, 9:45 – 10:45am
Ballroom C
H. Donald Ratliff, Georgia Institute of Technology
Logistics Modeling: From the Classroom to the Boardroom



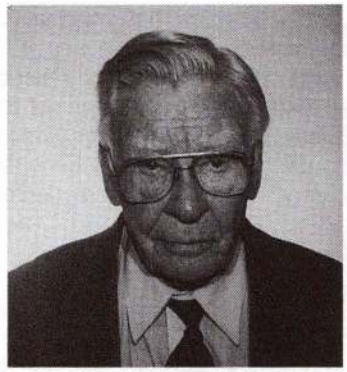
Abstract: A trend toward global customers, an increasing demand for customer service, a growing awareness of the huge logistics cost to provide this service and the remarkable technological advances related to computing are revolutionizing logistics. The key components to gaining a competitive advantage using logistics are "strategy" and "technology." There is currently a huge investment being made in technology for automatically capturing logistics data, tracking material and processing logistics related transactions. This creates the opportunity for taking advantage of better quality, more detailed and more timely information. It also poses the threat of logistics managers being buried under an avalanche of data or to the automation of bad decision making. In order to achieve the potential of new logistics technology, it must be integrated with good logistics strategy and decision making. This presentation will discuss the growing availability of this new information technology, its impact on logistics strategies and the concepts and tools necessary to utilize it for competitive advantage.

Biography: Dr. H. Donald Ratliff is Regents' and UPS Professor of Industrial and Systems Engineering and Executive Director of the Logistics Institute at the Georgia Institute of Technology. He is also Co-founder and served as President of CAPS Logistics, a leading edge supplier of logistics software, until its acquisition by the Baan Company in September 1998. He also serves on the executive board of the Logistics Institute – Asia.

As Executive Director of the Logistics Institute, Dr. Ratliff provides leadership for the largest research program in the world devoted to the study of engineering logistics. Within the Logistics Institute, there are currently more than 20 companies working with faculty and students on research related to the development of new decision and information technology for the design, planning and operation of logistics systems. Dr. Ratliff has published more than 50 refereed papers and designed a variety of computer software addressing logistics issues. He has given more than 100 invited presentations at national and international meetings. He has consulted for over 40 companies on a wide range of issues related to movement and storage of products.

Dr. Ratliff has served as the Editor-in-Chief of the *Journal of Operations Research*, Area Editor for *Optimization*, Departmental Editor for *Applied Optimization in IIE Transactions* and Associate Editor of *Management Science*. He was awarded the 1991 "Outstanding Research Award" of the Institute of Industrial Engineers for his work in logistics and is a Fellow of the Institute of Industrial Engineers. Dr. Ratliff was elected to the National Academy of Engineers for his work in developing interactive network optimization methodology for use in the design and operation of logistics systems. Concepts that he and his colleges developed for logistics network design, shipment planning, production scheduling and vehicle routing have been implemented by more than 200 companies and government agencies.

First Military Applications Society/INFORMS Plenary
Monday, May 3, 2:45 – 3:45pm
Ballroom C



Glenn A. Kent, RAND Corporation

The Art of Analysis

Abstract: The central purpose of analyses is to illuminate complex problems; to provide insight so that analysts and decision makers alike have a common understanding of what outcome we seek and a mental grasp of what factors affect that outcome - and why and to what extent.

Many seemingly complex problems can be collapsed so that the role of the various factors (players) in achieving the outcome becomes quite transparent and obvious - even to those who are not card-carrying analysts. Collapsing problems is especially useful for cases where both of the antagonists can do better by adapting what they are about to do in reaction to information about the course of action to which the enemy now seems committed. The problem being, however, is that in most interesting cases, that information is not available to either side in time. Here, the collapsing agent is the game-theoretic solution.

Some analysts seem to believe that illuminating problems and collapsing problems is a matter of computational capacity and in the new era of unlimited capacity, the analyst is king. I believe that collapsing problems is an art form - the art of analysis - and has little to do with computational capacity. And an art form not on the rise but on the wane.

One way to put renewed energy into this art form is to study cases of the past - where analytic methods have collapsed important problems to the point where the illumination is intense, the role of various factors is completely transparent and the decision maker is informed.

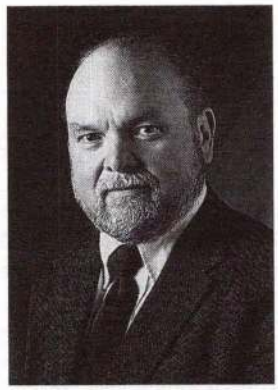
The purpose of this session is to illustrate how to briefly review selected cases of the past in the hope of instilling new energy into this form of analysis.

Biography: Glenn A. Kent is a Lieutenant General (retired) in the US Air Force and is currently a member of the US Air Force Scientific Advisory Board. He is the recipient of the Defense Distinguished Service Medal, the Distinguished Service Medal (Oak Leaf Cluster), the Legion of Merit (Oak Leaf Cluster) and the Vance R. Wanner Memorial Award given by the Military Operations Research Society (MORS). In 1982, he joined the RAND Corporation and is engaged in efforts related to national security, particularly in the areas of strategies and concepts.

Lieutenant General Kent received his BA in Mathematics from Western State College in Gunnison, Colorado in 1936, his MS in Meteorology from the California Institute of Technology in 1942 and his MS in Radiological Engineering from the University of California, Berkeley, in 1950. He attended the Naval Postgraduate School in Annapolis, Maryland, the Air War College at Maxwell Air Force Base, Alabama and was a Research Fellow at the Center for International Affairs at Harvard University in Cambridge, Massachusetts.

He has published numerous reports for RAND, as well as *A Summary Study of Strategic Offensive and Defensive Forces of the US and USSR*, prepared for the Director of Defense Research and Engineering and *The Interaction of Opposing Forces Under Possible Arms Agreements*, Occasional Papers in International Affairs, Harvard University, Center for International Affairs.

The Omega Rho Distinguished Lecture Plenary
Tuesday, May 4, 9:45 – 10:45am
Ballroom C



Ronald A. Howard, Stanford University

The Ethical OR/MS Professional

Abstract: As a professional, the practitioner of OR/MS requires considerable training and specialized study, but is he or she governed by a code of ethical conduct? The continual disclosure of ethical lapses of other professions challenges the ethical standards of our own. The most basic ethical principles concern initiating the use of force against people and property. Such potential actions can and do arise from the work of analysts, but far more common are issues that involve the ethical principles of truth telling. Telling the whole truth requires going beyond not lying to a proactive concern with avoiding any deception. We shall examine the ethical dilemmas that can arise in our work and how we can help ourselves and our students to resolve or, better, avoid them.

Omega Rho, the International Honor Society that promotes and recognizes superior scholarship and leadership in OR, MS and related disciplines, was founded in 1976. Omega Rho is one of the 65 Member Societies of the Association of College Honor Societies that was formed in 1925 to set and maintain high standards for the recognition and promotion of academic excellence in higher education. In 1998, Omega Rho became one of the societies of INFORMS.

Membership in Omega Rho is through its 34 active university chapters and numbers more than 4400 student and faculty inductees. Membership is selective and prestigious, and requires that an undergraduate student be in the top 25% of the class and that a graduate student attains a grade point average of 3.5 out of 4.0. Faculty members are eligible by exhibiting sustained activities in research and teaching of OR/MS disciplines. In addition, the Executive Committee of Omega Rho bestows Honorary membership upon outstanding individuals in recognition of their conspicuous contributions to and/or leadership and support for the advancement of OR and MS.

Dr. Ronald A. Howard will be inducted as the 29th Honorary Member of Omega Rho at the INFORMS Cincinnati Spring 1999 Meeting.

TUTORIALS

Sunday, May 2, 5:00 – 6:00pm

Track 5 - Trends & Topics in Process Modeling & Simulation

Deborah A. Sadowski, Systems Modeling Corporation

Many forces are at work in the world of simulation, all pointing toward the long-awaited "breakout" of simulation into a mainstream business decision-making tool. We examine these forces and their implications for researchers, vendors and practitioners.

Track 8 - Linear Programs, Integer Programs & Constraint Programming: Program != Program

Irvin Lustig, ILOG, Inc.

Constraint programming has arisen as a new tool for solving certain combinatorial optimization problems. It is possible to embed traditional mathematical programming problems within a constraint programming framework. A confusion that often arises is due to the use of the word "program" by each community. Similarities and differences between each modeling technique will be described. Tools that assist users in modeling and application development for applying these techniques will be discussed. Particular applications of interest to mathematical programmers are in the areas of column generation, sports scheduling and task sequencing problems.

Track 15 - Coordinating Production Distribution and Transportation Decisions in the Supply Chain

David Simchi-Levi, Northwestern University; levi@iems.nwu.edu

There has been renewed interest in the area of logistics among both industry and academia. A number of major forces have contributed to this trend. First, industry has realized the magnitude of savings that can be achieved by better planning and management of complex logistics systems. At the same time, information and communication systems have been widely implemented and provide access to data from all components of the supply chain. These developments call for the implementation of optimization-based decision support systems that take into account the inter-action between the various levels of the logistics network and utilize the wealth of available information. We provide examples that illustrate that this is possible by focusing on strategic, tactical and operational decisions in supply chain management.

Track 17 - Semidefinite Programming for Combinatorial Optimization

Christoph Helmberg, ZIB-Berlin; helmberg@zib.de

For several combinatorial optimization problems, semidefinte relaxations yield the currently best known approximation results. The high quality of semidefinite relaxations is confirmed by numerical experiments but they are rather expensive to compute. We review techniques for designing semi-definite relaxations for constrained quadratic 0-1 programming and graph partitioning problems and mention some of their theoretical properties. We then discuss algorithmic approaches to solve such relaxations. These are based on interior point methods and require, in part, new approaches in cutting plane schemes and reduced cost fixing. Finally, we give an outlook to recent methods, such as the spectral bundle method, that allows solving larger problems.

Track 18 - Generating Experimental Data for Combinatorial Optimization Problems

Nicholas G. Hall, Ohio State University; halln@cob.ohio-state.edu

Marc E. Posner, Ohio State University; posner1@osu.edu

OR literature provides little guidance about how to generate data for the computational testing of solution procedures. We demonstrate that widely used generation schemes introduce biases into computational results. Moreover, they don't represent how data arises in practice. We describe several principles for data generation and important properties in a data generation scheme. Specific proposals are provided for generating data for scheduling problems with various objectives and prespecified correlations. We present the first generation scheme that achieves a uniform target density in a precedence constraint graph and give a checklist for developing a generation scheme.

Track 19 - Exploiting Operations Research Algorithms in Constraint-Based Scheduling I: Constraint Propagation

Claude Le Pape, Bouygues Telecom; clepapeg@bouyguestelecom.fr
Exploiting powerful OR algorithms as part of constraint propagation is a key factor for the success of constraint-based scheduling. Part I of this tutorial reviews the basic principles of constraint propagation and the most commonly used OR techniques in constraint-based scheduling.

Track 20 - Semi-Infinite Programming

Kenneth O. Kortanek, University of Iowa
A linear semi-infinite program is a next level of extension of an ordinary LP whose finite number of variables now appear in an infinite number of linear inequalities. Since the publication of "Duality, Haar Programs, and Finite Sequence Spaces" in May 1962 by Charnes, Cooper & Kortanek, (US Proc. Nat. Acad. Sciences, 48 783-786) manifest applications have occurred, including engineering design, reliability, operations, economics and marketing, statistical inference, entropy, multirate systems and filter banks, mathematical finance, semidefinite programming and telecommunications. Two 1998 books shall serve as the foundation: "Linear Semi-Infinite Optimization" by M.A. Goberna & M.A. Lopez, J. Wiley, Series in Mathematical Methods in Practice and "Semi-Infinite Program-ming", R. Reemtsen & J.J. Rueckmann (eds.) Kluwer; Series in Nonconvex Optimization & Its Applications. Additional insights to modeling and solution approaches shall be reviewed from "Semi-Infinite Programming: Theory, Methods & Applications" by R. Hettich & K.O. Kortanek, SIAM Review, 35 1993, 380-429.

Track 21 - Resource-Constrained Project Scheduling: A Classification & Overview

Erik Demeulemeester, Katholieke Universiteit Leuven; erik.demeulemeester@econ.kuleuven.ac.be
Willy Herroelen, Katholieke Universiteit Leuven
Scheduling project activities subject to various types of precedence and resource constraints under various types of objective functions is a crucial problem in the field of project management that has gained wide and growing interest from theory and practice over the past few years. Marketed off the shelf computer software is claimed to be the most prevalent among all fields of OR. Research efforts have focused on a variety of problem types and have resulted in a wide spectrum of exact and heuristic solution procedures for solving important practical problems resulting from the counter-intuitive interaction between project network structure, resource requirements and resource availabilities. Using the framework provided by a recent classification scheme, this presentation will identify important problem types that have been researched in the literature. We will survey the recently developed solution strategies that have allowed obtaining computational advances that have significantly increased the domain of solvable practical problems.

Track 23 - Artificial Intelligence & Operations Research in Discrete Optimization Heuristics from the OR Perspective

Ronald L. Rardin, Purdue University; rardin@ecn.purdue.edu
Haldun S. Aytug, University of North Carolina; haytug@email.uncc.edu
Reha Uzsoy, Purdue University; uzsoy@ecn.purdue.edu
In the early 1980s, a burst of interest in artificial intelligence threatened to supplant the more optimization-based, operations research methods in dealing with discrete optimization problems too large to be solved exactly. Naturally, such claims were greeted with more than a bit of skepticism by the OR community, and the controversy raged through many meetings and papers. Now, with the benefit of a bit longer perspective, we endeavor to give a tutorial survey of the methods of AI relevant to this heuristic optimization context and their potential to help deal with the integer and combinatorial models of traditional interest to the optimization community.

Track 30 - The Economics of Design Quality Competition

Panos Kouvelis, Washington University; kouvelis@mail.olin.wustl.edu
We examine the relationship between the firm's investments in design quality improvement and its ability to thrive or even survive in oligopolistic environments. We describe the use of a differential game theoretic approach in modeling price and design quality competition in a dupolistic environment. Our approach blends a generalized Lanchester-type combat model (which addresses the competitive market share dynamics based on firm's prices, design quality and historical inertia levels) with a generalized Bass-type diffusion model (which incorporates the cooperative product-life cycle or market penetration/saturation dynamics). Our discussion will examine in greater detail the following aspects of the problem: the strategic substitutability/complementarity effect that seems to have a pervasive influence on both firms' optimal decisions; the industry and market specific forces that underpin the incumbent's inability to stave off challengers at the more stable end of the spectrum, as well as the more frequent changes in technological and market leadership at more volatile photolithography end of the spectrum; the problems associated with accounting for the dynamic design quality-related cost-benefit trade-offs using conventional accounting approaches and extend the force/momentum accounting model proposed by lijiri; and the impact that design quality and inertia have on the industry's structure-conduct-performance linkages in general, and particularly on the nature and stability of the relationship between the firms which move away from oligopolistic (and towards monopolistic) competition, as a result. We show that the investments made by each firm in differentiating its products along design quality, inertia and other non-price dimensions to be instrumental in making price competition more muted and thus dampening the intensity of the rivalry in the industry.

Tuesday, May 4, 11:00am – 12noon

Track 4 - EMOSL: A New Paradigm for Solving Hard Optimization Problems

Sebastian Ceria, Columbia University; sceria@dashopt.com

EMOSL is a programming interface that allows the OR practitioner to implement tailored optimization algorithms by fully integrating an easy-to-use modeling language and state-of-the-art optimizer. EMOSL allows the programmer to manipulate the in-core representation of the problem using the notation used to specify the model, thus avoiding the traditional separation between modeler and optimizer. We will show examples of the use of EMOSL for the solution of problems in supply chain management.

Track 5 - Design & Analysis of Simulation Experiments

W. David Kelton, University of Cincinnati; david.kelton@uc.edu

A computer-simulation project should involve much more than building and running the model. The model should be exercised appropriately to gain insight into system operation, improvement, and stability. This tutorial will cover the essential topic areas of such design and analysis, with emphasis on statistical issues.

Track 8 - The OPL Optimization Programming Language

Pascal Van Hentenryck, University of Louvain

The OPL optimization programming language is a new modeling and programming language that supports linear programming, integer programming, constraint programming and scheduling. The language is strongly typed, providing extra semantic checking during execution. The ability to use a common language to apply both linear optimization and constraint programming techniques provides the capability of investigating which techniques are appropriate for hard combinatorial problems. The language consists of a modeling language for representing problems, and a control language, OPLScript, that allows models to be connected, and algorithmic procedures to be implemented. We will highlight the features of this new language and demonstrate some of the key features.

Track 9 – Genetic Algorithms & their Applications to Manufacturing

Lawrence Davis, Manugistics, Inc.

We will provide an overview of genetic algorithms and evolutionary computation and describe some of the many applications of these algorithms to manufacturing problems. The overview will be designed to give the listener a feel for the way that genetic algorithms work. The descriptions will be designed to give the listener a feel for the variety of problems and solution techniques that the genetic algorithm approach supports.

Track 10 – Preference Function Modeling: A New Methodology for Preference Measurement

Jonathan Barzilai, Dalhousie University; jonathan.barzilai@dal.ca

Ernst Grundke, Dalhousie University

PFM is a new methodology for measurement of preferences on interval scales. PFM represents a new easy-to-use but powerful decision paradigm and is based on a rigorous mathematical theory and advancements in the Theory of Measurement. Technically, PFM is a utility theory. However, in contrast to the "standard gamble" method of multiattribute utility theory (MAUT), PFM is intuitive, easy to use and has a built-in mechanism for reconciling inconsistent assessments. The tutorial will cover issues of practice and theory. We will present the PFM procedure and software and briefly outline the underlying theory.

Track 13 – Java: An Introduction & Operations Research Applications

Gordon H. Bradley, Naval Postgraduate School; bradley@nps.navy.mil

Java is a powerful object-oriented programming language that compiles to code that efficiently executes without modification in a number of different computing environments (Windows, NT, Macintosh, various Unix systems, JavaOS). The tutorial will present an overview of Java and related technologies with special emphasis on the use of Java to construct dynamic and distributed operations research applications. Specific capabilities that are unique to Java or are more powerful than in other languages will be illustrated with operations research examples. These include: access to code and data over the internet, interactive research papers with embedded algorithms and results, discrete event simulation libraries, network optimization systems, generic data structures libraries, dynamic loading of algorithms, execution on remote computers, collaborative work over the internet, SQL access to databases, and links to programs written in other languages.

Track 14 – Introduction of Optimization Modules

Averill M. Law, Averill M. Law & Associates

The hottest topic in simulation is probably the introduction of "optimization" modules into numerous simulation products, having been made possible by faster PCs and better search heuristics. In this tutorial we present the results of experiments for evaluating the quality and efficiency of the solutions produced by these "optimizers."

Track 17 – Model Validation & Scenario Generation for Stochastic Programming Models

Suvrajeet Sen, University of Arizona; sen@sie.arizona.edu

Stochastic programming provides an effective methodology for modeling uncertainty in decision making models. This tutorial will begin by describing a variety of applications, i.e., network planning, yield management,

financial planning, etc. These models result in large-scale optimization problems that are approximated by problems containing fewer scenarios than the entire deterministic equivalent. We will discuss alternative methods for evaluating the quality of solutions resulting from the approximations. We will also cover methods for generating scenario trees for multistage stochastic programming problems. Again, the emphasis will be on generating aggregations resulting in smaller approximations than the original problem. After a review of 2-stage bounding methods, we will discuss a sequential tree generation algorithm that generates the scenario tree as needed. Implications for modeling will also be discussed.

Track 18 – Fuzzy Dynamic Programming & its Variants

Augustine O. Esogbue, Georgia Institute of Technology; augustine.esogbue@isye.gatech.edu

A brief exposure to the problems and tools of optimization, mathematical programming and modern control reveals the existence of a bewildering array of problems that can be well posed in the parlance of dynamic programming. Incursions into many disciplines such as mathematics, engineering, computer science, economics, medicine, etc., reveal the existence of the inescapable problem of decision making and control. In dynamic programming, we are particularly interested in problems of this genre that can be attacked from the standpoint of multistage decision making (MDM) theory or framework. We provide a guided tour of the essential elements of fuzzy dynamic programming which was developed as a generalization of the classic version to deal with uncertainties of the imprecise, ambiguous and linguistically induced variety. We present both the aspects that are now classic in any discussion of the topic as well as its modern variants including our recently introduced fuzzy criterion dynamic programming motivated primarily by the need to explore more decision-maker tailored and non cost objective functions. We include the computational aspects a well as various key real world applications. We conclude with a paint brush of the research topics that have potential for significant contributions to the field.

Track 19 – Exploiting Operations Research Algorithms in Constraint-Based Scheduling II: Search & Optimization

Claude Le Pape, Bouygues Telecom; clepapeg@bouyguestelecom.fr

Constraint programming enables the development (at low cost) of many variants of search and optimization algorithms based on OR techniques. Part II of this tutorial reviews the most significant case studies and applications from the literature, i.e., project scheduling, non-preemptive and preemptive job-shop scheduling, etc. Experimental results are presented and discussed.

Track 30 – Retail Operations

Marshall Fisher, University of Pennsylvania; fisher@wharton.upenn.edu
Ananth Raman, Harvard Business School; araman@hbs.edu

Retailing is an industry in which we see enormous differences in performance. At one extreme, we have Wal-Mart, who from a standing start in 1962 has grown to become the largest retailer in the world, making Sam Walton the wealthiest man in the US along the way. At the other extreme, about 15% of the largest retailers in the US went bankrupt in the 1980s. Much of what separates the winners from the losers is explained by operational issues such as inventory turns, stockouts, lead-times and data-based forecasting – topics on which OR/MS has much to say. Based on our interaction with more than 30 retailers during the last 2 years, we will explain the scope of retail operations and highlight the tremendous opportunities for MS/OR.

WORKSHOPS

Saturday & Sunday, May 1 – 2
Salon F&G, 8:00am – 5:00pm
9th Annual Workshop on Computational & Mathematical Organization Theory (CMOT)

This workshop will explore advances in formal theories of organizations, new computational or network-based analysis tools for studying organizations and empirical tests of computational, mathematical, or logical models. Presentations will be from a combination of invited and submitted papers. Participants need not present a paper. A special issue of the journal *Computational and Mathematical Organization Theory* will be published based on the best papers in this workshop.

Rationale: Organizations can be usefully characterized as constraint-based adaptive systems composed of intelligent adaptive agents and technology, whose ability to act and be acted upon are structurally, culturally, and cognitively constrained. By merging computer science, social science and social networks, we can create richer and more precise models of intelligent agents, processes, multi-agent systems, and organizations. By developing and testing formal models that draw on these 3 traditions, the theorist is able to develop a more complete understanding of the dynamic and adaptive nature of groups and organizations. Consequently, the researcher is able to address issues where structural, adaptive and evolutionary issues are paramount; e.g., coordination, negotiation, organizational design, reengineering, organizational communication, organizational evolution, market restructuring and organizational learning. These opportunities are explored largely through presentation and discussion of formal models and theories.

Topic areas for 1999: emotional agents as organizational agents; emotions and multi-agent systems; formal models of knowledge networks; computational models of the evolution of social networks; modeling organizational adaptation and learning; canonical task models and metrics for comparing tasks;

organizations as multi-agent systems and multi-agent systems as organizations; computational models of trust and cooperation in organizations; the linkage between formal complexity theory and organizational theory; the linkage between formal complexity theory and social networks; modeling the evolution of inter-organizational networks, models of technology and IT enabled organizations; docking of computational models; and validation issues for computational models of organizations.

Sunday, May 2
Crystal Ball
Julep Room, 8:00am - 12noon
Dave Fredericks; Decisioneering, Inc.
This workshop will expose current and potential Crystal Ball PRO users to fundamentals of uncertainty analysis and Monte Carlo simulation techniques, uncertainty of inputs and selection of appropriate distributions, correlation of inputs, performing simulations, sensitivity analyses, effectively analyzing the results of simulation and gives the knowledge necessary to incorporate uncertainty analysis in models and analysis. The functionality of the Crystal Ball Developer Kit: Automate CB applications from within Visual Basic for Applications or any language outside Excel using OLE 2. This allows the user to run multiple simulations to test different sets of assumptions automatically and integrate CB with other software tools. The Developer Kit allows complex users to create turnkey applications with user-friendly interfaces to simplify the simulation and optimization process. OptQuest: Searches for optimal solutions to simulation models using decision variables or inputs that the user has control over. Simulation models give a wide range of possible outcomes but don't inform the user how to control the variables. Crystal Ball Extenders: The Tornado Chart Extender analyzes the impact model variables have on the outcome without running a full simulation. The Decision Table Extender is a pre-screen to evaluate the effects of alternate decisions in a simulation model. This allows the user to define a tighter range of possible values for decision variables and reduce the optimization time. The Two-Dimensional Simulation Extender independently addresses uncertainty and variability with the model, allowing a more accurate simulation. The Correlation Matrix Extender rapidly defines and automates the correlation of multiple assumptions. The Bootstrap Extender assesses the reliability and accuracy of the forecast statistics.

Taylor II
Mayflower I, 8:00am – 12noon
Roger Hullinger; F&H Simulations
The Taylor II training program is specifically designed for managers and engineers with no (or limited) experience using simulation. The workshop will focus on how to use simulation technology to optimize manufacturing processes. We will have a brief introduction to simulation, covering simulation basics, followed by a discussion of queueing theory and identifying and exploiting constraints. Highlights include learning how models are built in Taylor II, hands-on model building activity and instructions on building a simple manufacturing model. We will conduct "what-if" scenarios and generate reports & graphs from the model. Participants will learn to increase throughput and improve profits of a manufacturing model by testing how best to allocate resources. We will show how to explore the strengths and weaknesses of popular management , give examples of how to present results and communicate ideas through simulation and end with a Q&A period.

AMPL
Salon B & C, 1:00 – 5:00pm
Sanjay Saigal; ILOG, Inc.
AMPL is a comprehensive, powerful and flexible algebraic modeling language for LP, NLP and MIP. Based on modern modeling principles, AMPL utilizes an advanced architecture providing flexibility most other modeling systems lack. Successfully used in demanding model applications around the world, AMPL is available on a variety of PC and UNIX platforms. It works with a variety of leading linear and nonlinear optimizers. AMPL allows modelers to create models with maximum productivity. By using AMPL's natural algebraic notation, even a very large, complex model can often be stated in a concise understandable form. Since AMPL models are easy to understand, debug and modify, AMPL also makes maintaining models easy. Our major goal is to provide students, researchers and practitioners with an understanding of how to use AMPL to model problems, test algorithmic approaches and implement DSSs. The workshop is lecture-based, rather than hands-on. Attendees are expected to have practical optimization and computational experience, but exposure to algebraic modeling systems is not required. Topics include an introduction to AMPL using sample problem illustrating AMPL syntax and the AMPL Plus user interface, modeling syntax and solver control, linear and integer models, piecewise-linear models, networks, general nonlinear models and solver directives, command syntax, input/output, examining and modifying models, flow control and looping, debugging scripts and using AMPL to build decision-support systems and database interactions.

SIMUL8 - Simulation Software for Everyone's PC
Mayflower I, 1:00 - 5:00pm
Jaret Hauge; Visual Thinking International
Visual Thinking will present a condensed simulation training session using its popular SIMUL8 software designed for today's engineers, analysts and educators. With its intuitive, "easy-to-use" interface, we will show how quickly SIMUL8 models can be built and used on a variety of operations. The software can be used to identify discrete manufacturing bottlenecks, streamline continuous production or process flows, improve customer service levels and response times, model supply chains and distribution systems and to reengineer business and transaction processes. We will provide a hands-on SIMUL8 demonstration: job shop workflow balancing, production and inventory control, service operation enhancement and business process reengineering. We will give an overview of SIMUL8's design and features and end with a Q&A period.

Sunday 08:00-09:30

SA04 Decision Analysis & Support

Contributed Session

Chair: Shawn P. Daly, Tiffin University, 155 Miami St., Tiffin, OH 44883, sdaly@tiffin.edu

1) Target-Based Decision Theory: A Historical Perspective, ***Robert F. Bordley***, General Motors R&D Center, 12 Mile & Mound Rds., Warren, MI 48090-9055, robert_bordley@notes.gmr.com

Decision theory can be understood using either of 2 theoretically equivalent formalisms: in terms of maximizing a utility function or in terms of maximizing the probability of meeting an uncertain target. We review 300 years of history in order to better understand why the first interpretation, and not the second, has become so widespread.

2) A Multicriteria Decision Support Tool that Deals with Partial Information, ***Luis C. Dias***, University of Coimbra & INESC, Fac. of Economics, Av Dias da Silva 165, Coimbra, 3000, Portugal, ldias@inescc.pt, ***Joao C. Climaco***

We present a multicriteria decision support tool designed to deal with partial information. We consider the problem of choosing the most preferred alternative, in the framework of an additive aggregation model. The tool does not require precise values for the criteria importance parameters (scaling weights). Rather, the tool expects only partial information on these values (bounds and linear constraints)...

3) Connecting Decision Analysis & Case Analysis, ***Shawn P. Daly***, Tiffin University, 155 Miami St., Tiffin, OH 44883, sdaly@tiffin.edu

We will demonstrate how common analytical tools, e.g., ratio analysis, correlation, regression, statistical control, AHP, etc., are utilized within a standard case analysis framework, e.g., problem identification, decision criteria, alternative evaluation, action plan, etc. The purpose is to guide managers in selecting the appropriate analytical tool in each phase of decision making.

4) Measuring Value Focused Thinking Effectiveness, ***Orfelio G. Leon***, Universidad Autonoma de Madrid, Facultad de Psicologia, Madrid, 28049, Spain, orfelio.leon@uam.es

Within the context of DA, our aim is to discover whether the generation of values with the "value-focused thinking" approach is different from the "alternative-focused thinking" approach. In the first study, 2 different groups of subjects created a structure of values for the same decision problem. After homogenizing the terms used by both, we found that the VFT group generated a more extensive and hierarchical structure...

SA05 Efficiency of Simulations

Sponsor: College on Simulation

Sponsored Session

Chair: Pierre L'Ecuyer, Universite de Montreal, DIRO, CP 6128, Succ. Centre-Ville, Montreal, Quebec, H3C 3J7, Canada, lecuyer@diro.umontreal.ca

1) Fast Simulation of Random Walks with Heavy Tailed Distributions, ***Sandeep Juneja***, Indian Institute of Technology, Hauzkhas, Delhi, 110016, India, sandeepj@mech.iitd.ernet.in, ***Anurag Chandra***, ***Perwez Shahabuddin***

Consider the problem of estimating the small probability that the maximum of a random walk exceeds a large threhold, when the process has a negative drift and the underlying random variables have heavy-tailed distributions. We introduce the concept of delayed sub-exponential twisting that allows us to simulate these probabilities in an "asymptotically optimal" fashion...

2) Retrospective Stochastic Optimization of Buffer Allocation, ***Song Foh Chew***, Purdue University, Sch. of IE, 1287 Grissom Hall, West Lafayette, IN 47907-1287, chew@ecn.purdue.edu www.ecn.purdue.edu/~chew/, ***Bruce Schmeiser***

We consider the allocation of a given number of buffer positions to a given number of serial servers having given service-time distributions. The goal is computationally efficient optimization based on discrete-event simulation.

3) Randomly Shifted Lattice Rules for Problems of Finance & Risk Theory, ***Christiane Lemieux***, Universite de Montreal, DIRO, CP 6128, Succ. Centre-Ville, Montreal, Quebec, H3C 3J7, Canada, lemieux@diro.umontreal.cawww.iro.umontreal.ca/~lemieux,***Pierre L'Ecuyer***

We use randomly shifted lattice rules over the unit to reduce the variance of Monte Carlo estimators. Numerical illustrations are provided for Asian options pricing and for the estimation of ruin probabilities.

SA06 Interdependence & Flexibility in Product Development

Cluster: New Product Development

Sponsor: Technology Management Section

Sponsored Session

Chair: Christoph H. Loch, INSEAD, Blvd. de Constance, Fontainebleau, 77305, France, christoph.loch@insead.fr

1) New Forms of Interdependence in Virtual Product Development Teams, ***Nancy A. Staudenmayer***, Duke University, Fuqua Sch. of Bus., Box 90120, Durham, NC 27708-0120, nstauden@mail.duke.edu, ***Gerardine Desanctis***, ***Sze Sze Wong***

Virtual organizations rely heavily on linkages with other entities in order to conduct their core work activities, distributing tasks across space, time and other boundaries. We explore the implications of more virtual ways of working for the types of interdependencies in product development. It draws upon survey and case study data.

2) Managing Development Flexibility in Uncertain Environments, ***Stefan Thomke***, Harvard Business School, Morgan Hall T63, Soldiers Field, Boston, MA 02163, sthomke@hbs.edu

As product complexity and the rate of market change have dramatically increased, firms find it increasingly difficult to forecast product requirements in their development processes. I propose to redefine the problem from one of improving forecasting to one of increasing product development flexibility and will report on related empirical findings.

3) Positioning & Launching Platform-Based Products, ***Viswanthan Krishnan***, University of Texas, Dept. of Mgmt., CBA 4.202, Austin, TX 78712, krishnan@mail.utexas.edu, ***Saurabh Gupta***

The benefits of product platforms have gained increasing research attention. Are there costs associated with platforms? How do platforms influence the product location and launch decisions? We answer these questions with an application-driven mathematical model. Our analysis helps characterize the appropriateness of platforms for different business situations and implications for managers.

4) The Real Options Value of Modular Product Architecture, ***Christoph H. Loch***, INSEAD, Blvd. de Constance, Fontainebleau, 77305, France, christoph.loch@insead.fr, ***Michael T. Pich***

We explore the implications of choosing a modular vs integrated product architecture. The choice of architecture constrains future changes to the product's attributes. We compare the flexibility of varying performance attributes independently of one another in the 2 architectures. An option "value" results from the capability of meeting uncertain future market attribute targets.

SA07 Health Service Delivery: Fiscal & Knowledge Management

Cluster: Health Care Management & Policy

Invited Session

Chair: Tamara Stone, University of Missouri, Health Mgmt. & Informatics, 324 Clark Hall, Columbia, MO 65211, stonet@health.missouri.edu

1) Cutting Costs in Hospitals: The Impact on Patient Service, ***Linda V. Green***, Columbia Business School, 423 Uris Hall, New York, NY 10027, lvg1@columbia.edu

Using data from a major urban hospital, we explore the ramifications of various operational strategies that are being implemented in hospitals across the country. We develop insights on the impact of size, average length of stay, variability and organization of clinical services on occupancy rates and delays for beds.

2) How the Patient-Provider Relationship Impacts Patient Satisfaction, ***Tamara Stone***, University of Missouri, Health Mgmt. & Informatics, 324 Clark Hall, Columbia, MO 65211, stonet@health.missouri.edu, ***Annamarie Mantese***

We investigate 4 patient-provider relationship models and explore how various styles of interaction ultimately impact overall patient satisfaction with clinical care. We develop a method for identifying individual provider alignment with specific models. In addition, we systematically identify which patient-provider interactions best satisfy patient needs based on severity of illness.

3) Performance Measures of Provider Information Transfer: Who Knows Where Patients Get their Information?, ***Timothy B. Patrick***, University of Missouri, Health Mgmt. & Informatics, 324 Clark Hall, Columbia, MO 65211, patrickt@health.missouri.edu

We examine patients' sources of clinical information while receiving treatment. In addition, we identify what patients and providers consider as reliable sources of clinical information. Finally, we measure the quality of provider to patient information transfer in terms of whether providers know where patients are

obtaining their information.

SA08 Advertising & Education Concepts

Cluster: Marketing
Invited Session

Chair: H. Shanker Krishnan, Indiana University, Kelly Sch. of Business, Dept. of Mktg., Bloomington, IN 47405, skrishna@indiana.edu

1) Does Collaborative Advertising Build Brand Equity for Both Brand Partners?, ***S. Samu***, Berry College, Campbell Sch. of Bus., Mt. Berry, GA 30149, ***H. Shanker Krishnan***, ***Robert E. Smith***

Many firms have formed strategic alliances between their brands and other firms' brands to attain development and growth objectives. While such partnerships may take many forms, one specific type of alliance is collaborative advertising, where 2 brands from different firms are featured in an ad. Despite the increasing use of collaborative advertising, very little research examines their effectiveness.

2) A General Theory of Internal Public Relations, ***Lawrence Harris***, Quinnipiac College, Sch. of Business, 2775 Mt. Carmel Ave., Hamden, CT 06518, lharris@quinnipiac.edu

We present the need for internal public relations vs. an ombudsman or facing a whistle blower. This overall model explains all variables affecting the imperatives of internal public relations. This includes needs of the organization, needs of the individual, negotiating with conflicting publics and needs of the individual vs. needs of the organization.

3) A New Theory of Value Creation, ***Minna Mattila***, University of Jyvaskyla, Sch. of Bus. & Economics, PO Box 35, Finland, mimaja@tase.jyu.fi

We create a new theory of value creation for marketing operations in internet, which would provide practical tools for management. The study is conducted by observing web-pages and doing in-depth interviews. The method applied is Perelman's argumentation theory. Once the structure of an optimal value proposition is being discovered, it will be implemented to a company for testing (or simulated).

4) An Exploratory Evaluation of Supplemental Instruction, ***Val Clulow***, Monash University, Dept. of Mktg., Fac. of Bus. & Econ., Box 197, Caulfield East, 3145

Supplemental Instruction is a peer tutoring approach to learning, which attempts to build study skills linked to students' study of particular curriculum, rather than isolated from it. A study of students undertaking the subject Statistics for Marketers, which had a fail rate, was undertaken and marketing students involved in a peer tutoring program linked to the subject were interviewed about their learning experience.

SA09 Analysis of Complex Problems using Real Data Sets

Cluster: Knowledge Discovery & Data Mining
Sponsor: Quality, Statistics & Reliability Section
Invite/Sponsor Session

Chair: Alice E. Smith, University of Pittsburgh, 1031 Benedum Hall, Dept. of IE, Pittsburgh, PA 15261, aesmith@pitt.edu, aesmith@engrng.pitt.edu

1) Validation of Artificial Neural Networks on Sparse Data Sets, ***Terry L. Huston***, St. Louis University, Coll. of Bus. & Admin., 3674 Lindell Blvd., St. Louis, MO 63108, hustontl@slu.edu, ***Alice E. Smith***, ***Janet M. Twomey***

Modeling sparse data sets is a challenge for data analysis tools. Many real world problems present themselves without adequate data for accurate modeling. A validation technique is described combining ANNs and statistical techniques to model sparse data sets for predictive purposes, and this is illustrated using admittance and GPA data from MBA students.

2) Rule Induction Techniques used to Identify Factors Affecting Missed Operations in Assembly Operations, ***Ken Currie***, Tennessee Technological University, Ctr. for Mfg. Research, Box 5077, Cookeville, TN 38505, kcurrie@tntech.edu, ***Steve LeClair***

In the summer of 1996, a team from Tennessee Tech conducted a study of the systemic causes of missed operations at the Saturn assembly plant. The findings revealed significant statistical information to link cause with effect in establishing root causes of missed operations. A follow-up study was conducted using the ID3 algorithm...

3) Methods for Worker Assignment in Manufacturing Cells, ***Rona C. Warner***, University of Pittsburgh, Dept. of IE, 1048 Benedum Hall, Pittsburgh, PA 15261, rlcst13@pitt.edu, ***Kim L. Needy***, ***Bopaya Bidanda***

A model for worker assignment in manufacturing cells that considers both technical and human skills is presented. The model has 2 stages. In the first, relationships are established between worker skills and cellular output measures via regression and neural network techniques. In the second, an optimization heuristic is employed that iteratively selects and evaluates combinations of workers...

4) A Hybrid Committee Neural Network Approach to Manufacturing Process Modeling, ***Sarah Lam***, University of Pittsburgh, Dept. of IE, 1031 Benedum Hall, Pittsburgh, PA 15261, ***Alice E. Smith***

An approach that uses multiple neural networks in parallel as a committee to model manufacturing processes is presented. The neural networks that comprise the committee are created during a resampling validation procedure on a real data set from abrasive flow machining of automotive parts. Committee networks results are compared to models using a single neural network...

SA10 Decision Analysis I

Contributed Session

Chair: Gregory S. Parnell, Virginia Commonwealth University, Dept. of Math. Sci., Oliver Hall, 1015 W Main St., Richmond, VA 23284-2014, gparnell@vcu.edu

1) withdrawn - author request of 4/2, ***Timothy J. Carrothers***, Harvard School of Public Health, 655 Huntington Ave., Ste. 1308, Boston, MA 02115, tcarroth@hsph.harvard.edu, ***John D. Graham***, ***John S. Evans***

2) Applications of the CE-VALUE FUNCTION PAK, ***Ron E. Davis***, San Jose State University, Coll. of Business, One Washington Square, BT 750, San Jose, CA 95192, davis_r@cob.sjsu.edu, http://www.cob.sjsu.edu/facstaff/davis_r/

The CE-VALUE FUNCTION PAK is a set of custom functions for use in EXCEL and Windows applications. They map distributions into dollar values based on the exponential utility function with the risk tolerance parameter. Development of the CEValue-Maximal frontiers will be exemplified by means of several case studies.

3) Using Portfolio Analysis to Create & Analyze Customer Support Projects, ***Gregory S. Parnell***, Virginia Commonwealth University, Dept. of Math. Sci., Oliver Hall, 1015 W Main St., Richmond, VA 23284-2014, gparnell@vcu.edu

Each year, the customer support office of a large high-tech defense organization searches for creative ways to help their customers. Using multiobjective DA, value-focused thinking and portfolio analysis with MILP, we developed and analyzed more than 200 tasks to develop their best portfolio for given budget assumptions.

4) Application of a Bounded Asymmetric Loss (Blinex) Function to the Direct Mail Decision Problem, ***Daling Wen***, GE Capital Consumer Financial Services, 5300 Kings Is Dr., Mason, OH 45040, wend@econqa.cba.uc.edu, ***Martin S. Levy***

We consider a bounded asymmetric loss function (BLINEX), derived from the LINEX loss. We review properties of BLINEX and results on the existence, uniqueness, and admissibility when applied to Bayesian estimation. An application of BLINEX is presented to the problem of deciding the direct mailing size that maximizes profit.

SA11 RAHMORS I

Sponsor: Military Applications Society
Sponsored Session

Chair: Ray L. Livingston, Teledyne Brown Engineering, 300 Sparkman Dr., PO Box 070007, Huntsville, AL 35807-7007, ray.livingston@pobox.tbe.com

1) Applications of OR Techniques to Invoke Change in a Public Sector Environment, ***Pauline P. Cason***, SAIC, 6725 Odyssey Dr., Huntsville, AL 35896, paulie.p.cason@cpmx.saic.com

Can federal work places change? Air Force "Pick-a-Base" brings a new flavor to the traditional OMB Circular A-76 Outsourcing Studies. For a number of years, government policy makers have urged the services to apply commercial practices. In May 1998, Air Education and Training Command, Randolph AFB, awarded a contract for a series of A-76 studies over a 2-year period...

2) Better Understanding of the Impacts of System Performance Characteristics on Force Effectiveness, ***Hugh Griffis***, Signature Research Inc., 495 Highland Dr, Madison, AL 35758, ***Robert Elich***

The military acquisition community has a continuing need to establish and refine cause and effect relationships between system performance characteristics and the resultant force effectiveness in a simulated combat environment. The existing, well-established processes for defining requirements, establishing

design trade spaces and balancing system performance vs. costs are discontinuous...

3) Modeling & Testing: Force-on-Force Support to Systems Acquisition, *Ray L. Livingston*, Teledyne Brown Engineering, 300 Sparkman Dr., PO Box 070007, Huntsville, AL 35807-7007, ray.livingston@pobox.tbe.com

We outline the DoD and Army requirements to use M&S in support of the DoD acquisition process. The author argues that, even with supporting regulatory guidance, operational M&S in support of operational T&E is deficient. Obstacles to the integration of OM&S and OT&E are provided.

SA12 Session 1

Cluster: Engineering Cost
Invited Session
Chair: Frank Cheng, Central Michigan University, Ind. & Eng. Tech. Dept., Mt. Pleasant, MI 48859

1) Optimizing of High Performance Engines through Response Surface Methods, *Todd Dvorak*, University of Central Florida, Dept. of IE & Mgmt. Systems, Orlando, FL 32816, ***Robert Hoekstra***

Optimizing automotive engine performance has traditionally required a lengthy "trial and error" search. The objective of the search is to identify the best combination of components or geometry configurations that maximizes or satisfies multi-objective performance measures. A better approach is to apply response surface methods and linear/non-linear multiobjective methods to the engine performance problem domain...

2) Intelligent Robot Trends for 1998, *Ernest L. Hall*, University of Cincinnati, Ctr. for Robotics Research, ML 72, Cincinnati, OH 45221

An intelligent robot is a remarkably useful combination of a manipulator, sensors and controls. The use of these machines in factory automation can improve productivity, increase product quality and improve competitiveness. We present a discussion of recent economic and technical trends. The robotics industry now has a billion-dollar market in the U.S. and is growing...

3) Cost & Time Considerations in Product Design, *Mahendra S. Hundal*, University of Vermont, Dept. of Mech. Eng., Votey Bldg., Burlington, VT 05405-0156, hundal@me.uvm.edu

The highly competitive nature of the marketplace requires that manufacturers be able to deliver products to the customer on time, of high quality and at low cost. There are rules for developing products for low cost and in short time which will be discussed. Time-based design and production call upon both engineering and management initiatives...

4) Robot Workcell Design: Simulation, Communication & Control, *Frank Cheng*, Central Michigan University, Ind. & Eng. Tech. Dept., Mt. Pleasant, MI 48859

Rapid deployment represents a new way of developing manufacturing processes. Among the various tools and technologies are the simulation and flexible automation. Issues of implementing rapid deployment technologies in robot workcell design are discussed, including the robot workcell simulation and cell control support. Robot simulation plays an important role in the concept development, process planning, and programming...

SA13 Multiple Criteria Optimization: Methods

Cluster: Multicriteria Decision Making
Invited Session
Chair: Sai Kolli, American Airlines, PO Box 619616, MD 5494, DFW Airport, TX 75261-9616, saikolli@amrcorp.com

1) Euclidean Centers & Multiple-Objective Linear Programming, *A. Arbel*, Tel Aviv University, Dept. of IE, Tel Aviv, 69978, Israel, ami@eng.tau.ac.il, ***R. Sadka***

An algorithm for addressing MOLP problems is presented. The algorithm makes use of deriving a sequence of Euclidean centers which form an interior sequence of solution iterates leading to a solution on the efficient frontier.

2) Generating Pareto-Optimal Boundary Points in Multi-Party Negotiations using Constraint Proposal Methods, *Pirja Heiskanen*, Delft University of Technology, Mekelweg 4, Delft, 2628 CD, The Netherlands, p.heiskanen@twi.tudelft.nl

Recently, a constraint proposal method has been developed for computing interior Pareto solutions in multi-party negotiations. We generalize the method so that also Pareto-optimal points on the boundary of the decision set can be generated. Both theoretical and numercial results will be presented.

3) A Simple Approach for Sensitivity Analysis of Multiple-Objective Integer Programming Problems, *Sai Kolli*, American Airlines, PO Box 619616, MD 5494, DFW Airport, TX 75261-9616, saikolli@amrcorp.com

This presentation deals with a description of a simple method on the STEP method for performing sensitivity analysis of integer programming problems with multiple objectives. It will also include a brief discussion of the type of problems and solution methods currently available.

SA14 Topics in Disjunctive Programming & Constraint Programming

Sponsor: Computing Society
Sponsored Session
Chair: Ken McAloon, ILOG, Inc., 1901 Landings Dr., Mountain View, CA 94043, mcaloon@ilog.com

1) Derivative Hedge Effectiveness: Risk Management & Balance Sheet Optimization, *Katherine Wyatt*, Logic Based Systems Lab., Brooklyn College, Dept. of CS, 2900 Bedford Ave., Brooklyn, NY 12210, wyatt@sci.brooklyn.cuny.edu

New accounting standards require companies to report gains and losses on derivative financial instruments at fair value on the financial statement and specify "hedge accounting" rules for these instruments. A disjunctive program, which maximizes hedge effectiveness on financial statements and models rule compliance, is presented and computational results analyzed.

2) Implementation of Non-Chronological Search Strategies for CP, *Laurent Perron*, ILOG S.A., Paris, France, perron@ilog.fr

We describe the design of SOLVER, an extension of ILOG Solver, with 2 new features: distributed-memory and shared-memory parellelism and non-chronological search methods such as best-first search and limited discrepancy search. The system provides an efficient implementation of these search methods leading to significant improvements in run times.

3) Flow Theory & Constraint Programming, *Jean-Charles Regin*, ILOG SA, Les Taissounieres HB2, 1681 Route des Dolines, Paris, France, regin@ilog.fr, http://www.ilog.com/

We will present some useful global constraints that encapsulate flow algorithms: alldiff, distribute, sequence, allnullintersect and partition. Moreover, the way that we use flow algorithms in CP raises new problems in flow theory. We will present solutions to some of these and point out others that remain open.

SA15 Managing Uncertainty & Information Flow in Supply Chains

Cluster: Supply Chain Management
Invited Session
Chair: Stephen M. Gilbert, Case Western Reserve University, WSOM, 10900 Euclid Ave., Cleveland, OH 44106-7235, smg10@po.cwru.edu

1) Inventory Replenishment for Quick Service Restaurants, *Sherman X. Bai*, University of Florida, ISE Dept., 303 Weil Hall, Gainesville, FL 32611, bai@ise.ufl.edu, ***Yi Hui Li***

We evaluate several inventory replenishment policies for fast food restaurants, to identify the strategy to reduce the inventory counting at the stores and to improve the utilization of the truck fleet at the distribution center.

2) Impact of Variability Control Agreements on Supply Chain Performance, *Joseph Geunes*, University of Florida, ISE Dept., Gainesville, FL 32611, jxg15@psu.edu, ***Anant Balakrishnan, Michael S. Pangburn***

Distribution channels often contain several firms, each minimizing its own cost while meeting downstream demands. We consider the impact of agreements among channel partners that constrain order size variability, and show that such constraints can serve as an effective channel coordination and cost reduction mechanism.

3) Using Product Variety to Control Information Flow for New Products, *Craig E. Smith*, Case Western Reserve University, WSOM, 10900 Euclid Ave., Cleveland, OH 44120, ***Apostolos N. Burnetas, Stephen M. Gilbert***

We examine the problem of dynamic adjustments of the number of varieties offered along a single characteristic of a newly introduced product. The total demand for the product is Poisson with rate increasing and concave in the number of varieties, but otherwise unknown. We examine properties of the optimal policy.

SA16 Models for Modern Manufacturing I

Cluster: Modern Manufacturing
Invited Session

Chair: Marc E. Posner, Ohio State University, Dept. of IE, 1971 Neil Ave., Columbus, OH 43210-1271, posner1@osu.edu

1) Solving the Weighted Completion Time Problem with Batch Setups, *Kenneth Baker*, Dartmouth College, Tuck School, Hanover, NH 03755, ken.baker@dartmouth.edu, ***Simon Dunstall, Andrew Wirth***

We examine optimal and heuristic solution procedures for scheduling jobs on a single machine to minimize total weighted completion time in the presence of family setups. We report new computational experiments with a traditional B&B procedure as well as the performance of an effective heuristic procedure.

2) Lot Streaming & Scheduling in 2-Machine No-Wait Openshops, *S. Esaignani*, University of Toronto, Dept. of MIE, 5 King's College Rd., Toronto, Ontario, M5S 3G8, Canada, esai@mie.utoronto.edu, ***Nicholas G. Hall, Chelliah Sriskandarajah***

We minimize makespan in two-machine no-wait openshops with products allowing lot streaming. For a single product, we obtain optimal continuous-sized sublots. The algorithm of Gilmore & Gomory (1964) optimally schedules products for given lot sizes. Simultaneous lot streaming and scheduling of multiple products is a generalized TSP.

3) A Fast Algorithm to Minimize Makespan for the Two-Machine Flow-Shop Problem with Release Dates, *Paul A. Stephenson*, McMaster University, MGD-415, Dept. of MS/IS, Hamilton, Ontario, L8S 4M4, Canada, stephepa@mcmail.cis.mcmaster.ca, ***George Steiner***

We consider the 2-machine flow-shop problem with release dates where the objective is to minimize the makespan. We derive a new dominance order and incorporate it into an efficient B&B algorithm. Experiments indicate that the use of the dominance order cuts solution times in half.

4) A Column Generation Method for Multi-Machine Scheduling Problems, *Zhi-Long Chen*, University of Pennsylvania, Dept. of Systems Eng., 220 S 33rd St., Philadelphia, PA 19104-6315, zlchen@seas.upenn.edu

We present the column generation method for solving general parallel-machine and shop scheduling problems. The method has been proven superior for classes of hard problems that we consider. We give the general framework for the method and show some numerical results.

SA17 Spacecraft Autonomy

Cluster: Space Applications of Operations Research
Invited Session

Chair: Walter Truszkowski, NASA Goddard Space Flight Center, Code 588, Greenbelt, MD 20771, walt.truszkowski@gsfc.nasa.gov

1) Features of an Onboard System for Adaptive Activity Scheduling & Execution for NASA's Next Generation Space Telescope, *Glenn Cammarata*, NASA Goddard Sp Flight Ctr., Code 582, Greenbelt, MD 20771, glenn@glarus.gsfc.nasa.gov, ***Lou Hallock, C. Bruno, P. Myers, G. Welter, K. Stewart***

NASA's Next Generation Space Telescope will be a premiere research tool for extending mankind's understanding of the universe. The mission offers a unique opportunity for the use of an onboard system that makes real-time scheduling and execution decisions. We discuss investigations into issues regarding onboard adaptive scheduling and execution.

2) Agent-Based Spacecraft Autonomy, *Lou Hallock*, NASA Goddard Sp Flight Ctr., Code 582, Greenbelt, MD 20771, lhallock@pop500.gsfc.nasa.gov, ***Walter Truszkowski, Chris Rouff, Jay Karlin***

We preview an approach to intelligent and autonomous spacecraft operations through agent technology. An "agent" is an intelligent process capable of responding to goal-directed commands, adapting to a changing environment, and collaborating actively with other human and/or computer-based agents.

3) Space Applications of Multimodal Reasoning, *Karl Mueller*, NASA Goddard Sp Flight Ctr., Code 588, Greenbelt, MD 20771, mueller@kong.gsfc.nasa.gov, ***Nigel Ziyad, Chariya Peterson, John Rowe***

NASA is developing the Automated Multimodal Trend Analysis System (AMTAS), designed to integrate 3 types of reasoning, i.e., rule-based, case-based and model based reasoning. The current AMTAS is designed to be used for ground-based trending of spacecraft data. We explore the feasibility of AMTAS-like capabilities onboard a spacecraft.

4) Collaborative Autonomy for Virtual Platforms in Space, *Tom Brooks*, Century Computing, 8101 Sandy Spring Rd., Laurel, MD 20707, tbrooks@cen.com, ***Steve Geyer, John Farley***

Collaborative autonomy is team automation in which the team members act as peers. A Collaborative Autonomy Laboratory (CAL) is under development the NASA Goddard Space Flight Center. CAL will create an open testbed environment for the prototyping and evaluation of autonomy concepts. The current status of CAL will be discussed.

SA18 Parallel Implementation of Interior Point Methods for Large-Scale Optimization

Cluster: Linear Programming
Sponsor: Optimization Section
Sponsored Session

Chair: Jacek Gondzio, University of Geneva Logilab, HEC Geneva, 102 Bd. Carl-Vogt, Geneva, 1211, Switzerland, gondzio@com7000.unige.ch

1) Parallelization of the XPRESS Interior Point Optimizer for a Shared Memory Multiprocessor using an OpenMP (Like) Programming Environment, *Knud D. Andersen*, EKA Consulting/Dash Associates, Flat A, 12 High St., Leamington Spa, Warwickshire, CV31 3AN, UK, kda@eka.globalnet.co.uk, ***Erling D. Andersen***

We will describe the parallelization of the XPRESS interior-point optimizer (XIPO) for shared-memory multi-processors. We will discuss a parallel version of a Cholesky factorization because it is the most time consuming part of the XIPO method. Results are presented for SGI and windows platforms.

2) No Title Supplied, *Anshul Gupta*, IBM Research, T.J. Watson Research Ctr., PO Box 218, Yorktown Heights, NY 10598, anshul@watson.ibm.com

No abstract supplied.

3) Parallel Solution of Structured Linear Programs with Interior Point Methods, *Robert Sarkissian*, University of Geneva, Logilab, HEC Geneva, 102 Bd Carl-Vogt, Geneva, 1211, Switzerland, robert.sarkissian@hec.unige.ch, ***Jacek Gondzio***

Large linear programs are solved with a primal-dual interior-point algorithm on different parallel computers. We exploit block structures in the linear algebra of the interior-point algorithm. Special care is taken to handle nested structures. This feature is illustrated with problems known from the literature.

SA19 Supply Chain Optimization in the Pharmaceutical Industry

Cluster: Supply Chain Management
Invited Session

Chair: Javad Seyed, Deyes II, Inc., 1933 Amity Hill Ct., Raleigh, NC 27612, javad@deyes.com

1) Panel: Supply Chain Optimization in the Pharmaceutical Industry, *Gerry Cleaves*, i2 Technologies, ***George Thompson***, i2 Technologies

The pharamaceutical industry has lagged behind the process industry chemical, petrochemical, and petroleum companies in the areas of supply chain optimization, manufacturing decision support, advanced planning and scheduling and process control. However, they are becoming more sophisticated in the use of software and IT for ERP, sales force automation, research and development, Internet, Intranet, Extranet, and EC...

SA20 Issues in North American Natural Gas Modeling

Cluster: Energy
Sponsor: Section on Energy, Natural Resources & Environment
Sponsored Session

Chair: Steven A. Gabriel, ICF Kaiser International Inc., 9300 Lee Highway, Fairfax, VA 22031-1207, sgabriel@icfkaiser.com

1) A Conceptual Model of the Cash Out Problem: How to Optimize Imbalance-Based Penalty for a Natural Gas Marketing Company, *Viroj Buraparate*, PROS Strategic Solutions, 3223 Smith St., Ste. 100, Houston, TX 77006, vburaparate@prosx.com, ***Rudy Elizondo, Anthony Postert, Nicola Secomandi***

We study the imbalances that occur in a natural gas pipeline as a result of the nomination process and the pipeline operations. A conceptual model for optimally managing daily imbalances is proposed.

2) Revenue Management Issues & Opportunities in the Natural Gas Pipeline Industry, *Nicola Secomandi*, PROS Strategic Solutions,

3223 Smith St., Ste. 100, Houston, TX 77006, ***Viroj Buraparate, Rudy Elizondo, Anthony Postert***

We highlight revenue management issues and opportunities that arise in the natural gas pipeline industry. Differences and similarities with more traditonal revenue management applications are discussed.

3) withdrawn - chair request of 2/26, ***Anthony Postert***, PROS Strategic Solutions, 3800 Buffalo Speedway, Ste. 350, Houston, TX 77098, ***Viroj Buraparate, Rudy Elizondo, Nicola Secomandi***

4) Issues in North American Natural Gas Modeling, ***Steven A. Gabriel***, ICF Kaiser International Inc., 9300 Lee Hwy, Fairfax, VA 22031-1207, sgabriel@icfkaiser.com, ***Shree Vikas***

We present the findings of work based on a study for the US DOE to measure the role of underground gas storage in the North American natural gas system. A large-scale, network-based, market equilibrium model, developed by ICF originally for DOE was used for this analysis. This model has detailed representations of the supply, demand and transportation sectors with outputs...

5) Unconventional Natural Gas Resources on US Federal Lands, ***Robert A. Crovelli***, US Geological Survey, Denver Federal Ctr., PO Box 25046, MS 939, Denver, CO 80225, crovelli@usgs.gov, ***James W. Schmoker, Vito F. Nuccio***

The UNCLE (unconventional energy) petroleum resource assessment system, developed from analytic paobabilistic methodology, was used to calculate estimates of technically recoverable natural gas resources for continuous-type (unconventional) plays in sandstones, shales, chalks and coals on Federal lands of the conterminous US for the assessment regions and entire nation.

SA21 Applications in Project Management

Cluster: **Project Management**
Invited Session

Chair: Rainer Kolisch, Christian Albrechts Universitaet, Inst. Betriebswirtschaftslehre, Olshausenstr. 40, Kiel, 24098, Germany, kolisch@bwl.uni-kiel.de

1) Measuring the Quality of a Project: An Empirical Study, ***Rainer Kolisch***, Christian Albrechts Universitaet, Inst. Betriebswirtschaftslehre, Olshausenstr. 40, Kiel, 24098, Germany, kolisch@bwl.uni-kiel.de, ***Oya Icmeli Tukel, Walter O. Rom***

We attempt to identify a proper definition and possible measures for project quality. Specifically, a survey is designed to investigate the emphasis given to traditional performance measures as well as the level of customer involvement and satisfaction. The results of the survey will be discussed.

2) Measuring the Quality of Heuristics for the RCPSP: An Experimental Study, ***Soenke Hartmann***, Christian Albrechts Universitaet, Inst. Betriebswirtschaftslehre, Olshausenstr. 40, Kiel, 24098, Germany, hartmann@bwl.uni-kiel.de, ***Rainer Kolisch***

This study comprises 16 different heuristics proposed in the literature which are tested on a set of 1560 benchmark instances. We give a detailed comparison of the heuristics and provide explanations for their performance. Prosperous directions for further research are identified.

3) Planning & Controlling Multiple Interdependent Projects: A Case Study, ***Haluk Demirkan***, University of Florida, Coll. Bus. Admin., Dept. DIS, 351 BUS, PO Box 117169, Gainesville, FL 32611-7169, demirkan@dale.cba.ufl.edu, ***S. Selcuk Erenguc***

We review some of the major multi-project management issues in matrix and functional project development organizations and discuss a successful implementation of integrated project organization. Our discussion will focus mainly on the information technology services organization of a major credit card company.

4) New Product Development Projects: The Effects of Organizational Culture, ***Walid A. Belassi***, Cleveland State University, Coll. of Bus., OMBS Dept., Cleveland, OH 44114, w. belassi@popmail.csuohio.edu, ***Oya Icmeli Tukel***

We present the results of an empirical study in which the relationship between organizational culture and the characteristics of project structures is analyzed. A general measure for the degree of innovativeness is also proposed based on the results of this analysis.

SA22 Expert Systems

Contributed Session

Chair: Anita Lee-Post, University of Wisconsin, Sch. of Bus., 4114 Grainger Hall, Madison, WI 53706, aleepost@bus.wisc.edu

1) Applying Object-Orientation & Databases to Design Expert System Development Environment: An Illustration, ***Rashmi Malhotra***, Cabrini College, 610 King of Prussia Rd., Radnor, PA 19087, rmalhotr@cabrini.edu www.cabrin.edu/~rmalhotr, ***Davindner K. Malhotra***

We describe a relatively new approach to address the shortcomings of traditional expert system environments, the information-based approach, i.e., using a combination of OOP, DBMS and expert systems, etc. We illustrate the design of an object-oriented expert system shell (Ellipse) that uses a combination of knowledgebases and databases...

2) An Approach to Fuzzy System Identification, ***Ta-Wei Hung***, North Carolina State University, OR Program, PO Box 7913, Raleigh, NC 27695-7913, thung@eos.ncsu.edu, http://www.ie.ncsu.edu/fangroup/, ***Shu-Cherng Fang, Henry L. Nuttle***

An approach is proposed to identify a fuzzy system fron imput-output data pairs. This approach consists of 2 phases: a baseline design by clustering techniques and a fine-tuning process by optimization methods. It is validated by applying to the truck backer-upper and the Iris flower problems.

3) Decision Support for Concept Characterization in the Knowledge Acquisition Phase of Expert Systems Development, ***Anita Lee-Post***, University of Wisconsin, Sch. of Bus., 4114 Grainger Hall, Madison, WI 53706, aleepost@bus.wisc.edu

The lack of computerized tools to use at the conceptualization stage of the knowledge acquisition process has motivated us to investigate possiblities in this direction. An unsupervised learning technique called genetic algorithms is demonstrated as a tool for discovering associations between a concept and its set of attributes.

4) Producing Ultra-Low Interfacial Tension at the Oil/Brine Interface, ***Ali Elkamel***, University of Kuwait, Chemical Eng. Dept., PO Box 5969, Safat, 13060, Kuwait, elkamel@kuc01.kuniv.edu.kw, ***Taher Al-Sahhaf, Abdessater Ahmed***

The predominant and most promising EOR technique is the micellar-polymer flooding process which uses a surface active agent to decrease interfacial tension and hence, allows oil to freely move from its original location through the porous media. We study the conditions leading to ultra-low interfacial tension for optimal oil recovery...

SA23 Satisfiability

Sponsor: **College on Artificial Intelligence**
Sponsored Session

Chair: John Franco, University of Cincinnati, Dept. of Elect. Eng., Comp. Eng. & Comp. Sci., Cincinnati, OH 45221-0030, franco@gauss.ececs.uc.edu

1) The Phase Transition in Random K-Horn Satisfiability & its Algorithmic Implications, ***Gabriel Istrate***, University of Rochester, Dept. of Comp. Sci., Rochester, NY 14627, istrate@cs.rochester.edu

We study the satisfiability of random (at most) k-Horn formulas via a probabilistic analysis of PUR, an implementation of positive unit resolution. While the threshold is always coarse, the regions "k unbounded" and "k constant" have substantially different properties. Our analysis also yields several average-case results for PUR.

2) Searching for Stable Models, ***John S. Schlipf***, University of Cincinnati, Dept. of ECE & Comp. Sci., Cincinnati, OH 45221-0030, john.schlipf@uc.edu

Stable models for logic programs are suggested as a way of representing plausible scenarios for various instances of "common-sense reasoning." We motivate the study with examples and discuss work on computing stable models.

3) Algorithms to Compute Small & Large Stable Models, ***Miroslaw Truszczynski***, University of Kentucky, Dept. of Comp. Sci., Lexington, KY 40506-0046, mirek@cs.engr.uky.edu

Let k be a fixed integer. We will discuss the complexity of the problem to decide whether a finite propositional logic program has a stable model of size; at most k, at least n-k, where n is the number of rules in the program. We will present several algorithms to compute small and large stable models and state several open problems.

4) Average Case Analysis of the Apriori Algorithm, ***Paul Purdom***, Indiana University, Dept. of Comp. Sci., Lindley Hall, Indianapolis, IN 46202, pwp@cs.indiana.edu

The a priori algorithm is concerned with determining sets of items that occur together frequently. The input consists of a list of baskets. Each basket is a set of items. The problem for the algorithm is to determine which sets of of items occur in at least k baskets...

SA24 GARCH Option Pricing Models

Sponsor: Financial Services Section
Sponsored Session

Chair: Ivilina Popova, Purdue University, Krannert Grad. Sch. of Mgmt., W Lafayette, IN 47907, ipopova@mgmt.purdue.edu

1) Pricing Claims Under Garch-Level Dependent Interest Rate Processes, ***V. Cvsa***, Case Western Reserve University, Weatherhead Sch. of Mgmt., Cleveland, OH 44106, _vxc10@po.cwru.edu, ***Peter Ritchken***

We develop option pricing models for interest rate claims when the underlying follows a mean reverting process with the volatility following an array of possible GARCH like specifications. Analytical solutions to bond prices exist for some special cases. Efficient algorithms enable prices of American claims to be established.

2) Option Valuation With Co-Integrated Asset Prices, ***Stanley R. Pliska***, University of Illinois, Dept. of Finance, 601 S Morgan St., Chicago, IL 60607-7124, srpliska@uic.edu, ***Jin-Chuan Duan***

In a discrete time context with stochastic volatilities, we develop the theory for valuing options when underlying prices are co-integrated. Diffusion limits are also considered. A numerical study of spread options suggests that allowing for co-integration can have a significant effect on option prices, especially when volatilities are stochastic.

3) Stock Index Futures Trading & Volatility in International Equity Markets, ***Stewart Mayhew***, Purdue University, 1310 Krannert, West Lafayette, IN 47907-1310, mayhew@mgmt.purdue.edu, ***Huseyin Gulen***

We examine stock market volatility before and after the introduction of index futures trading in 25 countries, using 4 alternative GARCH specifications. We document a change in GARCH parameters associated with futures listing, most often corresponding to a reduction in unconditional volatility.

4) Option Pricing Under Regime Switching, ***Ivilina Popova***, Purdue University, Krannert Grad. Sch. of Mgmt., W Lafayette, IN 47907, ipopova@mgmt.purdue.edu, ***Jin-Chuan Duan***, ***Peter Ritchken***

We develop a model when the underlying stock price dynamics are modeled by a regime switching model in which prices remain in one volatility regime for a random amount of time before switching over into a new regime. As a result, we capture the asymmetric response of volatility to good and bad news and the negative correlation between returns and volatility.

SA25 Transportation Applications I

Contributed Session

Chair: Michael Haynes, Lafayette College, Dept. of Civil & Environ. Eng., Easton, PA 18042, haynesm@lafayette.edu

1) ProfitBid: A Tool for Negotiating & Evaluating Carrier Bids, ***Will McCullers***, Profit Point, Inc., 713 Dover Rd., Wyneewood, PA 19096, wtmcculler@aol.com, ***Joseph R. Litko***

We present a generic model for evaluating competing transportation bids. Users can negotiate with the carriers from a rational position to suggest concessions which can be mutually advantageous. Constraints on carrier activity can be imposed over user-defined regions and zones. Package deals involving groups of lanes can be evaluated.

2) Integration of an Intermodal Transportation Planning Model with Geographic Information Systems, ***Michael Haynes***, Lafayette College, Dept. of Civil & Environ. Eng., Easton, PA 18042, haynesm@lafayette.edu, ***Maria P. Boile***

We present an integration of a network equilibrium model within a GIS. The resulting application is an integrated environment that executes intermodal network analysis and stores, modifies and graphically displays the results.

3) Airfield Capacity & Delay Models for Small Canadian Airports, ***Gerald W. Shapiro***, Logistics Management Institute, 2000 Corporate Ridge, McLean, VA 22102, gshapiro@cais.com

Analytical models for evaluating airfield capacity and delays at Canadian airports, with varying levels of air traffic services, are presented. These models are used for planning the NAV Canada.

4) Line Capacity Optimization using the Branch & Bound Method, ***Erika Egyhaziova***, MultiModal Applied Systems Inc., 125 Village Blvd., Ste 270, Princeton, NJ 08540, erika@multimodalinc.com, ***Marc S. Meketon***

Intelligent railroad line capacity systems seek the best plan for meeting and passing trains on sidings and multiple tracks. The B&B method has been used in several commercial systems to develop the meet/pass plans. We overview the basics of this method, using simple examples for illustration purposes.

SA26 Reliability & Quality Control I

Sponsor: Quality, Statistics & Reliability Section
Sponsored Session

Chair: Sudha Jain, University of Toronto, Dept. of Stats., 100 St. George St., Toronto, Ontario, M5S 3G3, Canada, jainsu@ustat.utoronto.ca

1) Monitoring Cardiac Intensive Care Patients with Adaptive Real-Time SPC, ***Haim Shore***, Ben-Gurion University of the Negev, Dept. of IE, Fac. of Eng. Sci., PO Box 653, Beer-Sheva, 84105, Israel, shor@bgumail.bgu.ac.il

Initial results are presented from a research effort aimed at developing a real-time adaptive SPC system for cardiac intensive care patients. A computer package that combines conventional approaches of data analysis with fuzzy technologies and neural networks serves as a platform for this study.

2) Modular Test Plans for Certification of Software Reliability, ***Mainak Mazumdar***, University of Pittsburgh, Dept. of IE, 1048 Benedum Hall, Pittsburgh, PA 15261, mmazumd@engrng.pitt.edu, ***Jayant Rajgopal***

We consider the problem of certifying the reliability of a software system modeled as a Markov chain that can be decomposed into a finite number of modules. The minimum number of tests required of each module is determined such that the probability of certifying an unreliable system is less than a specified small fraction. This requires solving a 2-stage mathematical program.

3) Impact of Measurement Uncertainty on Dimensional Variation & Quality Improvement during Sheet Metal Assembly Processes, ***Jinhui Wang***, University of Michigan, Dept. of Mech. Eng., Ann Arbor, MI 48109-2136, jinhuiw@engin.umich.edu, ***Darek Ceglarek***

Coordinate measurements dominate in improving product quality during the sheet metal assembly process. However, coordinate measurement gauges do not have the tracking capability of all measured features that are of importance for variation reduction. Studies on limitations of coordinate measurements for in-process product quality improvement and variation reduction are presented.

4) On Statistical Monitoring of Automatic-Controlled Processes, ***Fugee Tsung***, HKUST, Dept. of IE/EM, Clear Water Bay, Kowloon, Hong Kong, season@ust.hk

The importance of statistical process control (SPC) or statistical process monitoring (SPM) techniques for quality improvements is well recognized in industry. With advances in sensing and data capture technology, large volumes of data are being routinely collected in automatic-controlled processes. There is a great need for SPC and SPM for variation reduction and quality improvement in these environments.

SA27 Advances in the Analysis of Polling Systems

Sponsor: Applied Probability Society
Sponsored Session

Chair: Diwakar Gupta, McMaster University, DeGroote Sch. of Bus., 1280 Main St. W, Hamilton, Ontario, L8S 4M4, Canada, guptad@mcmaster.ca

1) Does it Make Sense to Set Up if No Work is Waiting?, ***Shun-Chen Niu***, University of Texas, Sch. of Mgmt., PO Box 830688, Richardson, TX 75083-0688, scniu@utdallas.edu, ***Robert B. Cooper***, ***Mandyam M. Srinivasan***

We derive simple, closed-form formulas that describe counterintuitive results for polling models, such as the reduction of waiting times as a consequence of forcing the server to set up even when no work is waiting. The analysis reveals further insight on the ubiquitous renewal-theory paradox in queueing theory.

2) Exact Analysis of the State-Dependent Polling Model, ***Mandyam M. Srinivasan***, University of Tennessee, MS Program, Knoxville, TN 37996-0545, msrini@utk.edu, ***Mahender P. Singh***

A classic polling model with state dependent setup times and exhaustive service is analyzed. This model has challenged researchers for many years, due to its inherent complexity. We develop an exact analytic algorithm and present computational results. The computational results are discussed in the context of the renewal-theory paradox.

3) The Polling System with State-Dependent Changeover Times, ***Martin Eisenberg***, AT&T, 101 Crawfords Corner Rd., Rm. 1K207, Holmdel, NJ 07733, meisenberg@att.com

We consider the polling system where the changeover time from one queue to

another depends upon whether the visted queue has customers waiting. The solution involves an unusual type of iteration. We determine the necessary and sufficient conditions for this iteration to converge.

4) Polling Systems with State-Dependent Server Vacations, ***Diwakar Gupta***, McMaster University, DeGroote Sch. of Bus., 1280 Main St. W, Hamilton, Ontario, L8S 4M4, Canada, guptad@mcmaster.ca, ***Yavuz Gunalay***, ***Mandyam M. Srinivasan***

We consider a polling model in which the server takes a vacation upon emptying the system. Vacation lengths are station-dependent. We derive standard performance measures and compare our system to those with state-independent server vacations. Applications and relationship to the T-policy in M/G/1 queues are also discussed.

SA28 Constrained Vehicle Routing & Scheduling

Sponsor: Section on Logistics
Sponsored Session

Chair: Ajesh Kapoor, CAPS Logistics Inc, 2700 Cumberland Pkwy., Ste. 150, Atlanta, GA 30339, ajesh.kapoor@caps.com

1) Constrained Routing Optimization: Applications, Issues & Challenges, ***Rajiv Saxena***, Menlo Logistics, Logistics Optimization, One Lagoon Dr., Ste. 300, Redwood City, CA 94065, saxena.rajiv@menlolog.com

We share experiences of using routing and scheduling DSSs in analytical and operational modes. We discuss case studies, issues and challenges faced during these applications.

2) Vehicle Routing vs. Transportation Planning: The Tradeoffs, ***Jay Truchon***, Camelot is-2, 9306 Sweetbriar Pl., Jonesboro, GA 30236, jaytruchon@mindspring.com

Pool consolidation and distribution, cross-docking, merge in-transit and ocean and air consolidation add to the complexity of today's common business transportation problem. Current solutions that daisy chain routing with pool consolidation and network flow models are not enough for today's business needs.

3) Impact of Reverse Logistics on Routing Algorithms, ***Sandesh Jagdev***, Burnham Service Company, 1630 Phoenix Blvd., Atlanta, GA 30349, sandeshj@bsc.attmail.com

Reverse logistics today consist of 2 major streams: pure pickup problems and mixed pickup and delivery problems. Each routing algorithm has certain positives to suit a certain situation. The application of routing algorithms is very subjective. There are selective algorithms that could be specifically applied to various reverse logistics problems.

4) Sequential Programming for Network Vehicle Routing, ***Michael Zhang***, i2 Technologies, 200 Galleria Pkwy., Ste. 300, Atlanta, GA 30339, michael_zhang@i2.com

No abstract supplied.

SA29 Product & Process Design Issues

Sponsor: Manufacturing & Service Operations Management Society
Sponsored Session

Chair: Amiya K. Chakravarty, Tulane University, Freeman Sch. of Business, New Orleans, LA 70118-5669

1) Effect of Demand Surges on Manufacturing Performance, ***Timothy L. Smunt***, Wake Forest University, Babcock Grad. Sch. of Mgmt., PO Box 7659, Winston-Salem, NC 27109-7659, tim.smunt@mba.wfu.edu

Temporary surges in demand due to marketing promotions or other external effects can cause substantial degradation of manufacturing performance for long after the surge occurred. This research studies the effects of various such temporary shocks to the system for a number of different process configurations.

2) Optimal Machine Setup & Product Clustering for Printed Circuit Board Manufacturing, ***George G. Polak***, Wright State University, MSIS Dept., 271 Rike Hall, Dayton, OH 45435, gpolak@wright.edu, ***Michael Magazine***

For PCBs, competent requirements differ among board types. Each change of feeders in a pick-and-place machine that attaches components to a blank board can improve batch processing time, but indicates a machine setup. We develop an original IP model for optimal product clustering by setup and include numerical results.

3) A Model of Supplier Capability Development, ***Geoffrey G. Parker***, Tulane University, Freeman Sch. of Bus., New Orleans, LA 70118, geoffrey.parker@tulane.edu

We explore the evolution of capabilities in supply chains by examining the sequence of contracts, project-by-project, among the members of the chain. A 2-buyer, 1-supplier model of supplier project choice is analyzed. The model predicts supplier choices as a function of buyer technology as well as buyer/supplier relationships.

4) Product Design with Two Supplier Scenarios, ***Amiya K. Chakravarty***, Tulane University, Freeman Sch. of Business, New Orleans, LA 70118-5669, ***Nagraj Balakrishnan***

The tradeoff in designing products typically involves consideration of manufacturing and development costs and the potential market share. Relevant questions are: how many product varieties in a product group should be introduced in the market and what are the minimum numbers of options required in the different modules to support this variety?...

SA30 The Relationship Between Product Development Speed & Quality

Sponsor: Manufacturing & Service Operations Management Society
Sponsored Session

Chair: Barbara Flynn, Wake Forest University, Babcock Grad. Sch. of Mgmt., PO Box 7659, Reynolds Station, Winston-Salem, NC 27109-7659, barb.flynn@mba.wfu.edu

1) Common Infrastructure for Product Development Speed & Quality: Theoretical Foundation, ***Susan D. Amundson***, Arizona State University, Dept. of Mgmt., Box 874006, Tempe, AZ 85287-4006, susan.amundson@asu.edu

While product development speed and quality have traditionally been considered a tradeoff, recent evidence suggests that some organizations have been able to pursue both simultaneously. We draw upon cross-disciplinary literature to develop a theoretical model for this relationship, which posits that there is a common infrastructure supportive of both.

2) Case Studies of the Relationship Between Product Development Speed & Quality, ***Roger Schroeder***, University of Minnesota, Carlson Sch. of Mgmt., 338 Mgmt. & Economics Bldg., Minneapolis, MN 55455, rschroeder@csom.umn.edu

We draw upon case studies of 8 product development projects in the electronics industry to develop propositions related to the relationship between product development speed and quality. Topics include organizational culture, supplier relationship, project characteristics, project planning and control, quality practices, human resource issues and strategic management.

3) Strategic Choice as a Foundation for Product Development Speed & Quality, ***E. James Flynn***, Wake Forest University, Babcock Grad. Sch. of Mgmt., PO Box 7659, Reynolds Station, Winston-Salem, NC 27109-7659, jim.flynn@mba.wfu.edu

We apply the Miles & Snow strategic choice typology to the relationship between product development speed and quality, proposing that prospectors will achieve the greatest gains in both, followed by analyzers, defenders and reactors. Hypotheses are tested using a database of 100 projects in 10 organizations in the electronics industry.

4) Supplier Power as a Deterrent to Product Development Speed & Quality, ***Barbara Flynn***, Wake Forest University, Babcock Grad. Sch. of Mgmt., PO Box 7659, Reynolds Station, Winston-Salem, NC 27109-7659, barb.flynn@mba.wfu.edu

We discuss the power relationship between suppliers and customers, describing key measures and postulating a negative relationship between supplier power and product development speed and quality. This is tested using a database of 100 projects in 10 organizations in the electronics industry.

SA31 Continuous Location Problems

Sponsor: Section on Location Analysis & Transportation Science Section
Sponsored Session

Chair: Zvi Drezner, California State University, Dept. of MS/IS, Fullerton, CA 92834, zdrezner@fullerton.edu

1) The Generalized Cover Problem, ***Jeffrey D. Camm***, University of Cincinnati, QAOM Dept., Cincinnati, OH 45221, jeff.camm@uc.edu, ***Sriram Kannan***

We explore a generalization of the set cover problem where the constraint coefficients are between 0 and 1 inclusive. We review several site selection applications of generalized cover problems and discuss solution approaches.

2) The Location of Hubs in Networks, ***Morton O'Kelly***, Ohio State University, Dept. of Geography, Columbus, OH 43210,

okelly+@osu.edu

Hubs serve as conduits for interactions between geographically dispersed nodes. There are lower variable costs where greater flows are handled by higher capacity infrastructure. Providers of transportation services reduce their average unit costs by bundling flows and channeling them between hubs. The resulting facility locations are interdependent because of the flows between them.

3) A One-Dimensional Location Allocation Problem with Mobile Servers, ***Yigal Gerchak***, University of Waterloo, Dept. of MS, Waterloo, Ontario, N2L 3G1, Canada, ygerchak@engmail.uwaterloo.ca, ***Haldun Sural***

Where should mobile servers be stationed when they are idle to minimize expected response time to requests? These questions arise in connection with automated warehouses, elevators, and finding home bases for emergency vehicles on a highway. We address situations with explicit responsiblity zones and situations without them. Algorithms and examples are provided.

4) Routing & Location On A Network With Hazardous Threats, ***Oded Berman***, University of Toronto, Faculty of Management, 105 St. George St, Toronto, Ontario, M5S 3E6, Canada, berman@fmgmt.utoronto.ca, ***Zvi Drezner***, ***George O. Wesolowsky***

We consider 2 situations: one is a hazardous event that may happen on the network affecting a set of off-network sites; the other is a hazardous event which may happen at an off-network location which affects traffic on the network. Eight different models, aiming at optimizing different objectives, are formulated and solved.

SA32 Economics of Electronic Commerce

Cluster: **Telecommunications & Electronic Commerce**
Invited Session

Chair: Tomak Kerem, University of Purdue, Krannert Grad. Sch. of Mgmt., 1310 Krannert Bldg., West Lafayette, IN 47906

1) Electronic Markets for Trading Network Services: Economic Analyses & Mechanism Design, ***J. Sairamesh***, IBM, TJ Watson Research Ctr., 30 Saw Mill River Rd., Hawthorne, NY 10532, jramesh@watson.ibm.com, ***Don Ferguson***, ***Jeff O. Kephart***

We consider a market economy for computational services in large computer networks. The economy consists of 3 kinds of players: suppliers, who sell computational resources such as network bandwidth/buffers and switch processing, brokers, who buy resources from suppliers and resell them in the form of multiple qualities of service and consumers who buy services from brokers based on their QoS requirements and willingness to pay...

2) Quasi-Naturally Occurring Experiments with Electronic Markets & Digital Products, ***Anitesh Barua***, University of Texas, Ctr. for Res. on EC, Dept. MSIS, Grad. Sch. of Bus., Austin, TX 78712, barua@mail.utexas.edu, ***Andrew B. Whinston***, ***Ram Chellappa***

Companies worldwide are committing to large investments in IT applications, new business strategies and processes in order to conduct EC. Yet, very little is known in either the business or the academic press about recipes for success in an electronic market. It is imperative that the assumptions, beliefs and ideas which provide a basis for EC related investments and organizational changes be tested empirically...

3) Economic Incentives of Service Providers in Electronic Markets, ***Alok Gupta***, University of Connecticut, 368 Fairfield Rd., U-41 IM, Storrs, CT 06269

Electronic markets such as the one fostered by the explosive growth of Internet and WWW involve complex interaction of incentives among the customers and service providers. We will explore and analyze the economic incentives of service providers for their choice of different pricing policies. We analyze the revenue implications as well as effectiveness of different price setting mechanisms...

4) On the Bundling of Information Products with Cross-Product Network Externalities, ***Baba Prasad***, University of Purdue, Krannert Grad. Sch. of Mgmt., 1310 Krannert Bldg., West Lafayette, IN 47906, prasad@mgmt.purdue.edu, ***Tomak Kerem***

We will analyze the bundling choices of the firm when there are cross-product externalities. Previous literature on bundling discuss the case of uncorrelated bundle components mainly. As it is observed in the bundling of Microsoft Windows 98 and Internet Explorer 4.0, there are strategic implications of having interrelated products in software bundling practices...

SA33 Combinatorial Problem Generation Methods

Cluster: **Experimentation with Synthetic Optimization Problems**
Invited Session

Chair: Raymond R. Hill, AFIT/ENS, 2950 P St., Bldg. 640, WPAFB, OH 45433, rhill@afit.af.mil

1) Some Characterizations of Synthetic Multidimensional Knapsack Problems, ***Raymond R. Hill***, AFIT/ENS, 2950 P St., Bldg. 640, WPAFB, OH 45433, rhill@afit.af.mil

We consider methods for generating random instances of multidimensional knapsack problems. Legacy methods are discussed and compared to improved problem generation methods. We discuss the strengths and weaknesses of each method while providing some new insights as to why problem generation methods should be rigorously considered.

2) A Comparison of Genetic Algorithm Parameterization on Synthetic Optimization Problems, ***James T. Moore***, AFIT, Dept. of Operational Sci., 2950 P St., Bldg. 640, WPAFB, OH 45433, jtmoore@afit.af.mil, ***Mehmet Eravsar***

We present the results of an empirical study considering the parameterization of a genetic algorithm. Specifically, we examine how that parameterization effects the solution quality obtained by the heuristic on a set of multidimensional knapsack problems with known optimal solutions and correlation structures varied across all possible correlation structures.

3) On the Random Generation of Synthetic 0-1 Knapsack Problems, ***Charles H. Reilly***, University of Central Florida, IEMS Dept., PO Box 162450, Orlando, FL 32816-2450, creilly@mail.ucf.edu

We consider seven classes of synthetic 0-1 Knapsack Problems. We quantify the objective-constraint correlation and determine the mean, variance, and coefficient of variation of the objective-constraint coefficient ratios for each class. We point out shortcomings of common problem generation methods and suggest an alternative method for generating Knapsack instances.

SA34 Optimization Techniques I

Contributed Session

Chair: Venkat Venkateswaran, AT&T Labs., 101 Crawfords Corner Rd., Rm. 3K-301, Holmdel, NJ 07733, vvenkateswaran@att.com

1) Maximum Flows & Critical Vertices in AND/OR Graphs, ***Yvo Desmedt***, University of Wisconsin, Dept. of Comp. Sci. & EE, PO Box 784, Milwaukee, WI 53201, desmedt@cs.uwm.edu, http://www.cs.uwm.edu/~desmedt, ***Yongge Wang***

Generally, the AND/OR graphs are used to model problem solving processes. The minimum-cost solution graph can be used to attack the problem with the least resource. However, in many cases, we want to solve the problem within the shortest time period and we assume that we have as many concurrent resources as we need to run all concurrent processes...

2) New Decomposition Methods for Optimization & Equilibrium Models, ***J. David Fuller***, University of Waterloo, Dept. of MS, Waterloo, Ontario, N2L 3G1, Canada, dfuller@engmail.uwaterloo.ca

We present an overview of several related lines of research motivated by a new primal-dual decomposition method for convex optimization models and applicable to the larger class of equilibrium models. Advantages include ease of model formulation and maintenance and computational improvements. Examples include decomposition by region, commodity, period, etc.

3) A Polynomial Algorithm for a Production-Transportation Problem, ***Idalia Flores***, UNAM, Cascada 526, Col. Banjidal, Mexico, DF, 09450, Mexico, idalia@servidor.unam.nx

A general algorithm is developed for a special concave minimization problem which is a production-transportation problem involving a concave production cost and linear transportation cost. This problem was solved by Tuy using parametric LP and some network results. Instead, this algorithm uses a linear function that understimates the concave objective function...

4) Bandwidth Allocation in Multicast Trees with QoS Constraints, ***Venkat Venkateswaran***, AT&T Labs., 101 Crawfords Corner Rd., Rm. 3K-301, Holmdel, NJ 07733, vvenkateswaran@att.com, ***Murali Kodialam***

We develop a solution procedure for the problem of allocating a fixed amount of bandwidth to links of a given multicast tree to minimize max delay. We also study the related problem of minimizing total bandwidth required to meet specified delay requirements.

5) MProbe: Analyzing a Mathematical Program, ***John W. Chinneck***, Carleton University, Systems & Comp. Eng., Ottawa, Ontario, K1S 5B6, Canada, chinneck@sce.carleton.ca, www.sce.

carleton.ca/faculty/chinneck.html

MProbe is software for the general analysis of mathematical programs, especially NLPs and MILPs. Examples of common analyses: is my constrained region convex? what are the most effective constraints? The most recent version has many new features. See http://www.sce.carleton.ca/faculty/chinneck/mprobe.html for details.

Sunday 09:45-11:15

SB01 1999 George E. Nicholson Student Paper Prize Competition I

Prize Session

Chair: Nicholas G. Hall, Ohio State University, 301 Hagerty Hall, 1775 S College Rd., Columbus, OH 43210-1399, halln@cob.ohio-state.edu

1) Nicholson Student Paper Prize Competition I

This session represents an opportunity for faculty, professionals and students to see some of the best research being performed by students.

2) Valid Inequalities for Problems with Additive Variable Upper Bounds, ***Alper Atamturk***, University of California, Dept. of IEOR, Berkeley, CA 94720-1777, atamturk@ieor.berkeley.edu

No abstract supplied.

3) Discrete-Review Policies for Scheduling Stochastic Networks: Trajectory Tracking & Fluid-Scale Asymptotic Optimality, ***Constantinos Maglaras***, Columbia University, Grad. Sch. of Bus., Uris Hall, 3022 Broadway, New York, NY 10027-6902, c. maglaras@columbia.edu

No abstract supplied.

4) Sustaining Technology Leadership Can Require Both Cost Competence & Innovative Competence, ***Glen Schmidt***, Georgetown University, Grad. Sch. of Bus., G-4 Old North, 37th & O St. NW, Washington, DC 20057, schmidtg@gunet.georgetown.edu

No abstract supplied.

SB04 Optimization Techniques III

Contributed Session

Chair: Bertrand Decocq, France Telecom/CNET, 38-40 rue du General Leclerc, Issy les Moulineaux, 92794, France, bertrand.decocq@cnet.francetelecom.fr

1) Solving Large-Scale Linear Programs: A Parallel Primal-Dual Algorithm, ***Diego Klabjan***, Georgia Institute of Technology, Sch. of ISyE, 765 Ferst Dr., Atlanta, GA 30332-0205, diego@isye.gatech.edu, http://udaloy.isye.gatech.edu/~diego, ***Ellis L. Johnson***, ***George L. Nemhauser***

Recently, the primal-dual simplex method has been used to solve LPs with a large number of columns. We present a parallel primal-dual simplex algorithm capable of solving LPs with at least an order of magnitude more columns than previous work. The algorithm repeatedly solves several LPs in parallel and combines the dual solutions to a new dual feasible solution...

2) The Land Warrior Arms Room, ***Michael A. Schneider***, US Military Academy, PO Box 1991, West Point, NY 10997, x96837@exmail.usma.edu, ***Barry Lingelbach***, ***Dave Zickafoose***

Our design team has developed and analyzed 5 feasible alternatives for a facility capable of storing the US Army's new land warrior system. The team's focus during the creation and modeling of these alternatives was to enhance unit readiness and deployability by allowing for the rapid distribution of equipment while minimizing implementation costs.

3) SDH Rings Interconnection Problem Resolution, ***Bertrand Decocq***, France Telecom/CNET, 38-40 rue du General Leclerc, Issy lesMoulineaux,92794,France,bertrand.decocq@cnet.francetelecom.fr, ***Abdel Lisser***

Two methods are used to solve an SDH rings interconnection problem. Both are based on the SA method, but the second one is solving LPs at each step to route the demands instead of routing them sequentially as in the first approach. Results are presented for small problems and for real problems.

4) A Bicriterion Approach for the Semi-Obnoxious Location Problem in the Plane, ***Anders J. V. Skriver***, University of Aarhus, Dept. of OR, Bldg. 530, Ny Munkegade, Aarhus, 8000C, Denmark, ajs@imf.au.dk, ***Kim Allen Andersen***

Locating an obnoxious facility is often modeled by the maximin problem. But the obnoxious facility is often placed unrealistically far away from the demand point, resulting in prohibitively high transportation cost and time. We model the problem as a bicriterion semi-obnoxious location problem in the plane...

5) One-Operator, Two-Machine Open Shop & Flowshop Scheduling with Setup Times for Machines & Maximum Lateness Objective, ***Mohammed F. Baki***, University of Waterloo, Dept. of MS, Waterloo, Ontario, N2L 3G1, Canada, mfbaki@uwaterloo.ca, ***Raymond G. Vickson***

We consider a scheduling problem in which a single operator completes some jobs requiring operations on 2 machines. When 1 machine is in use, the other is idle. After developing general properties of optimal schedules, we develop efficient algorithms for minimizing maxiumum lateness for open shop and flowshop cases.

SB05 Simulation Output Analysis

Sponsor: College on Simulation

Sponsored Session

Chair: Douglas J. Morrice, University of Texas, MSIS Dept., CBA 5.202, Austin, TX 78712-1175, morrice@mail.utexas.edu

1) Recent Work in Multiple Selection Procedures, ***Stephen Chick***, University of Michigan, Dept. of IOE, 1295 Beal Ave., Rm. 1777, Ann Arbor, MI 48109-2117

How much simulation output is required to justify a decision to select a particular system as being optimal? How can one "screen out" bad system designs? We look at several approaches, frequentist and classic, to this problem.

2) Optimality of Permuted Estimators, ***Jim Calvin***, New Jersey Institute of Technology, Dept. of Comp. & Info. Sci., Newark, NJ 07102, ***Marvin Nakayama***

We previously introduced a class of estimators (permuted estimators) for regenerative simulations. The estimators have smaller mean squared error than standard regenerative estimators and in most cases, the increase in computational cost is small compared with the decrease in mean squared error. We discuss optimality properties of permuted estimators within a class of estimators for regenerative processes.

3) Indifference Zone Specification for an Approach to Ranking & Selection for Multiple Performance Measures, ***Douglas J. Morrice***, University of Texas, MSIS Dept., CBA 5.202, Austin, TX 78712-1175, morrice@mail.utexas.edu, ***John Butler***, ***Peter Mullarkey***

In previous work, we developed a ranking and selection procedure for comparing systems that have multiple performance measures. The procedure combines multiple attribute utility theory with ranking and selection to select the best of K configurations using the indifference zone approach. We consider different ways to select the indifference zone parameter.

SB06 Managing the Back-End of Product Development

Cluster: New Product Development

Sponsor: Technology Management Section

Sponsored Session

Chair: Christian Terwiesch, University of Pennsylvania, The Wharton Sch., Dept. of OPIM, SH-DH 1317, Philadelphia, PA 19104, terwiesch@wharton.upenn.edu

1) A Formal Model of Engineering Fire-Fighting, ***Roger Bohn***, University of California, IR/PS 0510, 9500 Gilman Dr., La Jolla, CA 92093-0519, rbohn@ucsd.edu, ***R. Jaikumar***

Folklore in many organizations is that engineers and other knowledge workers often engage in "fire-fighting", rushing from crisis to crisis. We use a simple queueing model to show how it occurs. Once it begins, common coping methods exacerbate the problem. We include empirical data from a development and manufacturing facility.

2) Learning & Process Improvement during Production Ramp-Up, ***Christian Terwiesch***, University of Pennsylvania, The Wharton Sch., Dept. of OPIM, SH-DH 1317, Philadelphia, PA 19104, terwiesch@wharton.upenn.edu, ***Roger Bohn***

We analyze interactions among capacity utilization, yields and process improvement (learning) during production ramp-up of a new product. We model learning in the form of deliberate experimentation. Experiments such as engineering trials lead to process improvements, but they also reduce capacity in the short run. This creates a trade-off between experiments and production.

3) Productivity Improvement in a Network of Learning Factories: A Learning Curve Analysis, ***Michael A. Lapre***, Boston University, School of Mgmt., 595 Commonwealth Ave., Boston, MA

02215, mlapre@bu.edu, ***Luk N. Van Wassenhove***

We use a total factor productivity learning curve analysis to study the acquisition and transfer of tacit and explicit knowledge in a network of 3 factories. From the empirical evidence, we derive implications for managing the nature of shared knowledge, stability in process conditions and control over resources for experimentation.

4) Using Flexible Criteria for Components to Reduce Overall Development Costs of End-Products, ***Pat Hammett***, University of Michigan, Study of Auto Transportation, Ann Arbor, MI 48109, phammett@umich.edu

In efforts to minimize process validation problems during the launch of a complex product, manufacturers traditionally require suppliers of components to meet rigid criteria for conformance to specifications. This paper shows how certain manufacturers of automotive bodies are using more flexible criteria to reduce the overall development costs of the end product.

SB07 Health Care Research

Cluster: **Health Care Management & Policy**
Invited Session

Chair: Neset Hikmet, University of Rhode Island, Dept. of MSIS, Coll. of Bus., 7 Lippitt Rd., Kingston, RI 02881-1309, neset@uriacc.uri.edu

1) In Response to the Market Pressures: Complying with the Certification Requirements, ***Neset Hikmet***, University of Rhode Island, Dept. of MSIS, Coll. of Bus., 7 Lippitt Rd., Kingston, RI 02881-1309, neset@uriacc.uri.edu, ***Karen Abrahamson***, ***Maling Ebrahimpour***

Joint Commission on Accreditation of Health Care Organizations (JCAHO) certification requirements as well as market pressures is requiring the health care providers (HCP) to streamline their operations. These pressures are especially felt on the not for profit community HCPs. In the case study, the wait time analysis is used to evaluate the amount of time patients are waiting during their visit to the facility.

2) Knowledge Management for Epidemiological Research, ***Henry Linger***, Monash University, Sch. of Info. Mgmt. & Systems, PO Box 197, Caulfield East VIC, 3145, Australia, henry.linger@sims.monash.edu.au, ***Frada Burstein***

Lack of continuity is a problem for survey-based epidemiological research. Our framework provides a means for recording developmental, conceptual, and other supporting information and documentation which is traditionally poorly conserved. We illustrate the components of the framework using a major Australian epidemiological project as a case study.

3) Design & Use of g Statistical Control Charts in Infection Control, ***James C. Benneyan***, Northeastern University, MI & ME Dept., 334 Snell Engineering Ctr., Boston, MA 02115, benneyan@coe.neu.edu

Several approaches to the design and application of SPC to infection control, needle stick, and heart surgery complication data are examined, with particular emphasis on use of events-between g control charts, statistical design issues, and their operating characteristics.

4) Health Care Revenue Management, ***Jon A. Higbie, Jr.***, Talus Solutions, 4751 Best Rd., Atlanta, GA 30337, jhigbie@talus.net, ***Elizabeth Higbie***

Revenue management is an emerging business discipline with many successful applications in the airline, broadcasting, and hospitality industries. Issues related to the adaptation of revenue management techniques to the healthcare industry are explored and a model for the management of physical therapy resources is presented.

SB08 New Research Methods

Cluster: **Marketing**
Invited Session

Chair: Frank J. Carmone, Jr., Wright State University, Dept. of Mktg., 266 Rike Hall, Dayton, OH 45435

1) Estimating the True Number of Clusters using HINoV, ***Frank J. Carmone, Jr.***, Wright State University, Dept. of Mktg., 266 Rike Hall, Dayton, OH 45435, ***Ali Kara***

One of the major research questions when analyzing a data set for market segments (clusters) is "How many clusters are there?" We investigate the efficacy of a new algorithm, HINoV, to accurately estimate the true number of clusters in artificially generated data.

2) Voice: A Customer Satisfaction Model with Optimal Allocation Features, ***Abba Krieger***, University of Pennsylvania, The Wharton Sch., Philadelphia, PA 19104, ***Paul E. Green***

Customer satisfaction surveys are playing an increasingly prominent role in customer retention/attraction. Virtually all full-service marketing research suppliers offer some type of satisfaction measurement service. In contrast, the proposed model (Voice) attempts to model customer satisfaction in terms of before/after share projections that are a function of three principal competitive drivers...

3) Classification of Market Segment Membership: A Comparison of Algorithms, ***Scott M. Smith***, Brigham Young University, 3521 North University Ave., Ste. 100, Provo, UT 84606, ssmith@byu.edu

Increasing the ability to predict group membership in market segments is one of the most critical means to improving profitability of direct marketing activities. We present the results of actual tests of competing market segmentation algorithms as they are used to improve classification of members of market segments...

4) withdrawn - author request of 3/17, ***David B. MacKay***, Indiana University, Kelly Sch. of Bus., 1309 E 10th St., Bloomington, IN 47405, mackay@indiana.edu, ***Bryan Lilly***

SB09 Forecasting with Neural Networks

Cluster: **Knowledge Discovery & Data Mining**
Invited Session

Chair: G. Peter Zhang, Georgia State University, Dept. of Decision Sci., Coll. of Bus. Admin., Atlanta, GA 30303, gzhang@kentvm.kent.edu

1) Forecasting Exchange Rates using Neural Networks, ***Min Qi***, Kent State University, Dept. of Economics, Coll. of Bus. Admin., Kent, OH 44242-0001, mqi@bsa3.kent.edu, ***Yangru Wu***

Existing economic and time series models of exchange rates often provide inferior forecasts as compare to random walk. We use neural networks to model the relationship between exchanges rates and economic fundamentals. Based on monthly data of 4 major currencies, neural networks outperform random walk at all except one-month horizons.

2) Time Series Forecasting with Neural Committees, ***Victor L. Berardi***, Bloomsburg University, Dept. of Mgmt., Coll. of Business, Bloomsburg, PA, vberardi@aol.com, ***G. Peter Zhang***

Neural network committees have often been used to improve single neural network's capability for classification problems. We investigate the potential of neural network committees for time series forecasting. Real data such as exchange rate data are employed to illustrate the capability of the hybrid approach to time series forecasting.

3) Performance Comparison Between Different Neural Network Algorithms in Business Applications: An Application for Predicting Bank Failure, ***Kidong Lee***, Kent State University, Dept. of Admin. Sci., Grad. Sch. of Mgmt., Kent, OH 44242, klee@bsa3.kent.edu, ***David E. Booth***, ***James Hamburg***, ***Pervaiz Alam***

We examine a possible performance difference from employing diverse neural network algorithms to business applications. The focus is on identifying potentially failing banks efficiently using more appropriate detection methods. We compare 3 different neural network algorithms: backpropagation (with momentum and adaptive learning technique), Levenberg-Marquardt (LM) backpropagation, and radial basis networks.

SB10 Value of Information

Sponsor: **Decision Analysis Society**
Sponsored Session

Chair: Charles D. Linville, American University, Dept. of CS & IS, 4400 Massachusetts Ave., N.W., Washington, DC 20016-8116, clinville@worldnet.att.net.

Co-Chair: Paul Fischbeck, American University, Dept. of Cs & Is, 4400 Massachusetts Ave., N.W., Washington, DC 20016-8116

1) The Value of Expert Knowledge for Evaluating Contaminated Sites, ***Neil A. Stiber***, Carnegie Mellon University, Dept of Eng. & Public Policy, Pittsburgh, PA 15213, nas@andrew.cmu.edu

An expert judgement site-screening tool has been developed to evaluate natural attenuation as a remedial option for sites with trichloroethene (TCE) contamination of ground water. This expert system can increase the value of information for site investigation data and provide insights for improving the site investigation process.

2) A Review of the Value-of-Information Approach for Managing Health & Environmental Risks, ***Kimberly M. Thompson***, Harvard University, Sch. of Public Health, 718 Huntington Ave., B-206, Boston, MA 02115, kimt@hsph.harvard.edu

Recent national panels highlighted the importance of using a VOI approach when performing analysis to support decision making. To date there has been little synthesis of the many examples of applications exist and important methodological advances have been made. This presentation reviews the literature and focuses on remaining analytical challenges.

3) The Expected Value to Inventors of Information from Invention Evaluations, ***Thomas Tastebro***, University of Waterloo, Dept. of MS, Waterloo, Ontario, N2L 3G1, Canada, tastebro@mansci2.uwaterloo.ca, ***Yigal Gerchak***, ***Charles D. Linville***

Inventors considering whether and how to commercialize their inventions can often avail themselves to evaluations and advice provided by government supported programs initiated to encourage innovation. We report computations of the expected value of information from one such program, the Inventor' Assistance Program of the Canadian Industrial Innovation Centre.

4) Characterizing the Variance of Monte Carlo-Based Estimates of the Value of Information through Bootstrapping, ***Charles D. Linville***, American University, Dept. of CS & IS, 4400 Massachusetts Ave., N.W., Washington, DC 20016-8116, clinville@worldnet.att.net., ***Benjamin F. Hobbs***

Monte Carlo simulation provides a useful approach to estimating the expected value of information. However, since Monte Carlo sample sizes will be finite, simulation variance results in variance in estimates of the value of information. The statistical technique of bootstrapping provides a way to partially characterize this variance.

SB11 RAHMORS II

Sponsor: Military Applications Society
Sponsored Session
Chair: Bruce W. Fowler, US Army Aviation Missile Command, ATTN: AMSAM-RD-AS, Redstone Arsenal, AL 35898-5242, fowler-bw@redstone.army.mil

1) Non-Line-of-Sight, Precision Fire for Korea, ***John P. Ballenger***, Raytheon Systems, Co., 353 James Record Rd., Huntsville, AL 35824

We examine the need for non-line-of-sight, precision fire in Korea. To win a Korean scenario requires that US and ROK forces win the counterfire battle. Winning the counterfire battle places very heavy demands on all forms of fire support, thus virtually precluding direct fire support to maneuver units until the counterfire battle is won...

2) Aggregation within the Engagement Field, ***Bruce W. Fowler***, US Army Aviation Missile Command, ATTN: AMSAM-RD-AS, Redstone Arsenal, AL 35898-5242, fowler-bw@redstone.army.mil

We examine the formalism of aggregation of sequentially initiated engagements. The basis for this effort is the Engagement Field (see Proceedings 1st National MAS) and Formal Aggregation (Military Operations Research).

3) Fire Assignment & the Hierarchy of Models, ***Lawrence S. Phillips***, Camber, Huntsville, AL, ***Bruce W. Fowler***

One problem in the hierarchy of models is bootstrapping from the output of platform-level simulations to lower resolution rate-based models. We examine types of fire allocation/distribution/assignment and develop a mathematical theory consistent with rate-based models and the available observable output data.

SB12 Session 2

Cluster: Engineering Cost
Invited Session
Chair: Joseph C. Hartman, Lehigh University, IMSE Dept., Mohler Lab., 200 W Packer Ave., Bethlehem, PA 18015, jch6@lehigh.edu

1) Fleet Composition that Reflects Varying Periodic Requirements & Unit Reliability, ***Gunter P. Sharp***, Georgia Institute of Technology, Sch. of ISyE, MC 0205, Atlanta, GA 30332-0205, gsharp@isye.gatech.edu

Demand for units in a transportation fleet often varies throughout the day or week in a systematic manner. Thus, older, less efficient units may be assigned to peak demand and newer, more efficient units to base demand. We investigate relevant cost and reliability issues and present computational results.

2) Joint Decisions on Capacity Replacement & Expansion Under Economy of Scale, ***Zhi-Long Chen***, University of Pennsylvania, Dept. of Systems Eng., 220 S 33rd St., Philadelphia, PA 19104-6315, zlchen@seas.upenn.edu

We consider a capacity planning problem which involves both capacity replacement/disposal and capacity expansion/acquisition decisions under economy of scale. We present an exact solution method for the problem. Related problems that address additional issues such as possible technological innovations, and demand uncertainties.

3) Parallel Replacement Analysis under Capital Rationing Constraints & Service Requirements, ***Joseph C. Hartman***, Lehigh University, IMSE Dept., Mohler Lab., 200 W Packer Ave., Bethlehem, PA 18015, jch6@lehigh.edu

We examine a parallel replacement problem in which a number of assets are required for service each period and funds are limited for the replacement of disposed assets. Solution methods and computational results are presented for problems with large fleets in which a variety of assets are available for purchase in each period.

SB13 Multiple Criteria Optimization: Applications

Cluster: Multicriteria Decision Making
Invited Session
Chair: Sai Kolli, American Airlines, PO Box 619616, MD 5494, DFW Airport, TX 75261-9616, saikolli@amrcorp.com

1) Solving Multiple Objective Integer Programming Problems with Spreadsheet Software, ***Sai Kolli***, American Airlines, PO Box 619616, MD 5494, DFW Airport, TX 75261-9616, saikolli@amrcorp.com

Many publications dealing with multiple objective integer programming problems mention the difficulty in solving them. We deal with spreadsheet-based approaches for solving integer programming problems with multiple objectives. Advantages and disadvantages of spreadsheet methods will be discussed.

2) Development of Multiple Objective Bilevel Optimization in Concurrent Engineering Design Environments, ***San Myint***, Thammasat University, Institute of Tech., Dept. IE, Rangsit Campus, PO Box 22, Pathumthani, 12121, Thailand, san@siit.tu.ac.th

We demonstrate the importance of multiobjective approaches in solving engineering design problems. Due to the involvement of many factors and criteria with the uncertainty of constraint structure at design problems, the traditional multiobjective formulation could not cover the real product design development. Bilevel programming is proposed for modeling the engineering design problem...

3) Multiobjective Optimization into a Simulation Environment in the Context of a Factory Layout Problem, ***Mo Thanh Phong***, Ho Chi Minh City University of Technology, Sch. of Continuing Ed., Ho Chi Minh, Vietnam, phong.ho@bdvn.vnmail.vnd.net

This research is aimed at integrating multiobjective optimization into a simulation environment in the context of a factory layout problem. The factory layout problem is modeled as a 3-objective optimization problem: maximizing total layout flexibility, minimizing total travel time and maximizing total closeness rating scores. Flexibility is based on a new concept of reachability...

4) The Decision Forest: A Paradigm for Portfolio Optimization, ***Sam L. Savage***, Stanford University, Dept. of EES/OR, 417 Terman Eng. Ctr., Stanford, CA 94305-4023, savage@leland.stanford.edu

When allocating scarce resources to risky projects, it is common to rank them according to a reward/risk ratio, then start at the top and work down the list. This ignores the interplay between projects, which is at the heart of portfolio theory. The decision forest is an extension of Markowitz optimization to projects whose uncertainties may be viewed in terms of trees...

SB14 Perspectives on OR Consulting

Sponsor: Computing Society
Sponsored Session
Chair: Sanjay Saigal, ILOG Inc., 1005 Terminal Way, Ste. 100, Reno, NV 89502, saigal@ilog.com

1) Reengineering Recruit Distribution in the US Marine Corps, ***Hemant Bhargava***, Naval Postgraduate School, Monterey, CA 93943, bhargava@nps.navy.mil, ***Kevin J. Snoap***

We discuss a DSS for recruit distribution in the US Marine Corps. The system implements a basic assignment model. Its main contribution is in allowing the model manager to game the system and in methods for measuring and comparing quality of alternative solutions. The system has a complete user interface as well as connections to existing Marine Corps databases...

2) Walk Before You Run, ***James B. Moore***, MFAM Limited, 444

Malabar Dr., Waterloo, Ontario, N2K 2P7, Canada, mfam@sentex.net

We describe a strategy of implementing large-scale optimization models that avoids problems associated with trying to do too much too soon. The author's good and bad experiences in implementing models of different sizes and complexities are described.

3) Onsite Consulting: Experiences in Implementing a Large-Scale Distribution Network Model, ***Bruce A. Gamble***, Schneider Logistics Inc., PO Box 2666, Green Bay, WI 54306, gamble@kcc.com

We describe our consulting experiences implementing network LP models. We focus on aspects of the client-consultant relationship, in particular, the benefits that both we and our clients have derived from having a consultant/modeler positioned full-time at the client's location.

4) Refining Economics, Policy Analysis & Linear Programming: Yes, Virginia, There is an Intersection, ***David S. Hirshfeld***, MathPro, Inc., PO Box 34404, W Bethesda, MD 20827-0404, mathpro@erols.com

Many regulations affecting gasoline and diesel fuel production have been implemented in the past 25 years; more are coming. In every instance, LP modeling has been the accepted method for estimating social costs and capital requirements. Such analysis has saved billions for consumers and industry. Though a highly specialized form of OR consulting, it holds lessons applicable to much of OR practice.

SB15 Supply Contracts & Coordination Issues

Cluster: Supply Chain Management
Invited Session

Chair: Karen L. Donohue, University of Pennsylvania, The Wharton Sch., OPIM, 1300 SH-DH, Philadelphia, PA 19104-6366, donohuek@opim.wharton.upenn.edu

1) Inventory Cost Impact of a Mixture of Steady & Random Inventory Sharing a Production System, ***Ananth V. Iyer***, Purdue University, Krannert Grad. Sch., 1310 Krannert Bldg., West Lafayette, IN 47907, aier@mgmt.purdue.edu, ***Apurva Jain***

We consider orders from inventory locations that are produced by a make to order production system. We model the impact of increasing the proportion of inventory locations that place steady orders through changes in the selling environment. The models provide insight into the benefits of continuous product replenishment in a grocery environment.

2) Modeling Supply Chain Contracts: A Review, ***Andy A. Tsay***, Santa Clara University, Leavey Sch. of Bus. OMIS Dept., 500 El Camino Real, Santa Clara, CA 95053, atsay@sculsb.scu.edu, ***Steven Nahmias, Narendra Agrawal***

We summarize model-based research on contracts in the supply chain setting and provide a taxonomy for work in this area. We comment on limitations of the existing work and highlight some opportunities for future research.

3) To Return or Not to Return: Evaluating Supply Contracts for Multiple Retailers, ***Karen L. Donohue***, University of Pennsylvania, The Wharton Sch., OPIM, 1300 SH-DH, Philadelphia, PA 19104-6366, donohuek@opim.wharton.upenn.edu, ***Yu-Sheng Zheng***

We compare a series of supply contracts ranging from tradition no-returns policies to virtual return policies and determine when retailers favor one policy over another. We model the contract dynamics as a Stackelberg game where the supplier sets contract parameters and the retailers act as individual newsvendors with, possibly, correlated demand.

SB16 Models for Modern Manufacturing II

Cluster: Modern Manufacturing
Invited Session

Chair: Chung-Yee Lee, Texas A&M University, 238 Zachry Bldg., IE Dept., College Station, TX 77843, cylee@acs.tamu.edu

1) On the Multiple-Product Single Material Handling Hoist Cyclic Scheduling, ***Qing Liu***, AT&T Bell Laboratories, 379 Campus Dr., Rm. 2B09, Somerset, NJ 08873, qliu@att.com, ***Lei Lei***

A multiple-product cyclic scheduling problem with a single material handling hoist and time window constrains is studied. Two heuristic algorithms are evaluated. Both empirical and analytical results are presented. Some special case scenarios which can be solved by a polynomial algorithm are discussed.

2) Stochastic Scheduling to Minimize Expected Costs for Earliness & Tardy Jobs, ***Xiaoqiang Cai***, Chinese University of Hong Kong, Dept. of Systems Eng., Shatin NT, Hong Kong, xqcai@se.cuhk.edu.hk, ***Sean Zhou***

We address a stochastic scheduling problem in which a set of independent jobs is to be processed by a single machine under a common deadline. The machine is subject to stochastic breakdowns, which are characterized by a Poisson process. The objective is to minimize the expected costs for earliness and tardiness.

3) Machine Scheduling with a Rate-Modifying Activity, ***Chung-Yee Lee***, Texas A&M University, 238 Zachry Bldg., IE Dept., College Station, TX 77843, cylee@acs.tamu.edu, ***Jorge Leon, Chen-Sin Lin***

Motivated by a problem commonly found in electronic assembly lines, we deal with the problem of scheduling jobs and a rate-modifying activity on a single machine. A rate-modifying activity is an activity that changes the production rate of the equipment under consideration. We study the problem under deterministic and stochastic models.

4) Integrated Stock Replenishment & Shipment Scheduling Models, ***Sila Cetinkaya***, Texas A&M University, Dept. of IE, College Station, TX 77843-3131, sila@ie.tamu.edu, ***Chung-Yee Lee***

We consider a vendor realizing a sequence of random demands. Assuming that the vendor has the liberty of holding small orders until an agreeable dispatch time, we compute the optimum replenishment and dispatch policies simultaneously. The problem is important in the context of third party warehousing and vendor-managed inventory systems.

SB17 Military Space Applications

Cluster: Space Applications of Operations Research
Invited Session

Chair: W. Paul Murdock, Jr., Air Force Institute of Technology, Grad. Sch. of Eng., Dept. OS, 2950 P. St., Bldg. 640, WPAFB, OH 45433-7765, wmurdock@afit.af.mil

1) A Decision Analysis Evaluation of Eliminating Enemy Space Assets, ***Michael K. Betts***, Air Force Institute of Technology, Dept. of Operational Sci., 2950 P St., Bldg. 640, WPAFB, OH 45433-7765, mbetts@afit.af.mil, ***W. Paul Murdock, Jr.***

As the importance of the application of space control continues to grow in the military, the provocative issue of eliminating enemy space capabilities must be addressed. Proposed research will examine the prioritization and values of space, air and ground based lasers in the engagement of enemy space assets.

2) Development of Military Space Doctrine, ***Toby G. Doran***, Air Force Institute of Technology, Grad. Sch. of Eng., Dept. Aero. & Astronautics, WPAFB, OH 45433-7765, tdoran@afit.af.mil, ***W. Paul Murdock, Jr., Stuart C. Kramer***

Military space doctrine has been based on intuition and the ideas or values of the designers, but it should be more systematic. A value-focused approach would ensure a lasting document to cover the ever-changing technical environment and would ensure the doctrine encompasses the real values of decision-makers.

3) Integrating Satellite Operations in Campaign-Level Simulations, ***Francine N. Nelson***, Air Force Institute of Technology, Grad. Sch. of Eng., Dept. OS, 2950 P St. Bldg. 640, WPAFB, OH 45433-7765, fnelson@afit.af.mil, ***Gregory A. McIntyre***

The Space Warfare Center has initiated efforts to incorporate space capabilities into USAF's campaign-level simulation model called THUNDER. This particular research effort will examine data and methodological issues associated with incorporating space and space system effects into campaign level models, specifically targeting incorporating space capabilities into the THUNDER.

4) Optimal Space Surveillance Sensor Placement, ***Dale F. Reding***, Department of National Defence, OR & Analysis, 1 CAD/CANR HQ, Box 17000 STN Forces, Winnipeg, Manitoba, R3J 3Y5, Canada, dfreding@ora.dnd.ca, ***Bao Nguyen***

Recent advances in electro-optical sensor technologies have provided a low-cost means for the detection and tracking of manmade objects in space. We discuss the optimal facilities location problem associated with the placement of a suite of such optical sensors in Canada.

5) withdrawn - author request of 3/31, ***Daniel W. Thibault***, Defence Research Establishment Valcartier, DREV/IST, 2459 Boul. Pie-XI Nord, Val-Belair, Quebec, G3J 1X5, Canada, daniel.thibault@drev.dnd.ca, ***Dale F. Reding, Ron W. Funk***

SB18 Complexity Issues in Linear & Convex Optimization

Cluster: Linear Programming
Sponsor: Optimization Section
Sponsored Session
Chair: Robert M. Freund, MIT OR Center, Bldg. E40-149A, 77 Massachusetts Ave., Cambridge, MA 02139, rfreund@mit.edu

1) Ill Conditioned Convex Processes & Linear Inequalities, *Adrian Lewis*, University of Waterloo, Dept. of Combinatorics & Opt., Fac. of Mathematics, Waterloo, Ontario, N2L 3G1, Canada, aslewis@orion.math.uwaterloo.ca

We prove the smallest possible norm of a linear perturbation making a closed convex process nonsubjective is the inverse of the norm of the inverse process. This generalizes the fundamental property of the condition number of a linear map. We then apply this result to strengthen a theorem of Renegar.

2) Conditioning of Convex Programs from a Primal-Dual Perspective, *Javier Pena*, Carnegie Mellon University, Grad. Sch. of Indust. Admin., 5000 Forbes Ave., Pittsburgh, PA 15213-3890, jpena@cam.cornell.edu

Given a convex program and its dual, we analyze the conditioning of the "primal-dual" system of constraints, obtained by putting the primal and dual constraints together. We investigate the relevance of the conditioning of the primal-dual system relates to properties of both the primal and dual programs.

3) Condition Measures for Linear Programming Problems & Related Combinatorial Structures, *Levent Tuncel*, University of Waterloo, Dept. of Combinatorics & Opt., Fac. of Mathematics, Waterloo, Ontario, N2L 3G1, Canada, ltuncel@math.uwaterloo.ca

We will review some of the existing condition measures for LP problems. After discussing their relevance in complexity bounds, we will investigate the relationships among the condition measures and certain combinatorial structures defined by the data of the LP.

4) Generalizing Condition Measures to Non-Conic Convex Problems, *Marina Epelman*, MIT, OR Center, Bldg. E40-130, 77 Massachusetts Ave., Cambridge, MA 02139, mepelman@mit.edu, *Robert M. Freund*

We study condition measures of convex problems in the more natural and general non-conic form, as opposed to the previously studied conic form. We show some interesting relationships between these condition measures and traditional condition measures, and we demonstrate connections to worst-case analysis of algorithms.

SB19 Order/Assembly Scheduling

Cluster: Scheduling
Invited Session
Chair: Doug Blocher, Indiana University, Kelley Sch. of Bus., 1309 E Tenth St., Bloomington, IN 47405-1701, dblocher@indiana.edu

1) Assembly Scheduling Problems with Two or Three Steps, *Uttarayan Bagchi*, University of Texas, Dept. of Mgmt.Texas, CBA 4.202, Austin, TX 78712, bagchiu@uts.cc.utexas.edu

We consider scheduling problems in which each job entails production of different components on dedicated machines followed by single-machine assembly and/or testing operations. The scheduling objective is to minimize makespan. We extend various existing results on characteristics of optimal schedules and present worst case performances results for heuristics.

2) Multiobjective Customer Order Scheduling for a Job Shop, *Mark T. Leung*, Indiana University, Kelley Sch. of Bus., 1309 E Tenth St., Bloomington, IN 47405-1701, mleung@indiana.edu

Our objective is to find good order scheduling rules in a multi-objective job shop environment. An order is viewed as a collection of jobs, where the delivery of such an order can take place only when all component jobs are completed. Due dates can be internally or externally set.

3) Minimizing Customer Order Leadtime in a 2-Stage Assembly Flowshop, *Dilip Chhajed*, University of Illinois, 1206 S 6th St., Champaign, IL 61820, chhajed@uiuc.edu, *Doug Blocher*

We look at the problem of minimizing the customer order leadtime in a shop where several jobs produced on different processors are combined and shipped simultaneously. We explore lower bounds, properties of optimal solutions, and heuristics for this problem.

SB20 Perspective for Power System Planning in a Competitive Environment

Cluster: Energy
Sponsor: Section on Energy, Natural Resources & Environment
Sponsored Session
Chair: Paulo B. Correia, Departamento de Energia, CP 6122, FEM UNICAMP, Campinas - SP, 13.083-970, Brazil, correia@fem.unicamp.br

1) Optimal Expansion of the Mato Grosso do Sul Power System Considering Independent Producers, *Paulo B. Correia*, Departamento de Energia, CP 6122, FEM UNICAMP, Campinas - SP, 13.083-970, Brazil, correia@fem.unicamp.br

The electricity demand of the Mato Grosso do Sul State is most supplied by the ENERSUL, a former state owner company that was recently privatized. However, changes on the regulation of the wholesale electricity market are opening opportunities for independent producers. A mixed-integer model approaches the expansion problem of the ENERSUL system considering independent producers.

2) A New Approach for the Backup Tariff of Electricity Supply for Autoproducers, *Alfonso H. M. Santos*, Agencia Nacional de Energia Eletrica, SGAN-Q603, Modulo J-2 Andar, Brasilia, 70.830-030, Brazil, iara@aneel.gov.br, *Jose A. P. Balestieri*

High tariff levels and harsh contracted conditions have been traditionally employed by the electric power utilities in their buck up supply for autoproducers, constraining the large diffusion of this activity. We present a new approach, taken by the National Regulatory Agency for Electrical Energy to set back up tariff for the Brazilian Power System...

3) Technical & Economic Analysis of a Solid Waste Cogeneration Plant in Brazil, *Arnaldo C. Walter*, Departamento de Energia, C. Postal 6122-FEM-UNICAMP, Campinas, SP, 13083-970, Brazil, awalter@fem.unicamp.br

The least developments on the cogeneration technology, a new regulation on the wholesale market improves the chances of independent producers for supplying electricity in Brazil. We develop a technical and economic analysis of a solid waste plant for cogeneration, operation interconnected with the Southeastern system.

4) Feasibility of Electricity Generation Based on Biomass: The Role of External Costs

Feasibility of future electricity production based on biomass will strongly depend on incentive policies (justified due to external benefits of renewable-based power systems). We present a comparative analysis considering a high efficiency power system based on biomass and a thermal power plant firing natural gas. Externalities are evaluated in both cases and deployment policies are analyzed.

SB21 Parallel Computing, Genetic Algorithms & Practice in Project Management

Cluster: Project Management
Invited Session
Chair: Concepcion Maroto, Universidad Politecnica de Valencia, Dept. of Stats. & OR, Camino de Vera s/n, Valencia, 46071, Spain, cmaroto@eio.upv.es

1) Parallel Branch & Bound Experiences Solving the Resource Constrained Project Scheduling Problem, *Fortunato Crespo-Abril*, Universidad Politecnica de Valencia, Dept. of Stats. & OR, Camino de Vera s/n, Valencia, 46071, Spain, fcrespo@eio.upv.es, *Amparo Montesinos*, *Concepcion Maroto*

Parallel processing is one of the most promising techniques to solve NP-hard problems as the resource constrained project scheduling problem. We discuss possible sources of parallelism using a B&B algorithm, giving some indications of the strengths and weaknesses of these approaches. Finally, we present computational results obtained with a parallel machine.

2) Resource Allocation in Project Management by an Adaptive Genetic Algorithm, *Javier Alcaraz*, Universidad Politecnica de Valencia, Dept. of Stats. & OR, Camino de Vera s/n, Valencia, 46071, Spain, jalcaraz@eio.upv.es, *Concepcion Maroto*

The problem considered is a single-mode resource-constrained project scheduling problem, in which the objective is to minimize the makespan. A GA is proposed to solve it. This algorithm is an adaptive algorithm. Depending on the project characteristics, it employs a different set of genetic operators to solve it.

3) An Interactive Decision Support System Integrated into Project Management Software, *Pilar Tormos*, Universidad

Politecnica de Valencia, Dept. of Stats. & OR, Camino de Vera s/n, Valencia, 46071, Spain, ptormos@eio.upv.es, ***Antonio Lova***, ***Concepcion Maroto***

The capabilities of project management software have evolved rapidly during recent years, including new technologies. Nevertheless, resource allocation can be enhanced considering new objectives and algorithms. We have developed a DSS integrated into the standard project management software that includes new capabilities for scheduling and controlling projects.

4) One Step Further Towards Typifying Project Management, ***Ma Jose Oltra***, Universitat Jaume I de Castello, Dept. de Admin. & Mktg., 12080 Castello, Spain, oltra@emp.uji.es, ***Baldomero Segura***, ***Concepcion Maroto***

Different configurations of the productive activity in firms that mainly work by project are proposed. Information gathered from a survey sent to a sample of firms is used as a basis in order to identify several combination of key variables that can have influence on management of the production system.

SB22 Environmental Issues I

Contributed Session

Chair: Jhih-Shyang Shih, Resources for the Future, 1616 P St. NW, Washington, DC 20036, shih@rff.org

1) An Approximation Algorithm for Minimizing Fuel Consumption on Gas Transmission Networks, ***Seongbae Kim***, Texas A&M University, Dept. of IE, College Station, TX 77840, kim@habanero.tamu.edu, ***E. Andrew Boyd***, ***Roger Z. Rios***

We suggest a heuristic solution procedure for finding minimum fuel cost on gas transmission networks. The method exploits the underlying network structure and uses network theory in order to deal with the flow variables along with the pressure variables.

2) Optimization in Plant Genetics, ***Brij R. K. Kashyap***, Ryerson Polytechnic University, 190 Fairglen Ave., Scarborough, Ontario, M1W 1B1, Canada, bkashyap@acs.ryerson.ca, ***Sakti Jana***, ***Raju Addala***

We propose to present our recent work on the application of some OR techniques regarding optimal decisions aimed at maximization of gene diversity in core collections.

3) A Flexible Inventory System for Municipal Solid Waste Recycling, ***Jhih-Shyang Shih***, Resources for the Future, 1616 P St. NW, Washington, DC 20036, shih@rff.org, ***Garrick E. Louis***, ***Francis C. McMichael***, ***Lester B. Lave***

State laws mandate municipal waste recycling. Thus, municipalities recycle quotas of materials without regard to fluctuating prices. An inventory system is proposed which gives municipalities flexibility under state mandates. The dynamic model uses historical prices to minimize the present value of net recycling costs. Municipalities reach recycling targets most cost-effectively.

4) Developing Appropriate Management Systems for Indian Irrigation: Assessing Farmers' Preference, ***Gopal Naik***, Indian Institute of Management, Vastrapur, Ahmedabad, Gujarat, 380015, India, gnaik@iimahd.ernet.in, ***Amarlal H. Kalro***

The lack of user orientation in managing irrigation systems has contributed to inefficiency in their performance in India. Developing an appropriate management system requires assessing preferences of farmers. We use trade-off models for this purpose and show how the information generated from this model can be used in developing appropriate management systems.

SB23 Genetic Algorithm Theory & Application

Sponsor: College on Artificial Intelligence

Sponsored Session

Chair: Gary J. Koehler, University of Florida, Dept. of DIS, Warrington Coll., BUS 351, Gainesville, FL 32611, koehler@ufl.edu

1) An Empirical Analysis of the Bounds on the Genetic Algorithm, ***Haldun S. Aytug***, University of North Carolina, MIS/OM Dept., Charlotte, NC 28223, haytug@email.uncc.edu

We analyze the effects of different implementations of a GA on its run time complexity by varying its alphabet, crossover and mutation operators. We also analyze its behavior on various functions including the so-called "GA-hard" functions. We compare the observed number of iterations to the theoretical bounds reported in the literature.

2) Genetic Programming-Based Learning in High-Frequency Financial Data, ***Siddhartha Bhattacharyya***, University of Illinois, IDS, Coll. of Bus. Admin., 601 S. Morgan St. M/C 294, Chicago, IL 60607, sidb@uic.edu

Studies examining GP-based learning of trading models indicates that regular GP representation and operators lead to complex, unreliable solutions. This research undertakes a structuring of the representation and knowledge primitives based on domain related semantics; genetic search operators are modified to accommodate defined semantics. Experimental results are reported using foreign exchange data.

3) Computing Expected Waiting Times using the Genetic Algorithm Model for Group Decision Support Systems, ***Jacquelyn Rees***, Purdue University, Krannert Grad. Sch. of Mgmt., W. Lafayette, IN 47906, jrees@mgmt.purdue.edu, ***Gary J. Koehler***

Given a particular framework, we can model the problem of solving efforts of groups using group DSSs as an evolutionary search algorithm. Particularly, the search can be modeled as a simple GA using selection, crossover and mutation. Using a Markov chain model of the simple GA, we demonstrate the computation of expected waiting time to see a particular solution.

SB24 IT & Financial Services

Sponsor: Financial Services Section

Sponsored Session

Chair: Francis X. Frei, Harvard Business School, Morgan Hall T-65, Soldiers Field Rd., Boston, MA 02163, ffrei@hbs.edu

1) Screen-Based Trading in Futures Markets: Recent Developments & their Implications, ***Bruce W. Weber***, Columbia University, Mgmt. Science Division, Grad. Sch. of Bus., Uris Hall, New York, NY 10027, bweber@stern.nyu.edu

Financial markets are changing rapidly in response to customer needs and new trading technologies. In several futures markets today, automation reliably handles front-office functions including order routing, price determination and trade execution. New screen-based trading systems are examined and open outcry pit trading and electronic markets are modeled and compared.

2) Effects of Competition on Software Acquisition Strategies in Retail Banks, ***Baba Prasad***, University of Purdue, Krannert Grad. Sch. of Mgmt., 1310 Krannert Bldg., West Lafayette, IN 47906, prasad@mgmt.purdue.edu, ***Patrick T. Harker***

32% of IT expenditure in retail banks is on application software development, but 45% of retail banks develop more than 90% of application software in-house. We present a game-theoretic analysis of this imbalance in software development taking into account investment costs, technical competence and time-to-market.

3) Evaluating IT Investments: The Case of PC Banking, ***Francis X. Frei***, Harvard Business School, Morgan Hall T-65, Soldiers Field Rd., Boston, MA 02163, ffrei@hbs.edu, ***Lorin Hitt***

The ability to make effective IT investment decisions is becoming a critical driver of performance in retail banks. We use detailed case studies of the decision to implement PC banking in multiple banks to examine the IT decision process and its relationship to performance outcomes.

4) Informational Regimes & Technology Investments in Financial Markets, ***Sanjeev Dewan***, University of California, Grad. Sch. of Mgmt., Irvine, CA 94305-5015, sedewan@uci.edu, ***Haim Mendelson***

We use a game-theoretic framework to examine the interaction between a market's informational regime and traders' IT investments. We model the relationship between transparency, liquidity and traders' incentives to invest in technology that increases market efficiency. We find that the market's informational regime has a paramount effect on IT investment decisions.

SB25 Transportation Applications II

Contributed Session

Chair: Ingrid K. Busch, Oak Ridge National Lab., PO Box 2008, MS 6270, Oak Ridge, TN 37831-6270, ikx@ornl.gov

1) Integration of Transportation & Telecommunication Systems in ITS Applications, ***Ivan Bosnjak***, Vukeliceva 4, Zagreb, HR 10000, Hrvatska, bosjnaki@fpz.hr www.fpz.hr, ***Damir Simulcik***

Transportation and telecommunication systems have related missions from a broader perspective but also have significant differences in technical structure and development paths. We consider how advanced Intelligent Transportation Systems (ITS) enforce successful integration of these systems. In the new environment, flows of materials and people are strongly integrated with information flows and real-time management operations.

2) Serving Justice by Improving the Operation of the British

Columbia Prisoner Escort System, ***Maarten Oosten***, University of British Columbia, Fac. of Commerce & Bus. Admin., 2053 Main Mall, Vancouver, BC, V6T 1Z2, Canada, oosten@coe.ubc.ca, ***Martin L. Puterman***

Each day, several hundred prisoners in the Greater Vancouver area are transported under supervision between courts and correctional institutions. We developed an automated dispatching system that performed well when compared to the current approach and provided the basis for a planning tool which was used to evaluate various scenarios.

3) Modeling Ohio River Lock Investments, ***Ingrid K. Busch***, Oak Ridge National Lab., PO Box 2008, MS 6270, Oak Ridge, TN 37831-6270, ikx@ornl.gov, ***Michael R. Hilliard***

ORNL developed an optimization methodology to suggest which improvements should be made to the 19 lock and dam projects on the Ohio River main item over a 50-year planning period. The effort is part of the Ohio River Nagivation Investment model being developed for the Army Corps of Engineers.

SB26 Reliability & Quality Control II

Sponsor: **Quality, Statistics & Reliability Section Sponsored Session**

Chair: Sudha Jain, University of Toronto, Dept. of Stats., 100 St. George St., Toronto, Ontario, M5S 3G3, Canada, jainsu@ustat.utoronto.ca

1) Economic Design of Control Charts, ***Shreevardhan Lele***, University of Maryland, Dept. of Decision & IT, Smith Sch. of Bus., College Park, MD 20742-1815, rhsmith@umd.edu.slele

A graphical approach to control chart design is presented. We use this approach to obtain the optimal smoothing parameter for an EWMA chart as well as the optimal probability threshold for a Bayesian procedure.

2) Multivariate Control Charts for Location & Dispersion, ***Madabhushi Raghavachari***, RPI, Deci. Sciences & Eng. Systems, 110 8th St., Troy, NY 12180-3590, ragavm@rpi.edu

We discuss nonparametric bivariate control charts for location based on certain bivariate sign tests and compare them with Hotelling type of charts. Multivariate control charts for dispersion matrices are considered and we propose a few charts depending on the definitions of displacement of the dispersions from the control situation.

3) Range & Extreme Value Statistics Applications in System Reliability, ***Huseyin Sarper***, University of Southern Colorado, Program of ISE, Pueblo, CO 81001, sarper@uscolo.edu

Statistics of range and extremes belong to the general topic of order statistics. Many engineering systems reliability problems can be described as applications of the distribution of the extremes and range of the underlying parent random variables. Some results using both independent and dependent random parent variables will be presented.

4) Optimal Design of SPRT Charts for Simultaneous Monitoring of Means & Variance, ***Felipe Pachano***, University of South Florida, Dept. of IMSE, Tampa, FL 33620-5350, fpachano@eng.usf.edu, ***Tapas K. Das***

We provide an approach for optimally designing the parameters for SPRT control charts that monitor both mean and variance of a normally distributed process. Economic performance of this approach is compared with other approaches through numerical example problems and also via discrete event simulation.

SB27 Queues: Theoretical & Applied Approaches

Sponsor: **Applied Probability Society Sponsored Session**

Chair: Sudha Jain, University of Toronto, Dept. of Stats., 100 St. George St., Toronto, Ontario, M5S 3G3, Canada, jainsu@ustat.utoronto.ca

1) Transient Probabilities of M/M/2-Like Preemptive Priority Queues, ***Alan C. Krinik***, California State Polytechnic University, Dept. of Math., 3801 West Temple Ave., Pomona, CA 91768, ackrinik@csupomona.edu, ***Dan Marcus, Ray Shiflett, Li Ping Chu***

The classic cases of interest such as the M/M/1 and M/M/2 preemptive priority queueing systems are presented and compared to existing solution methods appearing in the literature. Transition probabilities of these systems are tabulated and compared to non-preemptive classic queueing systems M/M/1 and M/M/2. Numerical advantages and disadvantages of our combinatoric formulation are discussed.

2) The Pricing Scheme for Priority Queues, ***Chia-Li Wang***, National Dong Hwa University, Shoufeng, Hualien, 974, Taiwan ROC, cwang@cc.ndhu.edu.tw

In a priority queue, customers of different classes receive different priorities of service, and, hence, experience various levels of system performance. We will discuss how to use a pricing scheme to fairly reflect the amount of system resource used and the waiting time experienced by customers of each class in the queue.

3) A Priority Queueing Strategy for ATM Networks with Batch Arrivals, ***Srinivas R. Chakravarthy***, Kettering University, Dept. of Science & Math, 1700 West 3rd Ave., Flint, MI 48504-4898, schakrav@kettering.edu, ***Sashi Thiagarajan***

We study a priority queueing system useful in ATM networks, with 2 buffers of finite capacity, one for the real-time traffic such as voice and video and the other buffer for the non-real time traffic like data. Using matrix-analytic methods, steady-state analysis and selected numerical examples are presented.

4) Optimal Dimension of Service Firms: A Queueing Approach, ***Isabel Parra-Frutos***, University of Murcia, Fac. de Lavante, Ronda de Levante 10, Murcia, 30008, Spain, ipf@fcu.um.es, ***Joaquin Aranda-Gallego***

We propose a stochastic model, using queueing theory, for a service firm. The firm faces a random demand, therefore, the firm may control the arrival rate through the capacity and price in such a way that the firm's incomes are maximized. The model is expanded in order to consider heterogeneous consumers.

5) Statistical Inference for Busy Cycles of the Queues, ***Sudha Jain***, University of Toronto, Dept. of Stats., 100 St. George St., Toronto, Ontario, M5S 3G3, Canada, jainsu@ustat.utoronto.ca, ***Philip Reiss***

Several results are presented concerning mean busy periods and cycles for certain general classes of queueing systems with bulk arrivals. Using data from Monte Carlo simulations, we compare these estimation methods with a more straightforward technique: calculating the sample mean busy period and cycle over a sequence of simulated cycles.

SB28 Methods in Logistics

Sponsor: **Section on Logistics Sponsored Session**

Chair: Bruce A. Gamble, Schneider Logistics Inc., PO Box 2666, Green Bay, WI 54306, gamble@kcc.com

1) Approximation Algorithms for Economic Lot Sizing Models with Piecewise Linear Cost Structures, ***Ana Muriel***, University of Michigan, 701 Tappan, Ann Arbor, MI 48109, ***Lap Mui Ann Chan, David Simchi-Levi, Zuo-jun Shen***

We consider an economic lot sizing problem with a special class of piece-wise linear ordering costs that represent transportation costs charged by many LTL carriers. We show that even special cases of the lot size problem are NP-hard and develop approximation algorithms with fixed worst-case bounds.

2) Combined Location-Routing Decision Making, ***Lenin Kailasammani***, Schneider Logistics

Location decisions can have a major impact on operational level vehicle routing. In this regard, we will discuss the effect of combined location-routing decision making. We will take a logistics engineering perspective, focusing on practical issues.

3) Graphical Implementation Development Environment for Networks, ***Jonathan H. Owen***, Northwestern University, Dept. of IE/MS, 2225 N Campus Dr., Evanston, IL 60208-3119, ***Collette R. Coullard, David S. Dilworth***

Recent enhancements to the Graphical Implementation Development Environment for Networks (GIDEN) environment make it straightforward for users to develop a broad class of visually oriented network optimization solvers. We describe the use of GIDEN in solving a particular problem in the area of logistics/transportation.

SB29 Some Effects of Worksharing Arrangements on Processing Times

Sponsor: **Manufacturing & Service Operations Management Society Sponsored Session**

Chair: L. Joseph Thomas, Cornell University, Malott Hall, Ithaca, NY 14853-4201

Co-Chair: John O. McClain, Cornell University, Sage Hall, Ithaca, NY 14853. Kenneth L. Schultz

1) Queues in Which Servers Learn & Turn Over, ***Noah F. Gans***,

University of Pennsylvania, OPIM Dept., Wharton Sch., 3620 Locust Walk, Ste. 1300, Philadelphia, PA 19104-6366, gans@wharton.upenn.edu, ***Yongpin Zhou***

2) Defect Rates & Worker Attributes: Is there an Error-Prone Personality Type?, ***Kenneth L. Schultz***, Cornell University, Malott Hall, Ithaca, NY 14853, ***David C. Juran***

3) Some Effects of Worksharing Arrangements on Processing Times, ***Kenneth L. Schultz***, Cornell University, Malott Hall, Ithaca, NY 14853, ***John O. McClain***, ***L. Joseph Thomas***

4) Workflow Interdependence & Worker Heterogeneity on Flow Lines, ***Kenneth Doerr***, ***Chester Shriesheim***, ***Tracy Zhou***

Workflow interdependence is the reciprocal dependence that occurs because downstream workers must receive work from upstream and upstream workers must pass work downstream. Worker heterogeneity is the magnitude of between worker-differences in work-time distributions. We examine these 2 factors and their interaction on 2 different flow lines.

SB30 Facility Layout

Sponsor: Manufacturing & Service Operations Management Society Sponsored Session

Chair: Timothy L. Urban, University of Tulsa, 600 S. College Ave., Coll. of Bus. Admin., Tulsa, OK 74104, urban@utulsa.edu

1) Optimal & Heuristic Approaches to the Flowpath Design & Machine Layout Problem of Automated Guided Vehicle Systems, ***Wen-Chyuan Chiang***, University of Tulsa, Coll. of Bus. Admin., 600 S College Ave., Tulsa, OK 74104-3189, qm_wc@centum.utulsa.edu, ***Panos Kouvelis***

We address the flowpath design and machine layout problem AGVSs. We concentrate on the design of unidirectional flowpaths, i.e., vehicles are restricted to travel only on one direction along a given segment of the flowpath. A B&B algorithm and an efficient heuristic are provided.

2) Planar & Network Location Approaches in Facility Layout, ***Rakesh Nagi***, SUNY, 342 Bell Hall, Box 602050, Buffalo, NY 14260, nagi@eng.buffalo.edu www.acsubuffalo.edu/~nagi, ***Selcuk Savas***, ***Rajan Batta***

For a manufacturing facility, we model material handling aisles as a "finite-size" network and consider machines/departments as planar entities. Using network and location theory, we develop results for the optimal placement of a single planar entity and its associated aisle such that the material handling costs measured on the network are minimized.

3) Forest Harvest Layout Problems, ***Russell D. Meller***, Auburn University, 308 Dunstan Hall, Dept. of ISE, Auburn, AL 36849, rmeller@eng.auburn, ***Mark M. Clark***

Forest harvest layout problems are very important to the success of a forest harvesting plan. We compare this problem with the more well-known facility layout problem. Research in this area will be presented to illustrate problem scope, solution methodologies and example results.

4) Layout of Rural Natural Gas Distribution Systems, ***Timothy L. Urban***, University of Tulsa, 600 S. College Ave., Coll. of Bus. Admin., Tulsa, OK 74104, urban@utulsa.edu

The layout of rural natural gas distribution systems deals with the design of the pipe network to distribute natural gas from a source to several demand locations. Constraints, such as network geometry (rectilinearity) due to available rights-of-way, are taken into consideration. Approaches of formulating and solving the problem are presented.

SB31 Location Decisions

Sponsor: Section on Location Analysis & Transportation Science Section
Sponsored Session

Chair: Oded Berman, University of Toronto, Faculty of Management, 105 St. George Street, Toronto, Ontario, M5S 3E6, Canada, berman@fmgmt.utoronto.ca

1) Generalized Maximal Covering through Scenario Planning, ***Susan Hesse Owen***, Northwestern University, Dept. of IE/MS, 2145 Sheridan Rd., Evanston, IL 60208, hesse@iems.nwu.edu, ***Mark S. Daskin***

We introduce the demand node-based satisfaction problem, a generalization of the maximal covering problem which incorporates multiple future scenarios. Model formulations and simplifications are detailed. Optimal and heuristic computational results are also presented.

2) A Parallel Approach to Assist Real-Time Ambulance Relocation Decisions, ***Frederic Semet***, LIMAV, Universite de Valenciennes & CRT, BP 311, Le Mont HOUY, Valenciennes Cedex, 59304, France, frederic@crt.umontreal.ca, ***Michel Gendreau***, ***Gilbert Laporte***

To take into account the large number of constraints of the ambulance redeployment problem as well as the real-time dimension, we developed a parallel TS algorithm. When a call occurs, an ambulance is assigned according to an allocation rule and the memorized relocation decisions is applied. The optimization process is carried out on a full-time basis...

3) Deriving & Learning about Demand Distributions in Location Models, ***Yigal Gerchak***, University of Waterloo, Dept. of MS, Waterloo, Ontario, N2L 3G1, Canada, ygerchak@engmail.uwaterloo.ca

Location models typically assume a known spatial demand distribution or weights. But when a service is new or considerably altered, distributions are learned gradually as service requests materialize. We provide a mixture model which provides a probabilistic framework for recent robust models, and a Bayesian procedure for the updating.

4) Applying the Gravity Rule to the Airline Hub Problem, ***Tammy Drezner***, California State University, Dept. of Mktg., Fullerton, CA 92834, tdrezner@fullerton.edu, ***Zvi Drezner***

We propose a new model for the airline hub problem. Passengers use one hub on the way to their destination. We apply the objective of minimizing the total miles traveled by passengers. This formulation can be used as the basis for other objectives as well.

SB32 Economics of Networks & Network Games

Cluster: Telecommunications & Electronic Commerce
Invited Session

Chair: Tomak Kerem, University of Purdue, Krannert Grad. Sch. of Mgmt., 1310 Krannert Bldg., West Lafayette, IN 47906

1) Quality of Service Provision in Noncooperative Networks, ***Kihong Park***, Purdue University, Computer Sci. Dept., W Lafayette, IN 47907

With the increased deployment of high-speed local and wide area networks carrying a multitude of information from e-mail to bulk data to voice, audio, and video, provisioning adequate quality of service to the diverse application base has become an important problem. The traditional approach to Qos provision uses resource reservation coupled with admission control...

2) Experimental Investigation of Monopoly Power in a Durable Goods Market, ***Vidyanand Choudhary***, Carnegie Mellon University, Pittsburgh, PA 15213

Ronald Coase (1972) conjectured that a durable goods monopolist may not be able to exercise its monopoly power due to intertemporal competition with itself. A number of authors have since published analytical models which either confirm or reject this conjecture. We test the Coase conjecture using experimental economics...

3) Priority Pricing in Data Networks, ***Tomak Kerem***, University of Purdue, Krannert Grad. Sch. of Mgmt., 1310 Krannert Bldg., West Lafayette, IN 47906, ***Kemal Altinkemer***, ***Burak Kazaz***

We study the managerial implications of routing and capacity allocation via priority classes in data networks. We analyze the optimal pricing and routing choices of a network manager using a packet-switch-based ATM-like data network. We consider the case where the capacity on the links is fixed. We model the computer network as a closed network of M(x)/D/1 queues...

SB33 Community Operational Research

Cluster: Nontraditional OR
Invited Session

Chair: John M. Norman, University of Sheffield, Mgmt. School, 9 Mappin St., Sheffield, S1 4DT, UK, j.norman@sheffield.ac.uk

1) Community OR Issues & Public Art Practice, ***John M. Norman***, University of Sheffield, Mgmt. School, 9 Mappin St., Sheffield, S1 4DT, UK, j.norman@sheffield.ac.uk, ***Elizabeth H. Norman***

The issues of community OR are clearly relevant to the practice of public art. In this illustrated talk, examples of public art from Japan, the UK and the US will be shown and discussed and a case made for the art director system.

2) Making the Connections: Linking Community Operational Research to Health, ***Leroy White***, South Bank University, Faculty of

Health, London, SE1 0AA, UK, whitel@sbu.ac.uk

A London Health Authority used community OR to help develop best practice across the public and voluntary sectors, taking account of people's expressed needs. This case study illustrates how Operational Research can empower local communities to inform and influence health service planning and provision.

SB34 Optimization Techniques II

Contributed Session

Chair: Xibin Chen, Clemson University, 0-134 Martin Hall, Clemson, SC 29634, xbchen@math.clemson.edu

1) Partitioned Random Search for Global Optimization with Sampling Cost & Time Constraints, *Hengqing Ye*, HKUST, Clear Water Bay, Kowloon, Hong Kong, PRC, ieyehq@ust.hk

The partitioned random search (PRS) method has been developed for global optimization problem. The theoretical foundation is an important issue in the development of efficient algorithms for this class of methods. We propose an optimal sequential sampling policy for PRS with sampling cost and time constraints.

2) An Optimum Solution to the Knapsack Problem with Independent, Non-Linear Objective Function Values, *Jeffrey J. Blessing*, Milwaukee School of Engineering, 1025 North Broadway, Milwaukee, WI 53202, blessing@msoe.edu, http://www.msoe.edu/~blessing

An extension to the classic knapsack problem is defined in which the values of each item are non-linear functions of the quantity of the item already present in the knapsack. A dynamic programming approach is used to optimally solve this more difficult version of the knapsack problem.

3) Minimax under Transportation Constraints & Theory of Polyhedrons, *Vladimir I. Tsurkov*, Russian Academy of Sciences, Computing Ctr., 40 Vavilov Str., Moscow, 117967, Russia, tsurkov@ccas.ru, ***A. A. Mironov***

In contrast to the classic transportation problem, we consider minmax criterion. In this case, the decision maker doesn't know the tariff coefficients or these ones, as well as other nonlinear tariff objection function do not have any meaning at all and minmax statement leads to an effective solution. The main result is the algorithms for finding minmax values...

4) A Globally Convergent Method for Solving Combinatorial Optimization in Nash Games, *Xibin Chen*, Clemson University, 0-134 Martin Hall, Clemson, SC 29634, xbchen@math.clemson.edu, ***Michael M. Kostreva***

We present a computational approach to Nash equilibria in the case of the presence of combinatorial optimization. By means of the generalized bisection algorithm, one may compute the pre-equilibrium set which generalizes the Nash equilibrium. Results show that this approach is faster than previous approaches.

5) A Stochastic Shortest Path Problem with Terminal Cost, *James Bander*, University of Michigan, 1205 Beal Ave., Ann Arbor, MI 48105, jim.bander@umich.edu, ***Chelsea C. White, III***

We model the routing and departure time decisions made by a single vehicle in a JIT delivery environment. Although the problem is naturally modeled as a finite horizon Markov decision process, dynamic programming is not practical for large networks. We propose an alternative technique that calculates the optimal routing policy with much less computational effort.

SB35 Undergraduate OR/MS Project Showcase I

Contributed Session

Chair: Mark R. Parker, USAF Academy, 2354 Fairchild Dr., Ste. 6D2AF Academy, CO 80840, parkermr.dfms@usafa.af.mil

1) Undergraduate OR/MS Project Showcase I

This session will feature student presentations on undergraduate projects completed in senior-level OR case studies and computer simulation courses as well as independent studies. Participating students represent the US Air Force Academy, US Military Academy, US Naval Academy and US Coast Guard Academy.

Sunday 12:30-14:00

SC01 1999 George E. Nicholson Student Paper Prize Competition II

Prize Session

Chair: Nicholas G. Hall, Ohio State University, 301 Hagerty Hall, 1775 S College Rd., Columbus, OH 43210-1399, halln@cob.ohio-state.edu

1) Nicholson Student Paper Prize Competition II

This session represents an opportunity for faculty, professionals and students to see some of the best research being performed by students.

2) A Characterization of Weakly Bipartite Graphs, *Bertrand Guenin*, Carnegie Mellon University, GSIA, Pittsburgh, PA 15213

No abstract supplied.

3) Optimal Dynamic Pricing for Perishable Assets with Non-Homogeneous Demand, *Wen Zhao*, University of Pennsylvania, OPIM Dept., The Wharton Sch., Philadelphia, PA 19104

No abstract supplied.

4) Managing Learning & Turnover in Manpower Planning, *Yongpin Zhou*, University of Pennsylvania, OPIM Dept., Wharton Sch., 3620 Locust Walk, Ste. 1300, Philadelphia, PA 19104-6366, yongpin@wharton.upenn.edu, http://grace.wharton.upenn.edu/~zhou

No abstract supplied.

SC03 Telecommunication Systems: Modeling & Analysis

Sponsor: IFORS

Sponsored Session

Chair: Bezalel Gavish, Vanderbilt University, Owen Grad. Sch. of Mgmt., Nashville, TN 37220, gavishb@ctral1.vanderbilt.edu

1) Quality of Service Guaranteed Routing for ATM & Frame Relay Networks, *Kemal Altinkemer*, Purdue University, Krannert Grad. Sch. of Mgmt., W Lafayette, IN 47907, ***Bezalel Gavish***

Primary routes are determined for ATM and frame relay networks where high priority has a QoS guarantee on the maximum end to end average delay. Lower priority does not have any restrictions. The augmented Lagrangean aproach is used to come up with feasible routes that satisfy QoS guarantees.

2) Integer Programming by Constraint Addition: Design of Minimum Cost Connected Rings with Mininum-Coverage Requirements, *R. Patterson*, University of Texas at Dallas, School of Mgmt., Richardson, TX 75083-0688, rpatters@utdallas.edu, ***R. Gupta, R. Chandrasekaran***

A new problem is proposed: the minimum-coverage ring-spanning tree (MCRST) problem. This is believed to be NP-hard and is an important problem in telecommunications network design. The MCRST problem is formulated and solved using IP techniques. We present a new optimal solution technique based on decomposition of the problem into well-known sub-problems: the set covering problem and the spanning tree problem...

3) Anonymous Employees in Electronic Commerce, *John H. Gerdes, Jr.*, University of California, Anderson Grad. Sch. of Mgmt., Riverside, CA 92521, john.gerdes@ucr.edu

The advent of the Internet and electronic commerce has brought about many changes in corporate organizational structure. A prime example is the emergence of virtual organizations in the corporate landscape. In the limit, a virtual organization would bring together a diverse set of individuals to address a single problem...

SC04 Optimization Techniques IV

Contributed Session

Chair: Abraham P. Punnen, University of New Brunswick, Dept. of Math. Stats. & CS, PO Box 5050, Saint John, NB, E2L 4L5, Canada, punnen@unbsj.ca, http://or.csd.unbsj.ca/punnen/index.html

1) On Rate of Convergence of Monte Carlo Approximations of Stochastic Programs, *Tito Homem-de-Mello*, Ohio State University, Dept. of IWSE, 1971 Neil Ave., Columbus, OH 43210-1271, homem-de-mello.1@osu.edu, www-iwse.eng.ohio-state.edu/~facultyp/, ***Alexander Shapiro***

We discuss Monte Carlo simulation-based approximations of stochastic programming problems with discrete distributions. We show that the approximating problem provides an exact optimal solution of the true problem with probability approaching one exponentially fast as the sample size increases. This indicates that in such cases, Monte Carlo simulation algorithms could be very efficient.

2) Domination Analysis of Heuristics for the Asymmetric TSP,

Abraham P. Punnen, University of New Brunswick, Dept. of Math. Stats. & CS, PO Box 5050, Saint John, NB, E2L 4L5, Canada, punnen@unbsj.ca,http://or.csd.unbsj.ca/punnen/index.html,***Santosh N. Kabadi***

For the ATSP on a complete digraph on n nodes, we propose that an O(n*2) algorithm which produces a solution that is at least as good as 3+1!+2!+...+(n-2)! alternative solutions. Moreover, we show that the domination number of the patching heuristic and the node insertion heuristic is at least (n-2)!.

3) Linear Programming: A Neural Network Representation, ***Vincent C. Yen***, Wright State University, Dept. of MS/IS, Dayton, OH 45435, ***Hongxing Li***

We demonstrate the flexibility of neural networks for modeling and solving diverse mathematical problems. Seven interesting problems are discussed, including Taylor series expansion, Weierstrass' first approximation theorem and LP. The work is then extended to the neural representation of fuzzy LP.

4) Dynamic Decision Networks: An Approach for Solving the Dual Control Problem, ***Dennis M. Buede***, George Mason University, Dept. of Systems Eng. & OR, Fairfax, VA 22030, dbuede@gmu.edu

We develop a theory for combining DA and Bayesian networks for the real-time, dual control analysis of complex systems. This combination is called dynamic decision networks. This architecture is consistent with parallel processing architectures. Finally, the theory is being applied to the management of sensor resources for multisensor data fusion systems.

SC05 Selection Procedures in Simulation

Sponsor: College on Simulation
Sponsored Session

Chair: Susan Sanchez, University of Missouri, Sch. of Bus. Admin., 8001 Natural Bridge Rd., St. Louis, MO 63121-4499, susan_sanchez@umsl.edu

1) Using Ranking & Selection to "Clean Up" After a Simulation Search, ***Justin Boesel***, Northwestern University, Dept. of IE/MS, 2145 Sheridan Rd., Evanston, IL 60208-3119, jbo972@casbah.acns.nwu.edu, ***Barry L. Nelson***

R&S procedures are designed for structured experiments: equal first-stage sample sizes from all systems, all data available at the same time, etc. We use R&S to find the best system when the first-stage sampling is controlled by a search procedure that may violate many of the standard design assumptions.

2) Sequential Selection Procedures for Simulations, ***David Goldsman***, Georgia Institute of Technology, Sch. of ISyE, Atlanta, GA 30332, sman@isye.gatech.edu, ***Barry L. Nelson***, ***Seong-Hee Kim***

We consider the problem of selecting the best several competing simulated processes. We present a class of fully-sequential indifference-zone procedures to select the simulated process with the largest mean. These procedures guarantee a cetain probability of correct selection and have the added benefit of eliminating non-competitive processes as sampling progresses.

3) Selection for Rare Event Simulation Experiments, ***Susan Sanchez***, University of Missouri, Sch. of Bus. Admin., 8001 Natural Bridge Rd., St. Louis, MO 63121-4499, susan_sanchez@umsl.edu

We examine several related problems involving the selection of highly reliable systems. We show how adaptive sequential procedures can identify those simulated systems with extremely low failure probabilities, while achieving considerable savings in computational effort over single-stage or 2-stage procedures. We also discuss implications for reliability estimation.

SC06 Set-Based Design in Practice & Theory

Cluster: New Product Development
Sponsor: Technology Management Section
Sponsored Session

Chair: Durward K. Sobek, II, Montana State University, Dept. of MIE, 220 Roberts Hall, Bozeman, MT 59715-3800, dsobek@ie.montana.edu

1) Lessons from Implementing Set-Based Concurrent Engineering, ***Allen C. Ward***, Ward Synthesis, Inc., 3446 Gettysburg Rd., Ann Arbor, MI 48105, award@dundee.net

Set-based concurrent engineering posits that design teams can be more efficient by reasoning about and communicating sets of ideas rather than one idea at a time. I will discuss why, in practice, SBCE requires a different set of tools, skills, and attitudes to achieve these gains.

2) Design Methods in the Aerospace Industry: Looking for Evidence of Set-Based Practices, ***Joshua I. Bernstein***, MIT, Rm. 33-407, 77 Massachusetts Ave., Cambridge, MA 02139, jbern@mit.edu

This initial investigative study into set-based concurrent engineering (SBCE), sponsored by the Lean Aerospace Initiative at MIT, aimed to assess the "set-basedness" of the aerospace industry. This research found no clear-cut instances of set-based concurrent engineering, though many set-based techniques are used throughout the industry.

3) Mathematics & Algorithms Supporting Set-Based Design, ***William W. Finch***, MIT, Rm. 3-455G, 77 Massachusetts Ave., Cambridge, MA 02139, wfinch@mit.edu

The set-based design paradigm is one in which engineers think about sets of designs, environments, operating conditions, etc. Automation of set-based design processes requires development of new mathematical tools. This research combines predicate logic and constraint satisfaction to develop design automation tools for design under uncertainty, robust design and concurrent engineering.

4) Reducing Technical Uncertainty in Product & Process Development through Parallel Design of Prototypes, ***Ely Dahan***, MIT, Sloan Sch. of Mktg., 38 Memorial Dr., E56-323, Cambridge, MA 02142, edahan@mit.edu

We model prototyping using Bernoulli experiments with known rewards, costs and success probabilities. We compare the performance of pure parallel, pure sequential and hybrid parallel-sequential experimentation policies. We present a prototype design methodology and show how the experimentation mode determines the preferred product.

SC07 Health Applications

Contributed Session

Chair: Amy R. Wilson, University of California, Dept. of IE/OR, 4135 Etcheverry Hall, Berkeley, CA 94720, amy@ieor.berkeley.edu

1) Surgery Room Scheduling, ***Brian T. Denton***, McMaster University, DeGroote Sch. of Bus., 1280 Main St. W, Hamilton, Ontario, L8S 4M4, Canada, dentonbt@mcmaster.ca, ***Diwakar Gupta***

We present results from an optimization model for surgery room scheduling. The model determines optimal appointment times for scheduling a sequence of surgeries when the duration of each is a random variable. Appointment times are chosen to minimize a weighted sum of expected waiting times and unused capacity.

2) A Linear Programming Discriminant Analysis Model for HIV/AIDS Patients Classification, ***Seong Ho Kim***, St. Louis University, Dept. of MS, 3674 Lindell Blvd., St. Louis, MO 63108, kims2@slu.edu, ***N. K. Kwak***, ***Tae Sung Choi***

We present an application of LPDA to classify and predict the symptomatic status of HIV/AIDS patients. An LPDA model is developed and evaluated in terms of validity and reliability for application-based AIDS cost and services utilization survey datasets.

3) Targeting HIV Interventions in Injection Drug Users, ***Amy R. Wilson***, University of California, Dept. of IE/OR, 4135 Etcheverry Hall, Berkeley, CA 94720, amy@ieor.berkeley.edu, ***James G. Kahn***

Targeting HIV prevention strategies to the IDUs at highest HIV risk should improve outcomes. Using an epidemiological model, we explore the effects of targeting by gender, risk behaviors and HIV status. We also assess how intervention interactions can influence targeting decisions.

4) A Multicriteria Clinical Decision Model for Antibiotics Selection, ***Jim Iluga***, Clinique Ste. Elisabeth, Ave. Beau Rivage 10, Genval, 1332, Belgium, bestsprl@hotmail.com, ***Bertrand M. Mareschal***

There is no consensus on a quantitative approach to assist physicians in selecting the most appropriate antiobiotics in nosocomial infections, as most indicators focus on specific characteristics of the antibiotics. We present a multicriteria model based on the PROMETHEE methodology that considers several criteria such as efficiency (clinical, bacteriological), tolerance, costs, etc.

SC08 Sales & Sales Performance Models

Cluster: Marketing
Invited Session

Chair: Sarah Maxwell, Fordham University, Lincoln Center, 113 West 60th St., Rm. LL426B, New York, NY 10023

1) Playfulness: A Predictor of Sales Performance, ***Sarah Maxwell***, Fordham University, Lincoln Center, 113 West 60th St.,

Rm. LL426B, New York, NY 10023

Sales reps are expensive, and successful selection is crucial. Research has identified three key elements of success: adaptive selling behavior, intrinsic motivation and rewards, and a learning orientation. All 3 of these elements are related to playfulness as is depicted in a model based on Weitz, Sujan & Sujan (1986).

2) When Race Matters: Implications for Ethnic Salespersons in the US, ***Oscar W. DeShields, Jr.***, California State University, 1811 Nordhoff St., Northridge, CA 91330-8245, oscar.deshields@csun.edu

We identify a set of conditions that the race of the spokesperson will influence the effectiveness of the advertisement more than the credibility of the spokesperson. Tajfel's (1981) social categorization, social identity, and social comparison theory is used to give an explanation of when the ethnicity of a spokesperson will be more influential than the credibility of the spokesperson...

3) Recent Regression Alternatives to Structural Equation Analysis, ***Robert Ping***, Wright State University, Dept. of Mktg., 266 Rike Hall, Dayton, OH 45435

For variables containing error such as those with measures with multiple Likert-scaled items, ordinary least squares (OLS) regression approaches are known to produce biased coefficients. Structural equation analysis, for example using LISREL and EQS, has been proposed as a viable solution to this errors-in-variable problem. Using survey data examples, we summarize 2 recent advances.

4) Empirical Generalizations in Pre-Launch Forecasting of Recorded Music, ***Jonathan Lee***, University of Pittsburgh, 333 Mervis Hall, Pittsburgh, PA 15260, leej@vms.cis.pitt.edu

Forecasting adoption patterns of new products requires examination of sales patterns of similar products. An empirical generalization approach can be used in obtaining informed priors for forecasting adoption pattern and market potential of new products. The main idea is to use the experience obtained from previous brands to identify the generalized patterns...

SC09 Model & Data Representation Issues in Neural Networks

Cluster: Knowledge Discovery & Data Mining
Invited Session

Chair: Douglas M. Kline, Sam Houston State University, PO Box 2056, Huntsville, TX 77341-2056, douglaskline@acm.org

1) Connectionist Models for Learning, Discovering & Forecasting Software Effort: An Empirical Study, ***Parag Pendharkar***, Pennsylvania State University, Capital College, IS Dept., 777 W Harrisburg Pike, Harrisburg, PA 17057-4898, pxp19@psu.edu, ***Girish H. Subramanian***

We use neural networks for learning software effort from small training data sets containing information on software projects and test the performance of the model on a holdout sample. The design issues of developing neural networks for mining effort patterns on a smaller training data set will be discussed.

2) Data Representation Issues in Data Mining, ***Bee K. Yew***, Arkansas Technical University, Bus. & Economics Dept., Russelville, AR 72801-2222, beby@atuvm.atu.edu, ***Weixiong Ho***

We consider data representation in data mining particularly for neural network models. The focus is on the preparation phase in these settings. Neural network models treat certain numerical data differently which can lead to ambiguities in representations that are not present in the actual data meanings. Several examples are discussed.

3) Evaluating Methods for Multi-Period Time Series Forecasting with Neural Networks, ***Gerald Kohers***, Sam Houston State University, PO Box 2056, Huntsville, TX 77341-2056, mgt_gxk@shsu.edu, ***Douglas M. Kline***

ANNs are used for multi-step ahead forecasting. Three methods are compared: single ANN models for all steps, individual models for each step ahead and step-wise models. Issues of over-parameterization, sample size and methodology are addressed. The single model method performs well for limited sample sizes.

SC10 Approximations in Decision Analysis Modeling

Sponsor: Decision Analysis Society
Sponsored Session

Chair: Donald L. Keefer, Arizona State University, Dept. of Mgmt., PO Box 874006, Tempe, AZ 85287-4006, don.keefer@asu.edu

1) Sensitivity Analysis Techniques in Corporate Decision Analyses, ***David Lowell***, Santa Clara University, 450 Claremont Way, Menlo Park, CA 94025, dlowell@adg.com

We present examples from corporate decision analyses to demonstrate sensitivity analysis techniques and illustrate their power in constructing decision models that focus on the key aspects of the situation, that omit unnecessary detail and complexity and that provide insight and clarity to the decision maker.

2) Use of Approximation Methods for Eliciting Probability Distributions: Westinghouse Experience, ***William J. McAllister***, Westinghouse Science & Technology Center, 1310 Beulah Rd., Pittsburgh, PA 15235-5098, mcallwj@westinghouse.com, ***Robert K. Perdue***

Over the 15 years that we have been using DA at Westinghouse, the evolution of the methods we employ to elicit probability distributions has been driven by the types of analyses and available software. We discuss these methods, the practical concerns influencing our choice and illustrate them with examples.

3) Gaussian Influence Diagram Techniques for Clinical Program Design, ***Bill Poland***, Pharsight Corporation, 800 West El Camino Real, Ste. 200, Palo Alto, CA 94040, bill.poland@pharsight.com

Decision analysis gets unwieldly when a sequence of decisions is interspersed with learning about continuous uncertainties. Illustrating with the design of programs of clinical trials for investigational new drugs, I describe an effective approximation transforming all marginal distributions to normals and using the efficient inference of the Gaussian influence diagram.

4) Simple Approximations for Dependence among Binary Uncertainties: Additional Numerical Comparisons, ***Donald L. Keefer***, Arizona State University, Dept. of Mgmt., PO Box 874006, Tempe, AZ 85287-4006, don.keefer@asu.edu

Many decision and risk analyses include binary (success/failure) events that are probabilistically dependent. Assessing the complete set of probabilities needed to model these in detail is often impractical. We compare several simple approximations having very modest data requirements, extending earlier work to consider larger numbers of events.

SC11 Leveraging Information in the Battlespace

Sponsor: Military Applications Society
Sponsored Session

Chair: Joseph Helman, TASC, Inc., Mission Analysis Section, 1101 Wilson Blvd., Ste. 1500, Arlington, VA 22209, jjhelman@tasc.com

Co-Chair: Timothy Porter, Air Combat Comand, Afrcc, 14 West Wainwright Dr., Poquoson, VA 23662

1) Integrating UCAVs into the Battle, ***Scott D. Adams***, TASC, Advanced Systems Section, 1101 Wilson Blvd., Ste. 1500, Arlington, VA 22209, sdadams@tasc.com

The success of UCAVs will depend on how quickly and effectively they achieve and maintain battlefield dominance. This measure of effectiveness must be considered as roles and missions are defined and as UCAVs are integrated into planning and operations. The concept of UCAVs is easily championed; conducting UCAV operations requires significant problem solving.

2) Integration of Information Operations for Air Force Operations & Planning, ***Cliff O. Webster***, TASC, Mission Analysis Section, 1101 Wilson Blvd., Ste. 1500, Arlington, VA 22209, cowebster@tasc.com, ***Aric Kabillio***

In the context of the objectives identified in Joint Vision 2010, this paper examines the integration of information systems with existing strike platforms and operational concepts. This assessment examines the priorities for the Air Force in terms of reorganization, doctrinal adjustment, and technological investment necessary to facilitate an effective integration of emerging information systems and concepts...

3) Precision Guided Munitions: Trends in Offense, Defense & Arms Control, ***Joseph Helman***, TASC, Inc., Mission Analysis Section, 1101 Wilson Blvd., Ste. 1500, Arlington, VA 22209, jjhelman@tasc.com

We examine the development and proliferation of PGMs and related technology and examines prospects for arms control including supplier constraints.

SC12 Session 3

Cluster: Engineering Cost
Invited Session

Chair: Geonwook Jeon, University of Louisville, Dept. of IE, Louisville, KY 40292

Co-Chair: Hamid R. Parsaei, University of Louisville, Dept. of Ie, Speed Scientific School, Louisville, KY 40292, hrpars01@ulkyvm.louisville.edu
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1) A Genetic Algorithm Approach for Automated Knowledge Development, ***Ali K. Kamrani***, University of Michigan, IMSE Dept., 2250 Eng. Complex, 4901 Evergreen Rd., Dearborn, MI 48128-1491, kamkode@umich.edu

A GA-based system for automatic knowledge acquisition is presented. GA is an effective and efficient machine learning methodology which, is widely applied for analysis of complex systems. Different GA models are developed and compared in this study for generation of the best set of rules for the diagnosis of automated systems. A robot is used for this analysis.

2) A Sequential Approach in Forming Cellular Manufacturing Systems: A Multiobject Technique, ***Geonwook Jeon***, University of Louisville, Dept. of IE, Louisville, KY 40292, ***Herman R. Leep***, ***Hamid R. Parsaei***, ***Julius P. Wong***

Development of cell formation methodologies using multiple routing information, unlike those based on single routing information, is fairly recent and only a limited number has been proposed in the literature. Kusiak (1987) applied a mathematical programming approach to cell formation. A p-median model was formulated with the objective of maximizing the total sum of similarities...

SC13 Multicriteria Decision Making

Contributed Session

Chair: John F. Wellington, Capital University GSA, 2199 E. Main St., Columbus, OH 43209, jwelling@capital.edu

1) An Experimental Analysis of a Capacity Equipment Expansion Decision Using MAU, ***David L. Olson***, Texas A&M University, IOM Dept., College Station, TX 77843-4217, dolson@tamu.edu, ***Gary L. Stading***

MAU analysis can be used to identify statistically significant factors within a decision framework. Thirty-six manufacturing managers from the plastics processing industry participated in an experiment with 2 levels of demand and 3 levels of strategic product mix complexity. Results indicate which factors are significant.

2) Multicriteria Vehicle Routing: Security vs. Efficiency, ***Yupo Chan***, Air Force Institute of Technology, 2950 P St., WPAFB, OH 45433, ychan@afit.af.mil, http://www.afit.af.mil, ***Ernst K. Isensee***, ***James W. Chrissis***

Routing vehicles in real-time is of great interest. We offer a generalized dynamic programming algorithm to configure routes in a large-scale network. Three criteria are considered on the principle of weak monotonicity. The procedure is validated against a traditional multicriteria mathematical programming model. Selective non-dominated routes are shown to be generated on a real-time basis.

3) Optimization over the Efficiency Set, ***Yi-Hsin Liu***, University of Nebraska at Omaha, 60th & Dodge St., Omaha, NE 68182-0243, liu@unomaha.edu, ***Jerald P. Dauer***

To maximize a linear function over the efficiency set of a multiple objective linear program. The optimal solution is found via a bilevel linear program.

4) Multiple Criteria Formulations of Some Statistical Problems, ***John F. Wellington***, Capital University GSA, 2199 E. Main St., Columbus, OH 43209, jwelling@capital.edu, ***Subhash C. Narula***

Most statistical problems are formulated and solved as single criteria optimization problems. We show that some of these problems may be represented as multiple criteria problems, for example, point estimation, interval estimation, hypothesis testing, acceptance sampling, regression analysis, discriminant analysis, etc. Multiple criteria formulations of these problems provide useful insights.

5) withdrawn - author request of 4/8, ***Joao P. Costa***, University of Coimbra, Faculty of Economics, Av.Dias da Silva 165, Coimbra, 3000, Portugal, jpaulo@sonata.fe.uc.pt, ***Pedro C. Godinho***, ***Joao C. Climaco***

SC14 Constraint Programming & Optimization I

Sponsor: Computing Society
Sponsored Session

Chair: John Hooker, Carnegie Mellon University, Grad. Sch. of Indust. Admin., Pittsburgh, PA 15213, jh38@andrew.cmu.edu

1) Extending the AMPL Modeling Language for Combinatorial Optimization via Constraint Programming, ***Robert Fourer***, Northwestern University, Dept. of IE/MS, Evanston, IL 60208-3119, 4er@iems.nwu.edu, ***David M. Gay***

Modeling languages have not proved especially helpful for working with combinatorial optimization problems other than integer programs. We describe extensions to AMPL, an algebraic modeling language, that permit combinatorial problems to be formulated naturally and solved directly by search algorithms that have been developed in the context of constraint programming.

2) A Computational Comparison of Integer Programming & Constraint Logic Programming, ***Kenneth H. Darby-Dowman***, Brunel University, Mathematics & Stats., Uxbridge Middlesex, UB8 3PH, UK, kenneth.darby-dowman@brunel.ac.uk, ***James Little***

A computational comparison of integer programming and constraint logic programming on a number of optimization applications with respect to solver and problem characteristics is presented. It is found that no single technology dominates and a hybrid system is proposed. Results from a set of hybrid configurations are analyzed.

3) Modeling & Solving Mixed Logical/Linear Problems, ***Greger Ottosson***, University of Uppsala, Comp. Sci, greger@cmu.edu

We present an extension of traditional modeling languages where we allow for logical expressions, conditional constraints, variables in subscripts and variable index sets, how these can be compiled and solved, and how the solver integrates linear relaxations, B&B and discrete inference methods (constraint propagation) in that process.

4) An Implementation of a Solver in Mixed Logical/Linear Programming, ***Hak-Jin Kim***, Carnegie Mellon University, Grad. Sch. of Ind. Admin., Pittsburgh, PA 15213, hak-jin.kim@andrew.cmu.edu

CP has many features which have not been considered in OR. In particular, constraint propagation has never been seriously considered in mathematical programming. On the other hand, the relaxation method in OR is not treated systematically in CP. MLLP integrates finite domain constraint programming and LP. In this framework, an implementation of a solver for MLLP will be presented...

SC15 Global Supply Chain Management Challenges

Cluster: Supply Chain Management
Invited Session

Chair: Panos Kouvelis, Washington University, Olin Sch. of Business, St. Louis, MO 63130-4899, kouvelis@mail.olin.wustl.edu

Co-Chair: Joseph Milner, Washington University, Olin Sch. of Bus., One Brookings Dr., St. Louis, MO 63130, milner@wuolin.wustl.edu

1) Strategic Global Logistics: Breaking the Supply Chain, ***Ricardo Ernst***, Georgetown University, Sch. of Bus., 37th & O St. NW, Washington, DC 20057, ernstr@gunet.georgetown.edu, ***Elaine Romanelli***

We present a new view of supply-chain management that exposes strategic rather than cost implications of modern global logistics management. We describe a process and 3 basic approaches for re-conceiving and re-creating supply chains. The framework combines physical and information flows dimensions. The main implication is that strategic re-imaging of supply-chain logistics presents possibilities for adding...

2) Coping with Risk in Fixed Term Overseas Contracts, ***Alan Scheller-Wolf***, Carnegie Mellon University, 239 GSIA, Pittsburgh, PA 15213, awolf+@andrew.cmu.edu, ***Sridhar Tayur***

We model a situation where a firm faces income and cost streams in different currencies over a fixed horizon; for example, when contracting to construct a facility overseas. We explore optimal and heuristic policies, and note the appropriateness of different strategies as a function of the involved currencies characteristics.

3) Capacity Expansion Issues in Developing Markets, ***Panos Kouvelis***, Washington University, Olin Sch. of Business, St. Louis, MO 63130-4899, kouvelis@mail.olin.wustl.edu, ***Joseph Milner***

Firms expanding in developing markets face beyond demand uncertainty substantial supply availability problems. We model the multiperiod capacity expansion of a firm in such an environment, with the main decision the amount

of core and non-core capacity the firm should build in the presence of demand and outside supply (substitute for non-core) capacity uncertainty.

SC16 Models for Modern Manufacturing III

Cluster: Modern Manufacturing
Invited Session
Chair: Peter Brucker, University of Osnabrueck, Fac. of Math. & Info., Osnabrueck, D-49069, Germany, peter@mathematik.uni-osnabrueck.de

1) Local Search Algorithms for a Single-Machine Scheduling Problem with Positive & Negative Time-Lags, ***Johann Hurink***, University of Twente, Fac. of Mathematical Sci., PO Box 217, Enschede, 7500 AE, The Netherlands, hurink@math.utwente.nl, ***Jens Keuchal***

We present local search approaches for the following single-machine scheduling problem: a set of jobs with arbitrary processing times and given positive and negative time lags between the jobs has to be scheduled on a single machine such that the makespan is minimized.

2) An Exact Procedure for Minimizing the Number of Late Jobs on a Single Machine, ***Philippe Baptiste***, Bouygues, Techno. Nouvelles, 1 Av Eugene Freyssinet, St. Quentin en Yveli, F78061, France, baptisteWutc.fr, ***Laurent Peridy, Eric Pinson***

Given a set of jobs characterized by a release-date, a processing time and a due-date, we search for a 1-machine schedule on which the number of late jobs is minimal. We propose a B&B scheme based on dominance properties and on lower bounding techniques. Experimental results show that this procedure is very efficient.

3) On Some Two-Machine Flow Shop Problems, ***Frank M. Werner***, Otto-von-Guericke Universitat, PSF 4120, Magdeburg, D-39016, Germany, frank.werner@mathematik.uni-magdeburg.de, ***Jatinder N. D. Gupta, Volker Lauff***

Two 2-machine flow shop scheduling problems are considered. The first is a hierarchical criteria problem with sum of completion times to be minimized subject to a minimum makespan. In the second, for a given common due date, the sum of arbitrary earliness and tardiness penalties are to be minimized.

4) A New Lower Bound Based on Linear Programming for the RCPSP, ***Emmanuel Neron***, Universite de Technologie de Compiegne, BP649, Compiegne Cedex, F-60206, France, emmanuel.neron.@hds.utc.fr

A new lower bound for the 1-resource cumulative scheduling problem is presented. This bound, based on a new LP formulation, takes into account how resource requirements can be satisfied simultaneously. It is used in a B&B method for solving the resource constrained scheduling problem. Experimental results are presented.

SC17 Satellite Communications Applications

Cluster: Space Applications of Operations Research
Invited Session
Chair: Al Pisani, TASC, 14100 Park Meadow Dr., Chantilly, VA 20151, aapisani@tasc.com

1) Simulation of Data Coding Techniques for the Advanced Weather Interactive Processing System Satellite Broadcasting Network, ***Bruce Farquhar***, TASC, 14100 Park Meadow Dr., Chantilly, VA 20151, jbfarquhar@tasc.com

The Advanced Weather Interactive Processing System (AWIPS) is a modernization of the National Weather Service forecasting and warning system. Severe link outages between satellite and ground receivers were experienced and modeling and simulation was used to identify and propose solutions to this problem.

2) Simulation & Analysis of Internet Protocols over High BER, High Delay Channels, ***James H. Shattuck***, TASC, 14100 Park Meadow Dr., Chantilly, VA 20151, jhshattuck@tasc.com

The simulated performance of TCP/IP over Tactical Channels is presented. This simulation accounts for the TCP Slow Start Performance as well as the effects of window size.

3) C4ISR Military Worth, ***Kenneth A. Myers***, TASC, 14100 Park Meadow Dr., Chantilly, VA 20151, kamyers@tasc.com, ***Richard W. Storer, Kenneth L. Stanford, William J. Vogt***

A methodology is developed for analysis of military worth of C4ISR architectures. Denfense and Intelligence Community planners need insight to the impact of C4ISR on military operations effectiveness. Mission analyses for weapons and sensors support campaign simulations that demonstrate the relative operational merit of selected C4ISR systems in realistic scenarios.

4) Simulation & Analysis for the Prediction of Bit Error Rate due to Co-Channel Interference for Adjacent Satellites, ***Scott Frazier***, TASC, 14100 Park Meadow Dr., Chantilly, VA 20151, rsfrazier@tasc.com

The bit error rate is determined for a satellite network in which two satellites are periodically in view by a ground terminal antenna, resulting in co-channel interference. Both analysis and simulation are employed, assuming no error correction and half-rate coding, respectively.

SC18 Positive Semidefinite Programming & its Applications

Cluster: Linear Programming
Sponsor: Optimization Section
Sponsored Session
Chair: Yinyu Ye, University of Iowa, Dept. of MS, S384 Pappajohn Bldg., Iowa City, IA 52242-1000, yinyu-ye@uiowa.edu

1) The Spectral Bundle Method with Sign Constraints, ***Christoph Helmberg***, ZIB-Berlin, Konrad-Zuse-Zentrium, Takustrasse 7, Berlin, 14195, Germany, helmberg@zib.de, ***K. C. Kiwiel***

The recently introduced spectral bundle method allows to compute approximate solutions to large, structured, equality constrained semidefinite programs with fixed trace. We extend the spectral bundle method so that it can handle inequality constraints without seriously increasing computation time. We show numerical results for some combinatorial examples.

2) Solving Largescale Semidefinite Programs for Combinatorial Optimization, ***Steven J. Benson***, University of Iowa, 14 MacLean Hall, Iowa City, IA 52246, benson@math.uiowa.edu, ***Yinyu Ye, Xiong Zhang***

We present a dual scaling algorithm and show how it exploits the structure and sparsity of some largescale problems.

3) Numerical Experiments of Successive Convex Relaxation Methods for Nonconvex Quadratic Optimization, ***Mituhiro Fukuda***, Tokyo Institute of Technology, Dept. of Math. & Comp. Sci., 2-12-1 Oh-Okayama, Meguro-ku, Tokyo, 152-8552, Japan, mituhiro@is.titech.ac.jp, ***Akiko Takeda, Yang Dai, Masakazu Kojima***

Global optima of nonconvex quadratic optimization problems can be approximated based on the successive convex relaxation methods proposed by Kojima & Tuncel. We discuss implementation issues, and report comparative numerical results of some localized-discretized variants of their methods using semidefinite programs and linear programs.

4) General Interior-Point Maps & Existence of Weighted Paths for Nonlinear Semidefinite Complementarity Problems, ***Paulo R. Zanjacomo***, Georgia Institute of Technology, Sch. of ISyE, Groseclose Bldg., Atlanta, GA 30332, paulo@isye.gatech.edu, ***Renato Monteiro***

We study properties of fundamental maps that can be used to describe the central path of the monotone nonlinear complementarity problems over the cone of symmetric positive semidefinite matrices. Each fundamental map leads to a family of "weighted" continuous trajectories which include the central trajectory as a special case.

SC19 Production Scheduling

Cluster: Scheduling
Invited Session
Chair: Bryan A. Norman, University of Pittsburgh, 1048 Benedum Hall, Dept. of IE, Pittsburgh, PA 15261, banorman@pitt.edu

1) Problem Space Search in Scheduling, ***Robert H. Storer***, Lehigh University, IMSE Dept., Mohler Lab., W Packer Ave., Bethlehem, PA 18015, rhs2@lehigh.edu, ***Sekcuk Avci, Selim Akturk***

We present problem space search algorithms for interesting scheduling problems including weighted tardy and early-tardy problems. Both single machine and job-shop environments are considered. We also will discuss algorithms which link scheduling decisions with lower level decisions such as deterimining machining conditions for various parts.

2) An Approach to Job Shop Scheduling with Sequence Dependent Setups, ***Xiaoqing Sun***, The SABRE Group, 4333 Amon Carter Blvd., MD 5547, Ft. Worth, TX 76155, xiaoqingsun@sabre.

com, ***James S. Noble, Cerry M. Klein***

We address the job shop scheduling problem with release dates, due dates and sequence dependent setup times with the scheduling objective to minimize the total weighted square tardiness. The problem is decomposed into a series of single-machine scheduling problems within a shifting bottleneck framework...

3) Robust Schedules & Project Rescheduling, *Jeffrey W. Herrmann*, University of Maryland, Inst. for Systems Research, College Park, MD 20742, jwh2@eng.umd.edu, ***Kenneth M. Gerber***

Creating schedules for dynamic environments is a difficult task. We will discuss recent results on two different approaches. We will describe software for testing rescheduling algorithms for project scheduling. In addition, we will present a GA that can find robust schedules.

4) Developing Job Rotation Schedules Considering Task Workload Uncertainty, *Bryan A. Norman*, University of Pittsburgh, 1048 Benedum Hall, Dept. of IE, Pittsburgh, PA 15261, banorman@pitt.edu, ***Brian J. Carnahan, Mark Redfern***

We consider the problem of developing job rotation schedules considering the physical demands of different lifting tasks in a work environment. The weight of the objects, the lifting height and the duration of the lifting activities varies throughout the shift. Analysis of math programming and heuristic methods will be presented.

SC20 Optimization of Electricity Generation

Cluster: Energy
Sponsor: Section on Energy, Natural Resources & Environment
Sponsored Session
Chair: Andrew Philpott, University of Auckland, Dept. of Eng. Science, Private Bag 92019, Auckland, New Zealand, a.philpott@auckland.ac.nz

1) A Dual Evolutionary Method for Developing Spot Marketing Strategies for Generators with Storage, *John Kaye*, University of New South Wales, Dept. of Electrical Eng., Sydney, NSW, 2052, Australia, j.kaye@unsw.edu.au, ***Iain MacGill***

Evolutionary computation is well suited to modeling competitive behavior of generators in electricity spot markets and can produce useful and interesting strategies. A dual form of evolutionary computation is used to represent the decision making of generators with complex engineering features, including inter-temporal links such as storage...

2) Scheduling the Shutdown of Nuclear Power Plants, *Hamish Waterer*, Georgia Institute of Technology, Sch. of ISyE, 765 Ferst Dr., Atlanta, GA 30332-0205, hwaterer@isye.gatech.edu, ***Ellis L. Johnson, Martin Savelsbergh***

We consider the problem of scheduling the shutdown of nuclear power plants for refueling and maintenance. The resulting MIP is large but well structured. An interesting marriage of Benders' and Dantzig-Wolfe decompositions is used to solve the problem.

3) Revenue Maximizing Reservoir Management with Risk Attitudes, *Andrew Kerr*, University of Canterbury, Dept. of Mgmt., Private Bag 4800, Christchurch, New Zealand, a.kerr@mang.canterbury.ac.nz, ***Grant Read, John Kaye***

We consider a medium-term reservoir management problem where a reservoir company, with significant storage capacity, is a dominant player in a mixed hydro-thermal system where the other players are price takers. Using a stochastic dynamic programming model, we examine the impact of the decision maker having "risk attitudes" towards end-of-horizon outcomes.

4) Spreadsheets for Hydro-Generation Scheduling, *Tom S. Halliburton*, NSR Information, 2905 Santos Ln #2313, Walnut Creek, CA 94596, tomhal@ibm.net

A spreadsheet optimization model in use by a large utility is described. The models are linked to a range of data sources, enabling users to view and analyze various data items. Optimization can be done with the EXCEL Solver or a more powerful solver.

SC21 New Topics in Project Scheduling

Cluster: Project Management
Invited Session
Chair: Willy S. Herroelen, Katholieke Universiteit Leuven, Dept. of Applied Econ., Naamsestraat 69, Leuven, B-3000, Belgium, willy.herroelen@econ.kuleuven.ac.be

1) Factors Influencing Project Management Techniques & Software Usage & Attitudes on Future Research among Project Management Professionals, *Bruce Pollack-Johnson*, Villanova University, Dept. of Math. Sci., 800 Lancaster Ave., Villanova, PA 19085, bpollack@email.vill.edu, ***Matthew J. Liberatore***

Based on a random survey of members of the Project Management Institute (PM practitioners and academics), we examine the factors, i.e., demographic, work environment, experience, education, etc., that influence usage of analytic techniques, usage of PM software and features, and attitudes about NPV techniques and future research directions in PM.

2) Quality Assurance in Project Scheduling, *Abdelghani A. Elimam*, San Francisco State University, Coll. of Business, 1600 Holloway Ave., San Francisco, CA 94132, aelimam@sfsu.edu, ***Bajis M. Dodin***

Activities required to ensure adherence to specified quality are often absent from project scheduling. A recent survey indicated that quality assurance is of primary importance in project management. We add QA activities to the project and investigate their impact on the schedule of the project activities, duration and resources utilization.

3) Phase Transitions in Project Scheduling, *Willy S. Herroelen*, Katholieke Universiteit Leuven, Dept. of Applied Econ., Naamsestraat 69, Leuven, B-3000, Belgium, willy.herroelen@econ.kuleuven.ac.be, ***Bert De Reyck***

We report on phase transitions which have been observed in various resource-constrained project scheduling problems. While network complexity measures, i.e., order strength, complexity index, etc., reveal continuous easy-hard or hard-easy phase transitions, resource parameters, i.e., resource-constrainedness, exhibit a relatively sharp easy-hard-easy transition behavior.

4) withdrawn - chair request of 3/17, *Salah E. Elmaghraby*, North Carolina State University, Dept. of IE, Grad. Program OR, PO Box 7906, Raleigh, NC 27695-7906, elmaghra@eos.ncsu.edu, ***Hanijanto Soewandi, Erik L. Demeulemeester, Willy S. Herroelen***

SC22 Models for Resource Evaluation, Remanufacturing & Recycling

Cluster: Green Manufacturing
Invited Session
Chair: Julie Ann Stuart, Ohio State University, Dept. IWSE, 284 Baker Systems, 1971 Neil Ave., Columbus, OH 43210-1271

1) Reprocessing Models for Material Recovery of End-of-Life Products, *Julie Ann Stuart*, Ohio State University, Dept. IWSE, 284 Baker Systems, 1971 Neil Ave., Columbus, OH 43210-1271, ***Qin Lu***

We address the trade-offs of high-purity and value of reprocessed materials with processing costs and capacity. We present a deterministic model to decide which components, in what quantities, and for how many cycles, should be reprocessed for end-of-life products returned to a take-back center for recycling.

2) An Analysis of the Relative Resource & Pollution Efficiency of Metals & Polymers, *Jonathan Linton*, NJIT, Multi-Lifecycle Eng. Res. Ctr., University Heights, Newark, NJ 07102-1982

Attempts are frequently made to establish the relative environmental impact of different materials and processes. These attempts are usually controversial, since they assign relative values to incomparable pollutants. To avoid this difficulty, DEA is used to compare the relative efficiency of a variety of metals and polymers...

3) A Comparative Evaluation of the Repair & Remanufacture Options, *Rajesh Srivastava*, AFIT/LAL, 2950 P St., Bldg. 641, WPAFB, OH 45433-7765, ***V. Daniel R. Guide, Jr.***

Strategies in recoverable manufacturing include repair and remanufacturing. Repair and remanufacturing strategies are compared on various criteria to evaluate whether the activities are similar enough to be performed with the same manufacturing system and production planning and control system, or dissimilar enough that separate systems are needed.

SC23 Classification Methods

Sponsor: College on Artificial Intelligence
Sponsored Session
Chair: John W. Chinneck, Carleton University, Systems & Comp. Eng., Ottawa, Ontario, K1S 5B6, Canada, chinneck@sce.carleton.ca, www.sce.carleton.ca/faculty/chinneck.html

1) A Misclassification Minimization Support Vector Machine, *E. J. Bredensteiner*, University of Evansville, Dept. of Math, Evansville, IN 47715, eb6@evansville.edu

A classification method with the multiobjective of minimizing the number of points misclassfied as well as improving generalization through the use of support vector machines is presented. This problem is formulated as a parametric bilinear program. Computational results will be given.

2) Document Retrieval Applications, ***David Neu***, Rutgers University, RUTCOR, Bartholomew Rd. 640, Piscataway, NJ 08854-8003, neu@rutcor.rutgers.edu, ***Endre Boros***

We compare decision tree-based methods with logical analysis of data on classification problems arising in document retrieval tasks. We compare the size of the essential feature sets, the recall rate and the standard classification errors for these methods on 47 different topics over a database consisting of 120000 documents (TREC-7).

3) Classification using Linear Programming Infeasibility Analysis, ***John W. Chinneck***, Carleton University, Systems & Comp. Eng., Ottawa, Ontario, K1S 5B6, Canada, chinneck@sce.carleton.ca, www.sce.carleton.ca/faculty/chinneck.html

Heuristics for analyzing infeasible LP can also be used to place classifier lines which misclassify very few points. Recent developments, including empirical results, are presented.

4) Identification of Minimal Association Rules in Databases, ***Jan C. Bioch***, Erasmus University Rotterdam, Dept. of Comp. Sci., FEW H9-30, PO Box 1738, Rotterdam, 3000 DR, The Netherlands, bioch@few.eur.nl

The discovery of association rules in databases can be forumlated in terms of identification of monotone Boolean functions. We discuss the identification of maximal (minimal) (in)frequent sets and minimal association rules in databases. We also discuss the complexity of various algorithms.

SC24 Mini-Tutorials: Finance & Financial Services

Sponsor: Financial Services Section
Sponsored Session
Chair: Richard E. Wendell, University of Pittsburgh, 262 Mervis Hall, KGSB, Pittsburgh, PA 15260, wendell+@pitt.edu

1) Investment Science, ***David G. Luenberger***, Stanford University, EES&OR Dept., Terman Eng. Ctr. 314, Stanford, CA 94305-4023, luen@leland.stanford.edu

No abstract supplied.

2) Optimization Applications in Finance, ***Linus Schrage***, University of Chicago, 1101 E. 58th St., Chicago, IL 60637, linus.schrage@gsb.uchicago.edu

We give an introduction on the use of optimization to a variety of financial problems: portfolio design in the face of uncertainty, transaction costs and taxes; problems in bond bidding and bond portfolios; auctions and bidding; combinatorial issues in portfolio construction, such as limits on the number of assets in a portfolio...

SC25 Transportation Applications III

Contributed Session
Chair: Fabien Chauny, Ecole des HEC, 3000 Cote Ste-Catherine, Montreal, Quebec, H3T 2A7, Canada, fabien@crt.umontreal.ca

1) Airlift Planning for an Air Transport Group, ***Gilles Savard***, Ecole Polytechnique, Dept. of Math. & IE, Box 6079 Centre-Ville, Montreal, Quebec, H3C 3A7, Canada, gilles@crt.umontreal.ca, ***Eric Rancourt***

We present a generalized set-partitioning model solved by column generation to prepare the monthly airlift plans for the Air Transport Group of the Canadian Armed Forces. Crew feasibility, precedence, coupling and pickup-delivery constraints on airlift requests are considered. Numerical results are presented.

2) Monitoring the Applications of the Transportation Problem in Canning Companies using Linear Programming, ***Javier Faulin***, Universidad Publica de Navarra, Dept. of Stats. & OR, Campus Arrosadia, Pamplona, Navarra, 31006, Spain, ffaulinf@nexo.es, ***Alejandro G. del Valle***, ***Jose Antonio Alfaro***

The solution of the VRP is easily solved using LP, when the problem dimension is small, such as in the case of canning companies in Spain. We analyze several real cases and compare the outcomes, showing the reached improvements. Several optimal routes have been inspected for delivering and picking up.

3) A Global Approach for the Aircraft Loading Problem, ***Fabien Chauny***, Ecole des HEC, 3000 Cote Ste-Catherine, Montreal, Quebec, H3T 2A7, Canada, fabien@crt.umontreal.ca, ***Leandre Ratsirahonana***, ***Gilles Savard***

We present an integer nonlinear multi-commodity network flow model for solving the aircraft loading problem (ALP) where items are to be moved by a minimum number of aircraft. Constraints on weight, length, ramp, priority and center of gravity are taken into account. Real-life problems are presented.

4) Comparing Air Carriers & Air Taxi/Commuter Delay & Demand Distributions, ***Nastaran S. Coleman***, TRW, 1 Federal Systems Park Dr., Fairfax, VA 22033-4416, nastaran.coleman@trw.com, ***Daniel A. Citrenbaum***

Flight and arrival delay distributions as well as hourly demand distributions for air taxi, airline service quality performance (ASQP) and non-ASQP air carriers are studied for the National Airspace System. Significant but insubstantive differences are found for the means; however, there are no significant differences between the distributions, given that the taxi time distributions are the same.

SC26 Reliability Data Analysis

Cluster: Data Mining
Sponsor: Quality, Statistics & Reliability Section
Sponsor/Invite Session
Chair: Alice E. Smith, University of Pittsburgh, 1031 Benedum Hall, Dept. of IE, Pittsburgh, PA 15261, aesmith@pitt.edu, aesmith@engrng.pitt.edu

1) Cost Analysis & Maintenance Policies for a Series System with Highly Censored Data, ***Edward A. Pohl***, OSD PA&E, 1800 Defense Pentagon, Washington, DC 20330-1800, edward.pohl@osd.pentagon.mil, ***David M. Reineke***, ***W. Paul Murdock, Jr.***

We consider the problem of estimating the optimal replacement time for a series arrangment of 4 subsystems when data are subject to high levels of random censoring on the right. Simulation is used to compare the performance of the Kaplan Meier estimator, piecewise exponential estimator and maximum likelihood estimator in estimating optimal replacement time for the system...

2) Time Dependent Hazard Function Estimation from Merged Data Sets, ***David W. Coit***, Rutgers University, Dept. of IE, 96 FrelinghuysenRd., Piscataway, NJ 08854-8018, coit@rci.rutgers.edu, ***Tongdan Jin***

Hypothesis tests and gamma distribution maximum likelihood estimators will be presented for the case when there is only merged data sets without individual time-to-failure information recorded. Data sets with missing time-to-failure data often arise from field data collection systems which rely on recorded observations of the system by the operators and maintenance personnel.

3) The Effect of Failure/Repair on Complex System Performance, ***John S. Usher***, University of Louisville, Dept. of IE, Louisville, KY 40245, jsushe01@ulkyvm.louisville.edu

We will present a complete approach for determining the effect of component failure and repair on the overall performance of complex electromechanical systems which exhibit degraded performance. The approach will discuss methods for collecting and analyzing field reliability data from systems and then using the data to estimate component failure and repair rates.

4) Statistical Inference & Variate Generation for Nonhomogeneous Poisson Processes, ***Lawrence M. Leemis***, College of William & Mary, Dept. of Math., PO Box 8795, Williamsburg, VA 23187-8795, leemis@math.wm.edu

Nonparametric point and interval estimates are presented for the cumulative intensity function for a nonhomogeneous Poisson process with multiple realizations observed over various time intervals. A variate generation algorithm is used to generate processes given a stream of random numbers. Examples illustrate the use of the inference procedures.

SC27 1998 Erlang Prize Recipients

Sponsor: Applied Probability Society
Sponsored Session
Chair: Tava Lennon Olsen, University of Michigan, 2845 IOE, 1205 Beal Ave., Ann Arbor, MI 48109-2117, tlennon@umich.edu, http://www-personal.engin.umich.edu/~tlennon

1) Efficiency of Scheduling Policies in Multiclass Queueing Networks, ***J. G. Dai***, Georgia Institute of Technology, Sch. of ISyE, Atlanta, GA 30332-0205, http://www.isye.gatech.edu/faculty/dai/

Multiclass queueing networks are used to model telecommunication systems and complex manufacturing systems. A scheduling policy in a network is efficient if the utilization of a bottleneck station can increase to 100% as the arrival rate (in the open network) or the total WIP (in the closed network) becomes sufficiently large...

2) Networks of Queues: Customers, Signals & Product Form Solutions, ***Xiuli Chao***, NJIT, Dept. of IME, University Heights, Newark, NJ 07102, chao@megahertz.njit.edu

We review some recent results in queueing networks with signals and product form solutions. Necessary and sufficient conditions are presented for a network to have a product form stationary distribution, and a procedure is given to verify and calculate it when it exists. We also discuss networks with (network wide) state dependent transition rates as well as its relationships with state-independent transition rates.

SC28 Panel: The Impact of Information on Logistics

Sponsor: Section on Logistics
Sponsored Session

Chair: Chelsea C. White, III, University of Michigan, IOE Bldg., 1205 Beal Ave., Ann Arbor, MI 48109-2117, ccwiii@umich.edu

1) Panel: The Impact of Information on Logistics, ***Roger W. Baugher***, Norfolk Southern Corp., 125 Spring St. SW, MS 110, Atlanta, GA 30303, ***Chris Lofgren***, Schneider Logistics, Inc., 3101 S Packerland Dr., Green Bay, WI 54306-2666, ***Warren B. Powell***, Princeton University, Dept. of Civil Eng. & OR, Princeton, NJ 08544, ***Randolph W. Hall***, University of Southern California, Dept. of ISE, GER 240, Los Angeles, CA 90089-0193, hall@mizar.usc.edu, ***Chelsea C. White, III***, University of Michigan, IOE Bldg., 1205 Beal Ave., Ann Arbor, MI 48109-2117, ccwiii@umich.edu

The panelists will discuss the impact of new forms of information, enabled by new forms of IT, on improving the efficiency of moving freight, nationally and internationally. Discussion will also include barriers to successful implementation of IT, implementation failures and their reasons.

SC29 Retail Operations

Sponsor: Manufacturing & Service Operations Management Society
Sponsored Session

Chair: Marshall Fisher, University of Pennsylvania, The Wharton School, OPIM Dept., Philadelphia, PA 19102, fisher@wharton.upenn.edu

Co-Chair: Ananth Raman, Harvard University, Grad. Sch. of Bus. Admin., Morgan Hall, Boston, MA 02136, araman@hbs.edu

1) Implementing Marketing Models: Decision Support Systems for Vendor Managed Inventory & Clearance Markdown Management, ***Dale Achabal***, Santa Clara University, Leavey Sch. of Bus., Retain Workbench Res. & Edu, Santa Clara, CA 95053, dachabal@scu.edu, ***Shelby McIntyre, Steve Smith, Kirthi Kalyanam***

The increasingly competitive nature of the retail industry is forcing firms to identify new ways to manage key assets more productively. We describe the development of the marketing models and the DSSs for 2 applications that have led to significant improvements in operating results at several firms.

2) What Explains Superior Retail Performance?, ***Marshall Fisher***, University of Pennsylvania, The Wharton School, OPIM Dept., Philadelphia, PA 19102, fisher@wharton.upenn.edu, ***Ananth Raman, Vishal Gaur***

We report on interviews and a written survey of over 30 leading retailers of short life-cycle, unpredictable products to determine the drivers of superior performance. Retailers that achieve superior returns on inventory and shelf space use sales data to understand consumers and responsive supply chains to react to this information.

3) The Impact of Incentives on Store Operational Performance, ***Ananth Raman***, Harvard University, Grad. Sch. of Bus. Admin., Morgan Hall, Boston, MA 02136, araman@hbs.edu, ***Nicole DeHoratius***

We show, using empirical evidence from a consumer electronics retailer, that sales and shrink are both affected by changes in store manager incentives. Combining these data with data from questionnaire surveys and case studies at specific retailers, we recommend appropriate incentive mechanisms for retailers of various categories.

4) Does the Internet Always Intensify Price Competition?, ***Rajiv Lal***, Harvard University, Grad. Sch. of Bus., Morgan Hall, Boston, MA 02163, rlal2hbs.edu

We show that under realistic conditions, the Internet does not always increase price competition. The impact of the Internet on competition will depend on the importance of the products' non-digital attributes (for which physical inspection of the product is necessary).

SC30 Internet-Enabled Supply Chain Management

Sponsor: Manufacturing & Service Operations Management Society
Sponsored Session

Chair: Raj Veeramani, University of Wisconsin, Dept. of IE, 1513 University Ave., Madison, WI 53706

1) New Business Models for Internet Commerce, ***Anitesh Barua***, University of Texas, Ctr. for Res. on EC, Dept. MSIS, Grad. Sch. of Bus., Austin, TX 78712, barua@mail.utexas.edu, ***Ram Chellappa***

We present a new experimental approach which involves the creation of a real electronic market with real demand and real supply. We focus on experimental design aspects and methodological issues including the creation of market demand, incentives for buyers and sellers, transaction instruments and rules, time frame and potential biases.

2) Decision Support for Business-to-Business Electronic Commerce, ***Pinar Keskinocak***, IBM, TJ Watson Res. Ctr., Office 04-258, Rte. 134, Yorktown Heights, NY 10598, pinar@cmu.edu, ***Fred Wu, Sesh Murthy, Rama Akkiraju***

As supply chain partners increasingly use the Internet to purchase materials and market products, their need for assistance in buy/sell/make/auction/procure decisions grows. A DSS analyzes Internet-offered inventories and capacities in concert with an enterprise's own inventory, order book and capacity can recommend advantageous decisions.

3) Determinants of Success of Electronic Brokerages, ***Prabhudev Konana***, University of Texas, Dept. of MS/IS, Grad. Sch. of Bus., Austin, TX 78712, pkonana@icf.bus.utexas.edu, ***Nirup Menon, Glenn Browne***

New business models based on electronic brokerages are threatening traditional human-based brokerages. In this context, we attempt to describe and predict electronic brokerage usage based on transaction, consumer and electronic brokerage characteristics. We rely on transaction cost economics, trust and risk preferences to model usage.

4) Strategies for Dynamic Configuration of Supply-Webs, ***Pawan Joshi***, University of Wisconsin, Dept. of IE, Madison, WI 53706, joshi@cae.wisc.edu, ***Raj Veeramani***

We will discuss various decision strategies, e.g., for outsourcing and multi-party bid assembly, associated with dynamic or "on-the-fly" configuration of supply webs or virtual enterprises to meet customer demands. Simulation-based insights regarding the performance of individual companies and the overall supply web under these decision strategies will be presented.

SC31 Location Models & Algorithms

Sponsor: Section on Location Analysis & Transportation Science Section
Sponsored Session

Chair: Joyendu Bhadury, California State University, Dept. of Mgmt. & Finance, Sch. of Business & Economics, Hayward, CA 94542, jbhadury@csuhayward.edu

1) Multifacility Location with Groups of Demand Points on a Network, ***Oded Berman***, University of Toronto, Faculty of Management, 105 St. George St, Toronto, Ontario, M5S 3E6, Canada, berman@fmgmt.utoronto.ca, ***Zvi Drezner, George O. Wesolowsky***

We consider a location of several facilities on a network with groups of demand points. We identify the set of possible locations for each problem. We solved the problems when facilities are restricted to nodes by a steepest descent, tabu search, and simulated annealing.

2) A Competitive Facility Location Problem With Unessential Demands, ***Shogo Shiode***, Kobe Gakuin University, ***Shigehiro Osumi***

We consider a competitive facility location problem in which 2 mutually competitive companies intend to construct their facilities on a market. The customers in the market utilize the nearest facility but they do not utilize any facility if the minimum distance to all facilities exceed a certain value. We analyze this model and find the optimal solution.

3) Subsidy Competition in Location Modeling, ***H. A. Eiselt***, University of New Brunswick, PO Box 4400, New Brunswick, E3B 5A3, Canada, eiselth@fac.fadmin.unb.ca

A given network is partitioned into regions that offer subsidies to firms in order to attract them. While firms maximize their after-tax profit plus subsidy, regions optimize their respective revenues. This model examines a number of strategies for subsidy competition. These strategies are examined in a series of tests.

4) Network Design Subject to Facility Location: Polynomially Solvable Cases, ***Joyendu Bhadury***, California State University, Dept. of Mgmt. & Finance, Sch. of Business & Economics, Hayward, CA 94542, jbhadury@csuhayward.edu, ***R. Chandrasekaran***, ***L. P. Gewali***

We consider the NP-hard problem of designing a network subject to facility location. Some instances are presented that can be solved in polynomial time. Future research is also discussed.

SC32 Electronic Commerce Technology

Cluster: **Telecommunications & Electronic Commerce**
Invited Session

Chair: Reza Barkhi, Virginia Polytech Institute & State University, Dept. of Accounting & IS, Pamplin Coll. of Bus., Blacksburg, VA 24061

1) Electronic Commerce & Technological Advances, ***James O. Hicks, Jr.***, Virginia Polytech Institute & State University, Dept. of Marketing, Pamplin Coll. of Bus., Blacksburg, VA 24060

In the near term, the next 5 years, there are many technological advances that are likely to have a profound impact on both the cost and adoption of electronic commerce. The pace of processing, storage and particularly communication advances has accelerated recently and will continue in the future. Economics will require that most commerce be done electronically.

2) Effects of Cross-Modal Communications in Electronic Environments, ***Eloise Coupey***, Virginia Polytech. Institute & State University, Dept. of Mktg., Pamplin Coll. of Business, Blacksburg, VA 24060

One characteristic difference between environments for EC and traditional marketing venues is that the electronic environment may combine elements of multiple traditional environments, i.e., print, visual and auditory media, into a single presentation. This difference may affect the nature and influence of communications between parties in a transaction...

3) Electronic Commerce Evolutionary Approaches to Negotiation, ***Jacquelyn Rees***, Purdue University, Krannert Grad. Sch. of Mgmt., W. Lafayette, IN 47906, jrees@mgmt.purdue.edu, ***Reza Barkhi***

Decision-making and negotiation in an EC environment can be described as an evolutionary process. Particularly, these actions can be viewed as an adaptive search conducted by a set of agents. We propose that this process can be modeled as an evolutionary algorithm, particularly a genetic algorithm. Model details and implications will be discussed.

4) Application of Visualization Technologies to Electronic Commerce, ***David P. Tegarden***, Virginia Polytech. Institute & State University, Dept. of Acct. & IS, Blacksburg, VA 24061-0101, ***France Belanger***, ***Reza Barkhi***

Visualization technologies allow us to begin using our visual/spatial abilities in extracting useful information from today's flood of information. With the advent of the Internet, the already popular use of electronic commerce has exploded. We will explore the application of visualization technologies to EC.

SC33 Session Withdrawn - GE Corporate R&D Practitioner's Session

Cluster: **Novel Applications of Statistics**
Invited Session

Chair: Daniel J. Cleary, GE Corporate R&D, Info. Tech. Lab., Bldg. K1, PO Box 8, Schenectady, NY 12301, cleary@crd.ge.com

SC34 OR/MS in the News

Cluster: **OR/MS in the News**
Invited Session

Chair: John E. Kobza, Virginia Polytechnic Institute and State University, Dept. of ISE (0118), 250 NEB, Blacksburg, VA 24061, jkobza@vt.edu

1) Are Product Life Cycles Really Getting Shorter?, ***Barry L. Bayus***, University of North Carolina, Kenan-Flagler Business Sch., CB 3490, Chapel Hill, NC 27599-3490, barry.bayus@unc.edu

The conventional wisdom that "product life cycles are shrinking" has been used to support a general recommendation to speed new products to market. However, very little empirical evidence on this topic exists. Indeed, statistical analyses of the personal computer industry indicate that product lifetimes are not accelerating. Implications of these findings will be discussed.

2) Learning by Experimentation: Implications for R&D Performance, ***Stefan Thomke***, Harvard Business School, Morgan Hall T63, Soldiers Field, Boston, MA 02163, sthomke@hbs.edu

New forms of experimentation, e.g., computer simulation, combinatorial chemistry, etc., are changing the economics of iterative problem-solving in R&D and are now used in many fields ranging from automotive development to drug discovery. To fully leverage these new forms for increasing R&D performance, however, firms need to rethink their traditional processes...

3) 10 Years of Needle Exchange Research: OR in the AIDS Epidemic, ***Edward H. Kaplan***, Yale University, Sch. of Organization & Mgmt., Box 208200, New Haven, CT 06520-8200, edward.kaplan@yale.edu

Needle exchange programs allow drug injectors to trade used needles for clean ones with the goal of slowing the spread of the AIDS virus. The OR methods developed for evaluating these programs have received prominent attention in the media. Starting with New Haven, Connecticut's legal needle exchange in 1990, OR models have been featured in major reports...

4) Do You Lose if You Cruise? How to Park at the Mall, ***John E. Kobza***, Virginia Polytechnic Institute and State University, Dept. of ISE (0118), 250 NEB, Blacksburg, VA 24061, jkobza@vt.edu, ***C. Richard Cassady***

Frustrated drivers have searched for parking spaces as long as there have been automobiles. We discuss 2 parking strategies. One uses more driving time in hopes of getting a parking space closer to the store. The other quickly chooses a parking space hoping to avoid a lengthy search. An OR model can help to determine which is best.

SC35 Undergraduate OR/MS Project Showcase II

Contributed Session

Chair: Mark R. Parker, USAF Academy, 2354 Fairchild Dr., Ste. 6D2AF Academy, CO 80840, parkermr.dfms@usafa.af.mil

1) Undergraduate OR/MS Project Showcase II

This session will feature student presentations on undergraduate projects completed in senior-level OR case studies and computer simulation courses, as well as independent studies. Participating students represent the US Air Force Academy, US Military Academy, US Naval Academy and US Coast Guard Academy.

Sunday 14:15-15:45

SD03 Wireless Communications: Modeling & Analysis

Sponsor: **IFORS**
Sponsored Session

Chair: Joakim Kalvenes, University of Texas at Dallas, Box 830688, MS JO44, Richardson, TX 75083-0688

1) Tower Location & Channel Allocation in Hierarchical Cellular Systems, ***R. Gupta***, University of Texas at Dallas, Sch. of Mgmt., Box 860688, MS JO44, Richardson, TX 75083-0688, rgupta@utdallas.edu, ***Joakim Kalvenes***

We study the problem of tower location and channel allocation in hierarchical cellular phone systems with minicells, regular cells and macrocells. An integer programming model of the problem, including comsumer demand for service, is formulated and a solution method is proposed.

2) Adoption of Low Earth Orbit Satellite Systems: A Diffusion Model, ***Kemal Altinkemer***, Purdue University, Krannert Grad. Sch. of Mgmt., W Lafayette, IN 47907, ***Wei Thoo Yue***, ***Liang Yu***

LEOS systems provide communication services with one phone number throughout the world in such a way that there is a satellite above you at any point in time. The first mover is IRIDIUM. The follower is the GLOBALSTAR. It is studied with different scenarios to analyze the diffusion process of each system under competition.

3) Routing in Low Earth Orbit Systems, ***Bezalel Gavish***, Vanderbilt University, Owen Grad. Sch. of Mgmt., Nashville, TN 37220, gavishb@ctrall.vanderbilt.edu

The routing of sessions and packets in a LEO system has many features which do not exist in wire or fixed wireless based systems. Routing decisions have an impact on the satellite configuration, satellite capabilities, locations of gateways, type of routings supported by the system, session admission policies and handoff handling policies...

SD04 Computational Mixed Integer Programming

Cluster: Integer Programming
Sponsor: Optimization Section
Sponsored Session
Chair: Eva K. Lee, Georgia Institute of Technology, Sch. of ISyE, Atlanta, GA 30332-0205, evakylee@isye.gatech.edu

1) Mixed Integer Programming Approaches to Pernament Radioactive Seed Implants for Prostate Cancer Treatment, ***Eva K. Lee***, Georgia Institute of Technology, Sch. of ISyE, Atlanta, GA 30332-0205, evakylee@isye.gatech.edu, ***Richard J. Gallagher, Ellis L. Johnson, George L. Nemhauser, Marco Zaider***

MIP models developed to determine optimal seed configurations for radioactive implants for cancer treatment are described. Fast heuristic procedures producing high-quality clinically acceptable plans are discussed. Cutting planes are applied to a perturbed system to close the integrality gap on difficult instances arising from prostate cancer cases.

2) PARINO: A Parallel Branch & Cut Code, ***Jeff Linderoth***, Georgia Institute of Technology, Sch. of ISyE, 765 Ferst Dr., Atlanta, GA 30332-0205, jeff@akula.isye.gatech.edu http://akula.isye.gatech.edu/~jeff, ***Kalyan Perumalla, Martin Savelsbergh***

We describe the design and implementation of PARINO, a parallel B&C code for solving general MIPs. The main issue addressed is how to share globally useful information among the processors which helps guide the search for the optimal solution. Numerous computational results are presented.

3) Valid Inequalities for Some Resource Allocation Problems, ***Alper Atamturk***, University of California, Dept. of IEOR, Berkeley, CA 94720-1777, atamturk@ieor.berkeley.edu, ***George L. Nemhauser, Martin Savelsbergh***

Mixed integer models of a variety of resource allocation problems include a common structure with demand constraints, additive variable upper bounds and mutual exclusitivity constraints on sets of binary decision variables. We derive valid inequalities for this structure and present computational results.

4) A Branch-Cut-&-Price Algorithm for the Capacitated Vehicle Routing Problem, ***Ann Bixby***, Northwestern University, Dept. of IEMS, 2225 North Campus Dr., Evanston, IL 60201, abixby@iems.nwu.edu, ***Collette R. Coullard, David Simchi-Levi***

The VRP is an important problem in logistics. We formulate it as a set-partitioning model and develop a BC&P algorithm for its solution. In particular, we model the pricing problem as an IP, for which we develop a B&C algorithm. Computational results are discussed.

SD06 Decisions & Communication in Product Innovation

Cluster: New Product Development
Sponsor: Technology Management Section
Sponsored Session
Chair: Mohan V. Tatikonda, University of North Carolina, Kenan-Flagler Bus. School, McColl Bldg., CB 3490, Chapel Hill, NC 27599-3490, mohan_tatikonda@unc.edu

1) Beyond the New Product Development Speed Limit, ***Barry L. Bayus***, University of North Carolina, Kenan-Flagler Business Sch., CB 3490, Chapel Hill, NC 27599-3490, barry.bayus@unc.edu

Time-to-market decisions are on the mind of most companies. Trade-offs between time-to-market, product performance and quality, and development costs require consideration. Normative and empirical analyses argue products should not be rushed to market unless a careful analysis of the benefits and costs indicate that this is indeed the best strategy.

2) Decision Making Effectiveness in Virtual New Product Teams, ***Mitzi M. Montoya-Weiss***, North Carolina State University, Dept. of Bus. Mgmt., 132J Nelson Hall, Box 7229, Raleigh, NC 27695-7229, mitzi_montoya-weiss@ncsu.edu

As NPD becomes increasingly global in scope, new product teams are often composed of individuals who are not co-located. Information technology enables dispersed team communication. This study compares the decision making behaviors of co-located and dispersed new product teams. The dispersed teams in this study communicate via Lotus Notes.

3) Challenges in Corporate & University R&D Collaboration, ***Diane H. Sonnenwald***, University of North Carolina, Sch. of Info. & Library Sci., 100 Manning Hall, CB 3360, Chapel Hill, NC 27599-3360, dhs@ils.unc.edu

Corporations and universities establish collaborative relationships to create innovative products and support university research. Such collaborations require employees and faculty to mutually develop the collaborative process. Results of interviews with collaboration participants are presented. Significant challenges that can impede collaboration are rooted in organizational environments, project goals, and interpersonal relationships.

4) Requirements Determination for Time-Paced Software Development, ***Mohan V. Tatikonda***, University of North Carolina, Kenan-Flagler Bus. School, McColl Bldg., CB 3490, Chapel Hill, NC 27599-3490, mohan_tatikonda@unc.edu

Releasing new products on a regular time periodic basis is gaining attention but is not well understood. A major commercial developer of mainframe and shrink-wrap software is examined to identify how results from annual installed-base customer satisfaction surveys can best be used to prioritize product requirements for subsequent releases.

SD07 Public Programs

Contributed Session
Chair: Raymond G. Taylor, North Carolina State University, 652 Swan Point, Bayboro, NC 28515, nidrgt2@unity.ncsu.edu

1) Dynamic Facilities Location Problem with Service Requirement as a Function of Facility Location, ***Reddy Mannur***, Department of Justice OIG/A, 1425 New York Ave., Ste. 5000, Washington, DC 20530, nmannur@hotmail.com, ***James Kendrall***

We present a model for dynamic facilities location in which the demand is a function of the location of the facilities. Heuristic approaches for solving this problem will be presented and different extensions of the problem will be discussed.

2) The Prince's Glasses: Prosthesis, Prism or Magnifying Glasses?... Usefulness & Functions of French Local Observatories, ***Laure Langrand-Escure***, French Local Authorities Observatory, University of Val-de-Marne, 52 rue du Chemin vert, 75011 Paris, France, laure.langrand@hol.fr, ***Philippe Mouton***

The massive increase in number of French local observatories reveals new ways of managing information and decision making. This proliferation also reveals the specificity of the observation function which intend more to be entirely of local decision makers' opinion than to appraise the relevance of the French local authorities' actions.

3) Anticipation of the Impact of Large Suburban Housing Developments on Public School Enrollments, ***Raymond G. Taylor***, North Carolina State University, 652 Swan Point, Bayboro, NC 28515, nidrgt2@unity.ncsu.edu, ***Eleanor E. Hasse***

Using a near point algorithm within a GIS, county tax records were matched with a student database to determine how many students of what age are generated by a large housing development in each of several cost categories. This information was used to anticipate the demand for new school construction.

SD08 Retailing & Distribution Models

Cluster: Marketing
Invited Session
Chair: Charles Gulas, Wright State University, Dept. of Mktg., 266 Rike Hall, Dayton, OH 45435, cgulas@wright.edu

1) Modeling the Effects of Retail Atmospherics, ***Charles Gulas***, Wright State University, Dept. of Mktg., 266 Rike Hall, Dayton, OH 45435, cgulas@wright.edu

Studies have found consumer behavior to be influenced by background music, ambient scent, wall color, crowding, and other factors. However, to date, researchers have not modeled the potentially complex interactions of these factors. We suggest a conceptual model of the atmosphere and suggest directions for modeling research.

2) Acculturation to Shopping among Hispanic People: Does it Mediate Grocery Store Choice?, ***Lucette B. Comer***, Purdue University, Dept. Consumer Sci. & Retail, West Lafayette, IN 47907, comerl@vm.cc.purdue.edu, ***Eun Young Rhee, Ying Xie***

The most rapidly growing ethnic immigrant group in the US is Hispanic people. Representing a variety of national origins in Central and South American, Hispanics are making their presence felt in the US. Using structural equation modeling, we examine the mediating impact of general acculturation and ethnic grocery shopping preferences on the relationship between a set of demographic factors...

3) On the Optimality of Price Discrimination in Industrial Markets, ***Rajeev Tyagi***, University of California, Grad. Sch. of Mgmt., Irvine, CA 92697, rktyagi@uci.edu

We examine the choice between price discrimination and uniform pricing for a monopolistic supplier selling an intermediate product to downstream

manufacturers who differ in their efficiencies of production. We show situations where the supplier prefers uniform pricing over price discrimination even when the buying manufacturers differ in their willingness to pay...

SD09 New Techniques & Issues in Data Mining

Cluster: Knowledge Discovery & Data Mining
Invited Session

Chair: Marvin D. Troutt, Kent State University, Admin. Sciences Dept., Kent, OH 44242, mtroutt@bsa3.kent.edu

1) Multivariate Decision Trees for Data Mining, ***Xiaobai Li***, University of South Carolina, Sch. of Bus., Dept. of MS, 1708 College St., Columbia, SC 29208, lixp8@apanky.badm.sc.edu, ***James R. Sweigart, Michael Wang***

We present a set of multivariate decision tree methods for data mining. The proposed decision trees are built by recursively partitioning the data based on several traditional multivariate classification methods, such as linear discriminant analysis and linear programming. Our preliminary study showed that classification accuracy could be significantly improved using the proposed methods.

2) The Relationship between Data Mining & Knowledge Management, ***Alan T. Burns***, Kent State Univ., Admin. Science Dept., Coll. of Bus. Admin., Box 5190, Kent, OH 44242, aburns@bsa3.kent.edu, ***Marvin D. Troutt***

We envision practical knowledge management as accomplishable using data mining techniques to assist in the process of managing an organization's collective knowledge. Patterns detected from keyword searches of data sets via data mining techniques can be applied toward the development of Intranet web sites and resident expert directories.

3) Mining Completed Jobs Data to Identify Special Competences, ***Gary M. Van Zandt***, Simms Painting Co., Evanville, IN, gmvz@aol.com, ***Suresh K. Tadisina, Marvin D. Troutt***

A data mining study of completed jobs data was carried out at a painting contractor company. An efficiency technique called var* modeling was used to analyze the relationships between actual and expected optimal performances. The results suggest types of jobs and manager assignments which have superior cost and bid performances.

SD10 Progress in Utility Theory

Sponsor: Decision Analysis Society
Sponsored Session

Chair: David Bell, Harvard Business School, Morgan Hall 171, Boston, MA 02163, dbell@hbs.edu

1) Utility Theory & Customer Relationships, ***Luc Wathieu***, Harvard Business School, Morgan Hall, Boston, MA 02163, lwathieu@hbs.edu

In the contemporary world of marketing, suppliers often seek to exchange information with each consumer individually. This paper examines aspects of this practice from a decision theoretic standpoint.

2) Utility Functions with Parameters Dependent on Original Wealth, ***Christian S. Pedersen***, Trinity College, Trinity St., Cambridge, CB2 1TQ, UK, cs.pedersen@econ.am.ac.uk, ***Stephen E. Satchell***

We characterize the class of utility functions whose parameters depend on initial wealth. We discuss extensions of this result to generalized risk characteristics and for two-fund separation.

3) Utility Functions for Wealth, ***David Bell***, Harvard Business School, Morgan Hall 171, Boston, MA 02163, dbell@hbs.edu, ***Peter Fishburn***

We specify all utility functions for wealth implied by various risk conditions applied to four theories of utility.

SD11 Models for Navy Personnel Management

Sponsor: Military Applications Society
Sponsored Session

Chair: N. Keith Womer, University of Mississippi, School of Bus. Admin., University, MS 38677, womer@bus.olemiss.edu

1) An Experimental Investigation of the Serial Cost Sharing Rule, ***Robert E. Dorsey***, University of Mississippi, Sch. of Bus., University, MS 38677, ***Laura Razzolini***

The serial cost sharing rule has been proposed as a method for accurately allocating scarce resources in a manner that accurately reflects the underlying needs. We report the results of experiments that test the serial cost sharing rule and evaluate the degree to which it can be implemented in the field.

2) Maximum Score Estimation of Nuclear Officer Retention Models, ***Walter J. Mayer***, University of Mississippi, Sch. of Bus. Admin., University, MS 38677, ***N. Keith Womer, Tanja Blackstone***

A sample of over 8,000 officers was used computed both maximum score and maximum likelihood estimates of retention models. Comparisons of the estimates reveal that estimates of pay elasticities are sensitive to the assumption of normally distributed errors.

3) Event Pricing & Situational Involvement, ***Kirk L. Wakefield***, University of Mississippi, Sch. of Bus. Admin., University, MS 38677, ***N. Keith Womer***

We investigate the influence of situational involvement in an event on consumers' willingness to attend and their reservation prices. Based upon customer survey data and subsequent attendance data, the results show that knowledge of the influence of these situational factors allow management to set prices which will optimize revenue.

SD12 Session 4

Cluster: Engineering Cost
Invited Session

Chair: Peter C. Brewer, Miami University, Dept. of Accountancy, Oxford, OH 45056

1) The Impact of Activity-Based Costing & Graphical Data Representation on Decision Maker Effectiveness, ***Timothy D. West***, Iowa State University, Dept. of Acct., 300 Carver Hall, Ames, IA 50011-2063, twest@iastate.edu

Information technology continues to serve as a key drive or organizational change. From distributed processing to virtual reality animation, decision makers have access to greater amounts of data in a wider array of formats than ever before. Firms, however, must understand whether the cost of these new technologies exceeds the benefits associated with improvements in decision maker effectiveness...

2) Managing Environmental Costs Using Activity-Based Costing, ***Priscilla S. Wisner***, Thunderbird American Grad. School of Intl. Mgmt., World Business, 15249 N 59th St., Glendale, AZ 85306-6010

Pollution prevention and other environmental costs can be better understood and managed using ABC techniques. In a traditional accounting system, environmental costs are typically considered as overhead or administrative costs and subsequently are treated as "below the line" costs. In some accounting systems these costs are spread to the various products...

3) The Role of Simulation in an Activity Analysis Model, ***Robert J. Campbell***, Miami University, Dept. of Accountancy, Oxford, OH 45056, campberj@muofho.edu, ***Richard H. McClure***

We demonstrate the role of simulation in an activity analysis model that is employed to evaluate decision alternatives that impact activity demand. An example decision, changes in product design, and activity frequency change associated with the design change are investigated using 3 different simulation models. The problem is to assess whether product redesign would be financially beneficial to the firm...

4) Choosing the Right Activity Drivers using Regression Analysis, ***Robert J. Campbell***, Miami University, Dept. of Accountancy, Oxford, OH 45056, campberj@muofho.edu

The validity of ABC systems is based on the presumption of predictive, casual relationships between activity cost pools and selected activity drivers. It may seem logical that a driver, i.e., number of material moves, is appropriate for an activity cost pool such as transporting raw materials to the factory floor...

SD13 Group Decisions & Negotiation

Contributed Session

Chair: Paul Devine, PricewaterhouseCoopers, 1301 Avenue of the Americas, New York, NY 10019-6013, paul.devine@us.pwcglobal.com

1) Risk Analysis Model for Y2K Threats, ***Moufid Karray***, 77 University Crescent # 817, Winnipeg, Manitoba, R3T 3N8, Canada, moufidk@sprint.ca

Two R&D project selection models are proposed. The first (heuristic) is for progressive decision making and the second (LP) for simultaneous one. Both models consider interaction between projects and are based on DEA and multiple decision-making algorithms.

2) Pareto or Oligopoly Dominates the Report of Independent Council, ***Stephen S. T. Kao***, Ctr. for Rating the Presidents Ltd., 30

Illinois St., Racine, WI 53405, stkao@wi.net

The report creates jobs and increases productivity of laywers, reporters, printers, video and the Internet. Should everyone involved declare under oath that he/she nevery committed infidelity or adultery in their life in order to avoid discrimination against our young President? Otherwise, any report or committee should be void.

3) Multiple Dialogues for Synchronous Distributed Groups, *Neji Hajji*, University of Wisconsin, Sch. of Business, PO Box 742, Milwaukee, WI 53201-0742, jahhi@csd.uwm.edu, http://www.uwm.edu/People/hajji

Hajji (1995) proposed MMSTORM as a multimedia-based tool for implementing multiple dialogues in a same-time/same-place group setting. Dennis et al (1997) have shown that multiple dialogues improve the effectiveness of such groups. This research extends MMSTORM to a dynchronous distributed group setting and explores the success factors of multimedia-based tools in such settings.

4) Creating Synthetic Populations for the Forecast of Consumer Behavior, *Paul Devine*, PricewaterhouseCoopers, 1301 Av of the Americas, New York, NY 10019-6013, paul.devine@us.pwcglobal.com, ***Radoslaw A. Zapert***

Multi-agent models utilize populations of software agents as analogues for their real-world counterparts. We describe a methodology, developed at PricewaterhouseCoopers, for the creation of such populations for the representation of consumers making purchasing decisions. These embody the demographics, psychographics and dynamic social structures of target pupulations...

SD14 Constraint Programming & Optimization II

Sponsor: Computing Society
Sponsored Session

Chair: John Hooker, Carnegie Mellon University, Grad. Sch. of Indust. Admin., Pittsburgh, PA 15213, jh38@andrew.cmu.edu

1) Logical Reduction of Integer Programs in General Integer Variables, *John M. Wilson*, Loughborough University, Business School, Leicestershire, LE11 3TU, UK, j.m.wilson@lboro.ac.uk

Most developments at the logic/integer programming interface have involved {0,1} variables. We will consider the possibilities available for more general integer variables in integer programs. Problem reduction and cut generation will be considered from a logic point of view and linked with other work on detection of valid inequalities.

2) On Minimizing Input Data for Getting the Same Quality of Results, *Robert Rodosek*, Imperial College, IC-PARC, London, SW7-2AZ, UK, r.rodosek@icparc.ic.ac.uk

An important issue in network management is to collect "correct" data which are needed to solve network problems. A network problem is to recognize data flows among all nodes of the network. We present a constraint-based approach to solve this class of problems with minimum input data from a network node manager platform.

3) New Relaxations for Discrete Problems, *John Hooker*, Carnegie Mellon University, Grad. Sch. of Indust. Admin., Pittsburgh, PA 15213, jh38@andrew.cmu.edu

We describe a discrete relaxation based on a projection operation that reduces the induced width of the problem's dependency graph. The relaxation is solved by nonserial dynamic programming. An example is given for integer programming, but the method is more general.

4) A Combined Constraint Programming & Mathematical Programming System for Discrete Optimization, *Susanne Heipcke*, University of Buckingham, Sch. of Bus., Buckingham, MK18 1EG, UK, susanne@buckingham.ac.uk

We describe a system combining a commercial linear mixed-integer software with a finite domain constraint programming tool. First, we outline corresponding and complementary features of the 2 methods. This is followed by an overview on the implementation. The combined modeling and problem solving approach has been applied to test problems of different types and dimensions. We comment on the results.

SD15 Issues of Pricing, Costing & Inventory in Supply Chains

Cluster: Supply Chain Management
Invited Session

Chair: Joseph Milner, Washington University, Olin Sch. of Bus., One Brookings Dr., St. Louis, MO 63130, milner@wuolin.wustl.edu

1) Combined Pricing & Inventory Control under Uncertainty, *Aliza R. Heching*, IBM Corporation, PO Box 218, Yorktown Heights, NY 10598, ars9@columbia.edu

We address simultaneous determination of pricing and inventory replenishment strategies in a multi-retailer system facing demand uncertainty. We consider the impact of supply coordination and various pricing rules on overall system profits. We develop analytical approximations as well as simple, yet close-to-optimal, heuristic strategies.

2) Collaborative Forecasting in Supply Chains, *Yossi Aviv*, Washington University, Olin Sch. of Bus., One Brookings Dr., CB 1133, St. Louis, MO 63130-4899, aviv@wuolin.wustl.edu

In an attempt to streamline their supply chains, companies have engaged in information sharing practices and/or have established different types of coordination partnerships. We investigate the potential benefits of collaborative forecasting in centralized as well as in decentralized supply chains.

3) Production Planning & Pricing in a Multiple Item/Multiple Retailer Environment, *Joseph Milner*, Washington University, Olin Sch. of Bus., One Brookings Dr., St. Louis, MO 63130, milner@wuolin.wustl.edu, ***Meir J. Rosenblatt***

We consider how pricing affects supplier production planning and profitability in a multiple item/multiple retailer environment. We present a stochastic program which models suppliers' reaction to buyers' orders for short life-cycle goods where initial forecasts are updated by a common revelation. We present examples showing how pricing discounts can be effectively used.

SD16 Modern Manufacturing in Practice

Cluster: Modern Manufacturing
Invited Session

Chair: Scott T. Webster, Syracuse University, Sch. of Mgmt., Syracuse, NY 13244-2130, stwebste@syr.edu

1) Inductive Approach to Developing Practical Mathematical Programming Based Approaches to Industrial Scale Planning & Scheduling Problems, *Joseph F. Pekny*, Purdue University, Sch. of Chemical Eng., 1283 CHME, W Lafayette, IN 47907-1283, pekny@ecn.purdue.edu

Mathematical programming-based approaches to scheduling and planning problems promise a significant degree of flexibility, robustness, extensibility and scalability. However, achieving this promise in practice requires overcoming several barriers. We will review progress in the development of practical mathematical programming based approaches for large-scale problems.

2) Crew Constrained Scheduling & Modeling Issues, *Ken N. McKay*, Memorial University of Newfoundland, Fac. of Bus. Admin., St. Johns, NFL, N2K 2G4, Canada, kenmckay@morgan.ucs.mun.edu

Manufacturing personnel sometimes work together in crews and it may be possible to pause a job on one resource while the crew moves to another resource. These and other characteristics confound the scheduling problem. We discuss these types of issues based on an ongoing field study on production control practices.

3) Decomposition Procedures for Scheduling Reentrant Flowshops, *Ebru Demirkol*, Purdue University, School of IE, 1287 Grissom Hall, West Lafayette, IN 47907-1287, demirkol@ecn.purdue.edu, ***Reha Uzsoy***

We address the problem of scheduling reentrant flowshops to minimize maximum lateness in the presence of sequence-dependent setup times. We focus on developing tailored subproblems and solution procedures and report on computational experience.

4) Evolutionary Algorithm Design, *Scott T. Webster*, Syracuse University, Sch. of Mgmt., Syracuse, NY 13244-2130, stwebste@syr.edu

We describe a GA approach to algorithm design. Members of the population are computer programs that can take, for example, an instance of a scheduling problem as input and return a schedule. As the population evolves, new and potentially more effective algorithms are generated. We also report computational experience.

SD17 Theoretical Frameworks for Space Applications

Cluster: Space Applications of Operations Research
Invited Session

Chair: Richard C. Staats, MITRE Corporation, 1820 Dolley Madison Blvd., McLean, VA 22102-3481, staats@alum.mit.edu

1) The Multicriteria Optimization: An Axiomatic Approach,

Yuriy M. Pochtman, Dnepropetrovsk State University, Gusenko str. 4/6, ap. 30, Dnepropetrovsk, 320005, Ukraine, yuriy@ump.dp.ua

The multicriterial problems appear in the majority of real design problems in space applications. For the approach to solution of multi-criterial problems of space application, proposed in this paper, such an additional information is uniqueness and axiomatic properties (optimality by Paretto) of the solutions, obtained on a base of maxmin.

2) Tracking System Interoperability of Emerging Telecommunication Systems, ***John Manecke***, MITRE Corporation, 1820 Dolley Madison Blvd., McLean, VA 22102-3481, jmanecke@mitre.org

With the increasing availability of new wireless and land based telecommunications systems, the need to track and understand how systems can interact with these telecommunications services is paramount. The Levels of Information System Interoperability (LISI) construct is used to understand interoperability. This paper proposes a methodology for tracking emerging telecommunications systems and devices.

3) Multi-Planar Cutting of the Gordian Knot of Space-Based Communications, ***Richard C. Staats***, MITRE Corporation, 1820 Dolley Madison Blvd., McLean, VA 22102-3481, staats@alum.mit.edu

Spaced-based communications are not new, but the variety of applications is. Governments and commercial consumers need a framework to determine the most effective use of resources for near and mid-term strategies. We provide a framework for analyzing space based costs and effectiveness.

SD18 Optimization Applications in Finance & Economics

Cluster: Linear Programming
Sponsor: Optimization Section
Sponsored Session
Chair: June Dong, SUNY, Sch. of Bus., Oswego, NY 13126, dong@oswego.edu

1) A Comparative Study of Several Policy Incentives for Developing Health Claims, ***Jie Pan***, St. Joseph University, Dept. of Math & Comp. Sci., Philadelphia, PA 19131, jpan@mailhost.sju.edu, ***Nancy M. Childs***

We build market equilibrium models of the food industry under various regulatory incentives on the use of health claims. These incentives include market exclusivity and tax credit for R & D expenditures. We then compute the market equilibria and compare the total industry R & D investments as a measure for the effectiveness of the incentives.

2) Variational Inequalities for Marketable Pollution Permits with Technological Investment Opportunities: Case of Oligopolistic Markets, ***Kanwalroop Dhanda***, University of Portland, Sch. of Bus. Admin., Portland, OR 97203-5798, dhanda@up.edu, ***Anna Nagurney***

We develop a variational inequality framework for the modeling, qualitative analysis, and computation of equilibrium patterns in multiproduct, multipollutant oligopolistic markets with marketable pollution permits along with opportunities for investment in production technology and/or emission-abatment technology. The model deals explicitly with spatial differentiation and also guarantees that the imposed environmental standards are met through the initial allocation of licenses...

3) A Theory of Price Bias, ***Taiji Watanabe***, Monash University, Dept. of Accounting & Finance, Caufield, Victoria, Australia

We discuss price bias in the contingent market such as derivatives contract or forward contract market. A 2-agents-2-period model is considered. Risk-averse agents produce and consume the stochastic goods are considered. We suggest that contingent market prices are in general deviate from the true mean price of stochastic goods...

4) Strategic Pricing of New Products, ***Ngome Ntoko***, SUNY, Sch. of Bus., Oswego, NY 13126, ntoko@oswego.edu, ***June Dong***

An investigation of strategic pricing decisions by an innovating firm that seeks to introduce a new product and at the same time deter competition in the market for the product. We study the conditions under which the firm might use price as a strategic variable that minimizes short-run profits in order to limit long-run competition under varying production and capital costs assumptions.

SD19 Deterministic Machine Scheduling

Cluster: Scheduling
Invited Session
Chair: Chung-Lun Li, Washington University, Olin Sch. of Bus., One Brookings Dr., St. Louis, MO 63130, lichung@mail.olin.wustl.edu

1) Optimal Discrete-Valued Control for Manpower Planning & Scheduling, ***Xiaoqiang Cai***, Chinese University of Hong Kong, Dept. of Systems Eng., Shatin NT, Hong Kong, xqcai@se.cuhk.edu.hk

It is very important for those at high management levels to obtain optimal solutions for their manpower planning problems. We post, and thus solve, such a problem as an optimal discrete-valued control problem in discrete time.

2) Analysis of Heuristics for Some Single Machine & Flowshop Models, ***Philip M. Kaminsky***, University of California, Dept. of IE/OR, Berkeley, CA 94720-1777, kaminsky@vanguard.ieor.berkeley.edu, ***Hui Liu***, ***David Simchi-Levi***

We present recent results involving probabilistic analysis of some static and dynamic single machine and flowshop scheduling models with the following objectives: minimizing total completion time and minimizing maximum lateness objectives.

3) withdrawn - author request of 3/15, ***Chen-Sin Lin***, Bradley University, IMET Dept., 1501 W. Bradley Ave., Peoria, IL 61625, ***Chung-Yee Lee***

4) Single Machine Earliness-Tardiness Scheduling with Arbitrary Weights & Unit Processing Times, ***Surya D. Liman***, Texas Technical University, Dept. of IE, Lubbock, TX 79409, sliman@coe.ttu.edu, ***Shrikant S. Panwalkar***

We consider a single machine, deterministic scheduling problem with unit processing times and common due date. The objective is to find an optimal sequence and due date that minimize the sum of due date and weighted earliness-tardiness penalties. We show that the problem can be transformed into an assignment problem of size n x 2n.

SD20 Modeling Strategic Behavior in Competitive Electricity Markets

Cluster: Energy
Sponsor: Section on Energy, Natural Resources & Environment
Sponsored Session
Chair: Aleksandr Rudkevich, Tellus Institute, 11 Arlington St., Boston, MA 02116, arudkevi@tellus.org

1) The Role of Reactive Power/Voltage Support in Creating Market Power, ***Marija Ilic***, MIT, Dept. of EECS, Bldg. 10-059, 77 Massachusetts Ave., Cambridge, MA 02139, ilic@mit.edu, ***Tay Yong Yoon***, ***Chien-Ning Yu***

Power transmission system transfer bottlenecks are often related to the lack of voltage support, not to the thermal limits of transmission lines. We explore the market structure for reactive power/voltage control services, analyze the market power potential in systems with no such market and present results for the NEPOOL grid.

2) Exploring Repeated Game Play in Electric Power Pools using Agent-Based Simulation, ***Christopher J. Day***, London Business School, Sussex Place, Regents Park, London, NW1 4SA, UK, cday@lbs.ac.uk, ***Derek W. Bunn***

An agent-based simulation approach is applied to understanding the repeated interaction of generating companies in an England- and Wales-type electric power pool. To account for the repeated interaction, we investigate scenarios where companies optimize behavioral variables such as market share and price in addition to next period profit.

3) Analysis of Regional Transmission Systems, ***Robert T. Eynon***, Energy Information Administration, 1000 Independence Ave., SW, Washington, DC 20585, eynon@eia.doe.gov

We present results of a full alternating current analysis of electric transmission systems using the North American Electric Reliability Council regions. Issues related to market power, voltage support, reliability, and inter-regional trades will be discussed. Data and computational issues will be presented.

4) Using Methods of Optimal Control Theory to Analyze Strategic Behavior in Poolco-Type & Bilateral Power Markets, ***Aleksandr Rudkevich***, Tellus Institute, 11 Arlington St., Boston, MA 02116, arudkevi@tellus.org, ***Max Duckworth***

We apply the formalism of the Pontryagin maximum principle to obtain equilibria conditions in SFE-based games in poolco and bilateral models of wholesale power markets. We present illustrative closed-form solutions and numerical results to demonstrate the impacts of strategic behavior on electricity prices, market power and asset valuation.

SD21 Project Management

Contributed Session

Chair: Eunsang Yoon, University of Massachusetts, Dept. of Mktg, Coll. of Mgmt., 1 University Ave., Lowell, MA 01854

1) An Analytic Model for Project Risk Adjustments, ***Miao Fan***, NDMC, Dept. of Bus. Admin., PO Box 90046-15, Jung-ho, Taipei, 23500, Taiwan, ROC, mfan@rs590.ndmc.edu.tw, ***Neng-Pai Lin***

Most project risk management researchers focus on identifying and assessing the risk and making a choice among those specified alternatives. The possibility of adjusting the risky situation was ignored by those researchers. We defined 2 risk-adjustment strategies, then developed an analytic model where the associated cost of the strategies was included...

2) Diversity & Teamwork Performance: Project Group Organization & Interactive Learning, ***Eunsang Yoon***, University of Massachusetts, Dept. of Mktg, Coll. of Mgmt., 1 University Ave., Lowell, MA 01854

We investigate the relationship between the diversity of team members' experience and career plan and their project performance in the classroom business-planning environment. Empirical results indicate that the diversity can be utilized in a number of ways for enhancing the instructional effectiveness and the project-based learning.

3) Research & Development Project Planning Subject to Task Success Uncertainty, ***Steven J. Honkomp***, Procter & Gamble, 4550 Este Ave., Cincinnati, OH 45232, honkomp.sj@pg.com, ***Dharmashankar Subramanian***, ***Joseph F. Pekny***, ***G. V. Reklaitis***

We present an MILP to solve the pharmaceutical R&D pipeline planning problem with multiple projects and constrained resources. To encompass tasks which have a significant probability of terminating projects, the MILP incorporates success probabilities in the objective function and constraints. Results demonstrate performance improvements obtained by considering uncertainty at the planning stage.

4) Decision-Making in Multinational Enterprises: A Case for Global R&D Effort Allocation?, ***Joris Meijaard***, Erasmus University Rotterdam, Burg Oudlaan 50, Rm. H8-26, Rotterdam, 3062 PA, The Netherlands, meijaard@few.eur.nl

We present results of a comparative study of innovation decision-making in multinational enterprises. A set of R&D projects is analyzed at matched pairs of Dutch and American chemical and food company sites, obtaining practical results on the management of corporate R&D. Econometric techniques are used to analyze the dynamic allocation of efforts in various R&D contexts.

5) A Decomposition Approach to a Min Lag Precedence, Multi-Modal Models, ***John C. Van Hove***, Air Force Logistics Mgmt. Agency, AFLMA/LGY, 501 Ward St., Maxwell AFB, AL 36114, john.vanhove@aflma.gunter.af.mil, ***Richard F. Deckro***

A large-scale project/program scheduling program is developed and solved via integer decomposition. The model is presented and characterized. Acceleration approaches for the decomposition model are developed. Computational results and an illustrative example are presented.

SD22 Production Planning for Green Manufacturing

Cluster: **Green Manufacturing**

Invited Session

Chair: Jonathan Linton, NJIT, Multi-Lifecycle Eng. Res. Ctr., University Heights, Newark, NJ 07102-1982

1) Evaluating Models for Optimizing Production Planning in Remanufacturing, ***Jeff Smith***, Texas A&M University, 239A Zachry Eng. Ctr., College Station, TX 77843-3131, ***Brett A. Peters***, ***James Curry***, ***Sira Thienpaitoon***

Remanufacturing is often complicated by stochastic yield rates and processing times due to random product return condition. This research uses simulation as a test bed for evaluating optimization models by directly embedding the models within a simulation. The software was developed to work with commercial databases to reduce costs.

2) Production Planning & Control in Green Supply Chains, ***Erdem Eskigun***, Purdue University, 1287 Grissom Hall, Sch. of IE, West Lafayette, IN 47907, ***Reha Uzsoy***

We have developed a MILP model for a green supply chain. Due to difficulties in obtaining optimal results in a short amount of time, we have developed heuristics to obtain good solutions in modest CPU time. One of these algorithms is based on iterative rounding scheme while the other is motivated by decomposition approach.

3) Queueing Models for Remanufacturing Systems Design, ***V. Daniel R. Guide, Jr.***, Suffolk University, Sawyer School of Mgmt., Mgmt. Dept., 8 Ashburton Pl., Boston, MA 02108-2770

A typical remanufacturing system consists of disassembly operations, remanufacturing operations, and reassembly operations. We develop queuing network models for remanufacturing production systems and present approximate solutions. These approximations are quite robust and may be used to provide guidelines for system planners.

4) Managing a Remanufacturing Facility, ***Geraldo Ferrer***, University of North Carolina, Kenan-Flagler Business Sch., Chapel Hill, NC 27599, geraldo_ferrer@unc.edu, ***Clay Whybark***

We describe a management information system with an embedded DSS that facilitates managing a remanufacturing facility. The information system is based on material requirements planning logic (something that many firms in the industry are familiary with) and the DSS is based on LP.

SD23 Panel: Publishing Outlets for Technology & Innovation Management Research

Sponsor: **Technology Management Section**

Sponsored Session

Chair: Michael K. Badawy, Virginia Tech., PO Box 3987, Merrifield, VA 22116-2931, mbadawy@vt.edu

1) Panel: Publishing Outlets for Technology & Innovation Management Research, ***Abbie Griffin***, University of Illinois, 350 Commerce West, Champaign, IL 61820, abbieg@uiuc.edu, ***Linda Argote***, Carnegie Mellon University, Grad. Sch. of Indust. Admin., Pittsburgh, PA 15213, argote@andrew.cmu.edu, ***Robert M. Mason***, Case Western Reserve University, Weatherhead Sch. of Mgmt., 10900 Euclid Ave., Cleveland, OH 44106-7235, rmm3@po.cwru.edu, ***Michael K. Badawy***, Virginia Tech., PO Box 3987, Merrifield, VA 22116-2931, mbadawy@vt.edu

This panel of 4 technology and innovation management journal editors will present information related to the editorial policies, topical interests and scope and domain of their respective journals. An ample opportunity for discussing issues and guidelines for potential authors will follow.

SD24 Panel: Teaching with Cases

Sponsor: **Financial Services Section**

Sponsored Session

Chair: Mark N. Broadie, Columbia University, Grad. School of Bus., 415 Uris Hall, 3022 Broadway, New York, NY 10027-6902, mbroadie@research.gsb.columbia.edu

1) Panel: Teaching with Cases, ***Robert L. Carraway***, University of Virginia, Darden School, Box 6550, Charlottesville, VA 22906-6550, rlc6g@virginia.edu, ***Dana R. Clyman***, University of Virginia, Darden School, Charlottesville, VA 22906-6550, clymand@darden.gbus.virginia.edu, ***James Mote***, RPI, Lally Sch. of Mgmt., Troy, NY 12180, mote@acm.org, ***Mark N. Broadie***, Columbia University, Grad. School of Bus., 415 Uris Hall, 3022 Broadway, New York, NY 10027-6902, mbroadie@research.gsb.columbia.edu

In recent years, we have witnessed a significant increase in the utilization of cases in OR/MS courses, especially cases having financial components or addressing financial applications. Many of us are still learning how best to do this. Here, a panel will share perspectives on their experiences, discussing such questions as: what are your favorite cases?...

SD25 Collaborative Decision Making in Air Traffic Management

Sponsor: **Transportation Science Section**

Sponsored Session

Chair: Michael O. Ball, University of Maryland, Smith Sch. of Business, Inst. for Systems Research, College Park, MD 20742-1815, mball@rhsmith.umd.edu

1) Collaborative Allocation of Airport Capacity, ***William D. Hall***, MIT, OR Ctr., Cambridge, MA 02139, whall@alum.mit.edu, ***Amedeo Odoni***

The collaborative decision making (CDM) initiative of airlines and the FAA has substantially improved the operation of ground delay programs which consider arrival traffic only. We consider the extension of CDM to departure traffic. The additional flexibility such an approach would provide and the impact on configuration planning, departure planning and flow management is studied.

2) New Metrics for Efficiency & Data Quality in Air Traffic Management, ***Robert L. Hoffman***, University of Maryland, AVW

Bldg., Inst. for Systems Research, College Park, MD 20742, hoff@isr.umd.edu

With the recent movements in air traffic management to improve predictive capabilities and to move toward a more collaborative decision making environment, there has arisen a need for metrics to assess the success of large-scale efforts. We present metrics designed to measure the efficiency of ground delay actions and the predictive capabilities of recently improved databases...

3) Increasing Airline Operational Control in a Constrained Air Traffic System, ***Jennifer R. Goodhart***, University of California, Dept. of IE & OR, 4135 Etcheverry Hall, Berkeley, CA 94720, goodhart@ieor.berkeley.edu, ***Candace A. Yano***

We develop a method to reduce airspace congestion and transit delays while simultaneously giving airlines more influence in the selection of departure slots and aircraft trajectories. We describe data requirements, the problem formulation, a solution approach and implementation issues, including the impact of this approach on FAA and airline operations.

4) An Analysis of Alternate Models for the Fair Allocation of Resources in Ground Delay, ***Thomas Vossen***, University of Maryland, Smith Sch. of Business, Inst. for Systems Research, College Park, MD 20742, tvossen@rhsmith.umd.edu, ***Michael O. Ball***

A recent paradigm change, collaborative decision making, has affected the implementation of ground delay programs. We discuss the resource allocation models used and propose alternative models. Properties of these models are analyzed, particularly related to the fairness of the FAA-airlines collaboration process.

SD26 Quality & Reliability

Sponsor: Quality, Statistics & Reliability Section
Sponsored Session

Chair: Kwok-Leung Tsui, Georgia Institute of Technology, Sch. of ISyE, Atlanta, GA 30332, ktsui@isye.gatech.edu

1) A Minimum Bias Latin Hypercube Design, ***Kurt Palmer***, University of Southern California, Dept. of ISE, Los Angeles, CA 90089-0193, kpalmer@usc.edu, ***Kwok-Leung Tsui***

We develop a design for data collection from deterministic process simulators when it is intended that the data will be used to generate a meta model of the simulator. The design is a compromise between empirical model bias reduction and dispersion of the points within the input variable space. We compared its performance to that of other designs...

2) Estimating Distributions with Increasing Failure Rate in an Imperfect Repair Model, ***Paul Kvam***, Georgia Institute of Technology, Sch. of ISyE, Atlanta, GA 30332, pkvam@isye.gatech.edu

A failed system is repaired imperfectly (or minimally) if after failure, it is restored to the working condition of an identical system of the same age. We extend the nonparametric maximum likelihood estimator of a system's lifetime distribution function to test units known to have an increasing failure rate...

3) Use of Compound Noise Factor in Parameter Design Experiments, ***Xiaoli Hou***, University of Michigan, Dept. of Stats. & IOE, Ann Arbor, MI 48109-1027, ***C. F. Jeff Wu***

The technique was recommended for reducing the size of parameter design experiments. It works by selecting a few "extreme" conditions in the noise factors and "compounding" them into a single factor. We study its performance through analysis, simulations and comparison with the method of single arrays on real experiments.

4) Control Charts for Monitoring a Production Proportion, ***Zachary G. Stoumbos***, Rutgers University, Dept. of MS/IS, Fac. of Mgmt., 180 University Ave., Newark, NJ 07102-1895, stoumbos@andromeda.rutgers.edu, ***Marion R. Reynolds, Jr.***

CUSUM charts for monitoring a proportion p can be based on the binomial or Bernoulli distributions. A highly efficient control chart for monitoring p is proposed that is based on using sequential sampling at each sampling point. This chart is shown to detect shifts in p much faster than the CUSUM and Shewhart p charts.

SD27 Control of Networks under Differentiated QoS

Sponsor: Applied Probability Society
Sponsored Session

Chair: Constantinos Maglaras, Columbia University, Grad. Sch. of Bus., Uris Hall, 3022 Broadway, New York, NY 10027-6902, c.maglaras@columbia.edu

1) Power Control & QoS in Wireless Communication Networks, ***Mor Armony***, Stanford University, Dept. of EES & OR, Terman Eng. Ctr., Stanford, CA 94305-4023, armony@leland.stanford.edu, ***Nicholas Bambos***

Consider a wireless communication system with N nodes that interfere with each other when transmitting in the same channel. Messages that arrive to the system incur both transmission and queueing delays. Delays can be reduced by increasing transmission power. We examine centralized and distributed power control policies that guarantee a target average delay (QoS) while maintaining low power levels.

2) Differentiated QoS: Joint Pricing & Scheduling, ***Jan A. van Mieghem***, Northwestern University, Kellogg Sch. of Mgmt., MEDS Dept., 2001 Sheridan Rd., Evanston, IL 60208-2001, vanmieghem@nwu.edu

We analyze an integrated model for pricing and internal dynamic control of multi-class processing systems where QoS is measured by non-linear delay cost functions. Scheduling rules are endogeneous and we show that grades of service need not imply priority status. We connect to QoS guarantees.

3) Dynamic Control for Multiclass Networks with QoS Specifications, ***Constantinos Maglaras***, Columbia University, Grad. Sch. of Bus., Uris Hall, 3022 Broadway, New York, NY 10027-6902, c.maglaras@columbia.edu

We consider an open multiclass queueing network with differentiated QoS specifications such as guaranteed total delay bounds and blocking or overflow probabilities for each exogenous arrival stream. Using fluid approximations and an elementary large deviations analysis, we describe a family dynamic control policies, each of which guarantees the QoS specifications.

4) Rough Asymptotics for Tandem Non-Homogeneous M/G/ Infinity Queues via Poissonized Empirical Processes, ***Tim Zajic***, Univ. of Minnesota, Sch. of Math. 127 Vincent Hall, 206 Church St. SE, Minneapolis, MN 55455, zajic@math.umn.edu

We obtain large and moderate deviations principles for the joint distribution of the queue length and departure processes for tandem M/G/infinity queues. The results follow from large and moderate deviations principles for Poissonized empirical processes. As an application, we study how large queue lengths and numbers of departures build up.

SD28 Logistics: Design Issues

Contributed Session

Chair: Rakesh Nagi, SUNY, 342 Bell Hall, Box 602050, Buffalo, NY 14260, nagi@eng.buffalo.edu www.acsubuffalo.edu/~nagi

1) Fleet Sizing in the Truck Rental Industry with Dynamic & Stochastic Considerations, ***Peiling Wu***, Lehigh University, IMSE Dept., Mohler Lab, 200 W. Packer Ave., Bethlehem, PA 18015, pew2@lehigh.edu, ***Joseph C. Hartman***, ***George R. Wilson***

We address fleet sizing in the context of the truck rental industry, subject to nonstationary stochastic demand and uncertain travel times. A time-space network is developed and solved through both transient and steady state analysis. Decomposition procedures are applied to allocate demand among the heterogenous assets.

2) Determination of the Number of Automated Guided Vehicles in an Automated Container Terminal, ***Iris F. A. Vis***, Erasmus University, Rotterdam Sch. of Mgmt., PO Box 1738, Rotterdam, 3000 DR, The Netherlands, ivis@fac.fbk.eur.nl

To unload and load containerships quickly, new techniques and methods which allow effective coordination of all activities at a terminal have to be developed. We give methods that solve one of the problems that arise, namely the determination of the number of AGVs necessary to carry out all jobs.

3) Statistical Inventory Management, ***Jack Bonney***, ***Alex Bangash***

Bell Laboratories inventories requirements planning system implementation at their fiber optics apparatus plant helped decrease inventory levels, while increasing service levels. The process is characterized by the effective use of statistical tools integrated with ERP. Additionally, instrumentation and gauges measure the impact of forecast and supply plans in terms of inventory.

4) Integrated Distribution System Design with Warehouse Location & Logistics, ***Milind M. Mehere***, i2 Technologies, Inc., 565 Technology Sq., 9th Fl., Cambridge, MA 02139, milind_mehere@i2.com http://www.i2.com, ***Rakesh Nagi***, ***Joyendu Bhadury***

We address the warehouse location problem, involved in a multi-location, multi-destination, integrated distribution system set-up to minimize total

transportation costs using an MILP formulation. We also develop a K-mean heuristic algorithm for locating warehouses when the number of new potential sites is large. We present an industrial case of a large office products' distribution company, solution approaches and numerical results.

SD29 Advances in Global Operations Management & Technology

Sponsor: Manufacturing & Service Operations Management Society Sponsored Session

Chair: Aleda V. Roth, University of North Carolina, Kenan-Flagler Bus. Sch., Carroll Hall CB 3490, Chapel Hill, NC 27599-3490, aledaroth@unc.edu

1) Globalization, Agglomeration Economies, Knowledge & Technology Influences, ***M. Therese Flaherty***, University of Pennsylvania, Wharton Sch., Ste. 1310 SH-DH, 3620 Locust Walk, Philadelphia, PA 19104-6366, flahery@wharton.upenn.edu

Globalization, agglomeration and network economies, knowledge and technology are all understood to have interacting effects on internationalizing industries. We examine the history of firms of one successful and growing "global" industry to attempt to identify the effects and form of these influences on firm and industry performance.

2) Aligning Global Logistics with Product Design through Segmentation, ***Ricardo Ernst***, Georgetown University, Sch. of Bus., 37th & O St. NW, Washington, DC 20057, ernstr@gunet.georgetown.edu, ***Robert Thomas***

We study the role and influence of global logistics on product design and how both may be better aligned to enhance competitiveness and profitability. The key proposition driving our research is that by segmenting stakeholders at various levels of the supply chain and aligning them with traditional need-based market segments, product design resource allocation efficiencies...

3) Development of International Facility Networks with Financing, Trade Tariff & Tax Considerations, ***Panos Kouvelis***, Washington University, Olin Sch. of Business, St. Louis, MO 63130-4899, kouvelis@mail.olin.wustl.edu

We will discuss the design of global facility networks. A mathematical programming model captures essential design tradeoffs of such networks and explicitly incorporates government subsidies, trade tariffs and taxation issues. Focusing our analysis on special cases of the problem enables us to provide useful insights on preferable international facility networks for various environments.

4) Managing Assets in Global Operations, ***Anil Khurana***, Boston University, Sch. of Mgmt., 595 Commonwealth Ave., Boston, MA 02215, ***Aleda V. Roth***

We will present an emerging framework that derives from 4 points of departure from earlier paradigms of strategy and global operations. The first 2 shifts are strategic and independent in the global dimension, while the next 2 are key shifts in the area of global management.

SD30 Industry Applications of Supply Web Decision Systems

Sponsor: Manufacturing & Service Operations Management Society Sponsored Session

Chair: Raj Veeramani, University of Wisconsin, Dept. of IE, 1513 University Ave., Madison, WI 53706

1) A Large-Scale Aggregated Production Planning System at Motorola, ***Tianbing Qian***, Motorola, Inc., 3701 E. LaSalle St., Phoenix, AZ 85040, a13581@email.sps.mot.com, ***George Baartmans***

We describe a large-scale rough-cut capacity planning system, intelligent global optimization replanner (IGOR) that was developed at Motorola. The system uses LP at its planning engine, employs state-of-the-art software and hardware architecture and is used across Motorola Semiconductor Products Sector to improve its capacity utilization and on-time delivery. We will discuss the model...

2) withdrawn - author request of 3/29, ***Rajesh Gangadharan***, 909 E Las Colinas Blvd., 16th Fl., Irving, TX 75039, rajesh_gangaadharan@i1.com

3) Decision Support Systems for Rapid Cost Estimating & Quoting, ***Raj Veeramani***, University of Wisconsin, Dept. of IE, 1513 University Ave., Madison, WI 53706, ***Narayanan Viswanathan, Kumaran Jayaram, Wei-Chin Hsieh***

We will describe and demonstrate a variety of Internet technology-based DSSs that enable new paradigms for processing RFQs in various manufacturing industries, e.g., foundries, sheet metal fabrication, machining and equipment building. Examples based on actual industry implementations will be provided.

SD31 Facility Layout

Contributed Session

Chair: Jay B. Ghosh, SQU, PO Box 292439, Dayton, OH 45429-0439, jhgosh@squ.edu.com

1) Concurrent Design of Facility Layout & Automated Guided Vehicle Guidepath Design, ***Fataneh Taghaboni-Dutta***, University of Michigan, Sch. of Mgmt., Flint, MI 48502-2186

Facility layout has a significant impact on the cost and efficiency of short-term operations such as the efficienty of AGVs. The overall objective is to have an efficient layout that permits the smooth flow of AGVs. We investigate a concurrent approach to facility layout and AGV guidepath design.

2) A Heuristic Procedure for Multi-Year, Dynamic Facility Layout Problems, ***Yavuz A. Bozer***, University of Michigan, 1205 Beal Ave., Ann Arbor, MI 48109-2117, yavuz.bozer@umich.edu, ***Chi-Tai Wang***

Dynamic, multi-year facility layout problems are difficult (in a computational and modeling sense) yet are very significant in practice. We preseht a heuristic procedure to tackle the problem and discuss some of the modeling challenges and their implications for real-world dynamic layout problems.

3) Determining a Layout for a Parallel Aisle Warehouse, ***Kees Jan Roodbergen***, Rotterdam School of Management, PO Box 1738, Rotterdam, 3000DR, The Netherlands, kroodbergen@fac.fbk.eur.nl

In parallel aisle warehouses, order pickers can change from 1 picking aisle to another at a number of cross aisles. Average orderpicking time is highly dependent on the number and location of these cross aisles. We give methods to predict travel times and to determine a good layout.

4) New Heuristics for the Dynamic Layout Problem, ***Jay B. Ghosh***, SQU, PO Box 292439, Dayton, OH 45429-0439, jhgosh@squ.edu.com, ***John T. Simon***

The dynamic layout problem arises when material flows between facilities change over time. In such situations, relocating the facilities is expensive but may be warranted. The challenge is to find the initial layout and the sequence of relocations which minimize overall cost. The problem being NP-hard, we propose heuristic solutions.

SD32 Models of Electronic Market Microstructure

Cluster: Telecommunications & Electronic Commerce

Invited Session

Chair: Arun Sundararajan, NYU, Stern Sch. of Bus., 44 W 4th St., MEC 9-79, New York, NY 10012, asundara@stern.nyu.edu

1) The Microstructure of Electronic Markets: An Overview, ***Arun Sundararajan***, NYU, Stern Sch. of Bus., 44 W 4th St., MEC 9-79, New York, NY 10012, asundara@stern.nyu.edu

The microstructure of electronic markets differs significantly from that of traditional markets. An overview of these differences is illustrated through a series of models, covering the methods of price discovery and formation, how buyers and sellers are co-ordinated, the mechanism by which the markets clear, market quality, liquidity and immediacy.

2) Electronic Markets & Supply Chains: Interactions & Implications, ***Vinai Trichur***, University of Maryland, College Park, MD 20742

The proliferation of electronic markets and the refinement of technologies for searching and tapping into these markets is changing the way firms design products and manage their supply chains. We formulate mathematical models that capture these interactions and examine their implications for product design and supply chain management decisions.

3) The Impact of Intelligent Agents on Electronic Markets at Equilibrium, ***Ravi Arunkundram***, NYU, Stern Sch. of Bus., 44 W 4th St., MEC 9-79, New York, NY 10012, ***Shivakumar Viswanathan***

We analyze the impact of introducing an intelligent agent in an electronic market on the distribution of buyer and seller surplus, the resulting price dispersion, whether there are incentives to invest in technology and if a third party can viably provide an intelligent agent to optimize social welfare.

SD33 Supply Chain Optimization at Hunt Wesson, Inc.

Cluster: Novel Applications of Statistics

Invited Session

Chair: Sudhir Mallya, Hunt Wesson Inc., 1645 W Valencia Dr., Fullerton, CA 92833, smallya@hwfoods.com

1) Model-Based Forecasting at Hunt Wesson, ***Mark Krause***, Hunt Wesson Inc., 1645 W Valencia Dr., Fullerton, CA 92833, ***Sudhir Mallya***

At Hunt Wesson, we initiated a company-wide project to scientifically develop the forecasts at much detail level (SKU-Week-Location level) by using causal demand drivers. Standard forward stepwise regression is used to develop the forecast. In the second stage, certain Time series techniques are also incorporated to capture the seasonality and product life cycle effects. Initial results shows that we could achieve on an average 15% MAPE on monthly basis, which is 40% improvement over past.

2) Deciding Optimal Inventory Levels in Dynamic Business Environments, ***Scott Lebda***, Hunt Wesson Inc., 1645 W Valencia Dr., Fullerton, CA 92833, ***John Pooley***

Once the forecasting models have been developed, the second challenge was to integrate them with inventory deployment to achieve optimal stocking levels. The stocking levels are re-calculated every day at SKU-Location level, based on the forecast, the response time to that location, service level requirements and past forecast accuracy levels. We estimate an inventory reduction of $30 million.

3) Short-Term Forecast Corrections using Order-Based Forecasting Models, ***Sudhir Mallya***, Hunt Wesson Inc., 1645 W Valencia Dr., Fullerton, CA 92833, smallya@hwfoods.com, ***Mark Krause***

Considering the dynamic nature of our business, we feel it is necessary to correct our short-term forecast based on customer order arrival pattern. We developed regression-based open order forecasting models, again at the SKU-location level. This model will look at the customer orders already received during the first 4 days of the month and suggest the forecast correction for that month...

SD34 Panel: Juggling Family & a Career in OR/MS

Sponsor: Forum on Women in OR/MS
Sponsored Session

Chair: Tava Lennon Olsen, University of Michigan, 2845 IOE, 1205 Beal Ave., Ann Arbor, MI 48109-2117, tlennon@umich.edu, http://www-personal.engin.umich.edu/~tlennon

1) Panel: Juggling Family & a Career in OR/MS, ***Margaret L. Brandeau***, Stanford University, Dept. of IE/EM, Stanford, CA 94305, brandeau@stanford.edu, ***Brenda Dietrich***, IBM, TJ Watson Research Ctr., PO Box 218, Yorktown Heights, NY 10598, dietric@watson.ibm.com, ***Donna C. Llewellyn***, Georgia Institute of Technology, Sch. of ISyE, Atlanta, GA 30332-0205, dllewell@isye.gatech.edu, ***Dawn Groneck***, Procter & Gamble, 1 Procter & Gamble Plaza, PNC-12, Cincinnati, OH 45202-0599, groneck.dm@pg.com

The panelists will discuss issues involving managing a family and an OR/MS career. They will discuss parental leave policies at their institutions and what impact they believe taking advantage of such policies has on an individual's career. Perspectives will be given from both academia and industry.

SD35 Computer-Aided Education in OR & Operations Management

Sponsor: Forum on Education
Sponsored Session

Chair: J. B. Orris, Butler University, 140 Holcomb Research Bldg., 4600 Sunset Ave., Indianapolis, IN 46208, orris@butler.edu

1) Using a Website to Support Operations Research & Management Science Instruction, ***J. B. Orris***, Butler University, 140 Holcomb Research Bldg., 4600 Sunset Ave., Indianapolis, IN 46208, orris@butler.edu

We will discuss some of the issues related to creating a course website and the advantages/disadvantages of using a website not only for delivering traditional material but also for providing a platform for innovative methods. Website organization and site develoment software will be reviewed.

2) Operations Analysis using Spreadsheets, ***Kenneth E. Murphy***, Florida International University, Dept. of Decision Sci., University Park, Miami, FL 33199, murphyk@fiu.edu

The use of spreadsheets in quantitative management courses has 3 principle benefits for students. These include better applied analysis and modeling skills, increased comfort with spreadsheets overall and a greater appreciation of "real-world" problem complexity. We will describe how spreadsheet analysis is ulitized in the MBA core operations management course, potential pitfalls and challenges for the future.

3) Teaching Management Science with Spreadsheets: Evaluating Students, ***Krish Muralidhar***, University of Kentucky, Gatton Coll. of Bus. & Econ., Lexington, KY 40506-0034, kmura@pop.uky.edu

Recently, there has been considerable interest in teaching MS techniques using spreadsheets. One advantage of using spreadsheets is that they allow students to use their own frames of reference in creating models but they also requires different evaluation techniques. This presentation reflects our experience with "hands on" examinations.

Sunday 16:00-17:00

SP36 INFORMS/CIST Plenary

Plenary Session

Chair: To be announced

1) Plenary: The Global Impact of Information Technology on Organizations in the Networked Era, ***Todd Garrett***, Procter & Gamble, 2 P&G Plaza, C-11, Cincinnati, OH 45202

P&G, like many large organizations, needs to deal with rapid changes in technology in a new, networked era. This new networked economy rewards companies who are quickest to sense changes and first to capitalize on them. Competitors can emerge quickly and make their presence felt with little capital investment. Soon, computing technology will be fast, ubiquitous, disposable and completely inter-connected. As ITs continue to emerge and we learn to fully make use of them, the process of linking computation with the gathering and re-use of knowledge will become the principal driver of market value in the networked economy. The INFORMS organization, which links the professional disciplines that deal with applicatons of IT for informed decision making, has a unique opportunity to help companies such as P&G achieve their corporate goals. The winning companies in the new millennium will harness these emerging ITs and use them to speed communication with their consumers. P&G will use these technologies to meet the accelerating needs and demands of the world's 5 billion consumers.

Sunday 17:00-18:00

ST05 Tutorial: Trends & Topics in Process Modeling & Simulation

Tutorial Session

Chair: Deborah A. Sadowski, Systems Modeling Corp., Sewickley, PA 15143

1) Tutorial: Trends & Topics in Process Modeling & Simulation, ***Deborah A. Sadowski***, Systems Modeling Corp., Sewickley, PA 15143

Many forces are at work in the world of simulation, all pointing toward the long-awaited "breakout" of simulation into a mainstream business decision-making tool. We will examine these forces and their implications for researchers, vendors and practitioners.

ST08 Tutorial: Linear Programs, Integer Programs & Constraint Programming: Program ! = Program

Tutorial Session

Chair: Irvin J. Lustig, ILOG, CPLEX Division, 889 Alder Ave., Ste. 200, Incline Village, NV 89451, irv@cplex.com

1) Tutorial: Linear Programs, Integer Programs & Constraint Programming: Program != Program, ***Irvin J. Lustig***, ILOG, CPLEX Division, 889 Alder Ave., Ste. 200, Incline Village, NV 89451, irv@cplex.com

Constraint programming has arisen as a new tool for solving certain combinatorial optimization problems. It is possible to embed traditional mathematical programming problems within a constraint programming framework. One confusion that often arises is due to the use of the word "program" by each community. Similarities and differences between each modeling technique will be described...

ST15 Tutorial: Coordinating Production Distribution & Transportation Decisions in the Supply Chain

Tutorial Session

Chair: David Simchi-Levi, Northwestern University, Dept. of IE/MS, 2145 Sheridan Rd., Evanston, IL 60208, levi@iems.nwu.edu

1) Tutorial: Coordinating Production Distribution & Transportation Decisions in the Supply Chain, ***David Simchi-Levi***, Northwestern University, Dept. of IE/MS, 2145 Sheridan Rd., Evanston, IL 60208, levi@iems.nwu.edu

In recent years, there has been renewed interest in the area of logistics among both industry and academia. A number of major forces have contributed to this trend. First, industry has realized the magnitude of savings that can be achieved by better planning and management of complex logistics systems...

ST17 Tutorial: Semidefinite Programming for Combinatorial Optimization

Tutorial Session

Chair: Christoph Helmberg, ZIB-Berlin, Konrad-Zuse-Zentrium, Takustrasse 7, Berlin, 14195, Germany, helmberg@zib.de

1) Tutorial: Semidefinite Programming for Combinatorial Optimization, ***Christoph Helmberg***, ZIB-Berlin, Konrad-Zuse-Zentrium, Takustrasse 7, Berlin, 14195, Germany, helmberg@zib.de

For several combinatorial optimization problems, semidefinite relaxations yield the currently best known approximation results. The high quality of semidefinite relaxations is confirmed by numerical experiments, but they are rather expensive to compute. We first review some techiques for designing semidefinite relaxations for constrained quadratic 0-1 programming and graph partitioning problems...

ST18 Tutorial: Generating Experimental Data for Combinatorial Optimization Problems

Tutorial Session

Chair: Nicholas G. Hall, Ohio State University, 301 Hagerty Hall, 1775 S College Rd., Columbus, OH 43210-1399, halln@cob.ohio-state.edu

Co-Chair: Marc E. Posner, Ohio State University, Dept. of Ie, 1971 Neil Ave., Columbus, OH 43210-1271, posner1@osu.edu

1) Tutorial: Generating Experimental Data for Combinatorial Optimization Problems, ***Nicholas G. Hall***, Ohio State University, 301 Hagerty Hall, 1775 S College Rd., Columbus, OH 43210-1399, halln@cob.ohio-state.edu, ***Marc E. Posner***

OR literature provides little guidance about how to generate data for the computational testing of solution procedures. We demonstrate that widely used generation schemes introduce biases into computational results. Moreover, they do not represent how data arises in practice. We describe several principles for data generation and properties that are important in a data generation scheme...

ST19 Tutorial: Exploiting Operations Research Algorithms in Constraint-Based Scheduling I - Constraint Propagation

Tutorial Session

Chair: Claude M. Le Pape, Bouygues Telecom, R&D Dept., 51 avenue de l'Europe, Velizy Cedex, 78944, France, clepapeg@bouyguestelecom.fr

1) Tutorial: Exploiting Operations Research Algorithms in Constraint-Based Scheduling I: Constraint Propagation, ***Claude M. Le Pape***, Bouygues Telecom, R&D Dept., 51 avenue de l'Europe, Velizy Cedex, 78944, France, clepapeg@bouyguestelecom.fr

Exploiting powerful OR algorithms as part of constraint propagation is a key factor for the success of constraint-based scheduling. Part I of this tutorial reviews the basic principles of costraint propagation and the OR techniques which are the most commonly used in constraint-based scheduling.

ST20 Tutorial: Semi-Infinite Programming

Tutorial Session

Chair: Kenneth 0. Kortanek, University of Iowa, 108 Pappajohn BAB, Rm. W272, Iowa City, IA 52242

1) Tutorial: Semi-Infinite Programming, ***Kenneth 0. Kortanek***, University of Iowa, 108 Pappajohn BAB, Rm. W272, Iowa City, IA 52242

A linear semi-infinite program is a next level of extension of an ordinary LP whose finite number of variables now appear in a infinite number of linear inequalities. Since the publication of "Duality, Haar Programs and Finite Sequence Spaces" in May 1962 (Charnes, Cooper & Kortanek), manifest applications have occurred in many fields...

ST21 Tutorial: Resource-Constrained Project Scheduling - A Classification & Overview

Tutorial Session

Chair: Erik L. Demeulemeester, Katholieke Universiteit Leuven, Dept. of Applied Econ., Naamsestraat 69, Leuven, B-3000, Belgium, erik.demeulemeester@econ.kuleuven.ac.be

Co-Chair: Willy S. Herroelen, Katholieke Universiteit Leuven, Dept. of Applied Econ., Naamsestraat 69, Leuven, B-3000, Belgium, willy.herroelen@econ.kuleuven.ac.be

1) Tutorial: Resource-Constrained Project Scheduling: A Classification & Overview, ***Erik L. Demeulemeester***, Katholieke Universiteit Leuven, Dept. of Applied Econ., Naamsestraat 69, Leuven, B-3000, Belgium, erik.demeulemeester@econ.kuleuven.ac.be, ***Willy S. Herroelen***

Scheduling project activities subject to various types of precedence and resource constraints under various types of objective functions is a crucial problem in the field of project management which has gained wide and growing interest from both theory and practice over the past few years. Marketed off-the-shelf computer software claims to be the most prevalent among all fields of OR...

ST23 Tutorial: Artificial Intelligence & Operations Research in Discrete Optimization Heuristics from the OR Perspective

Sponsor: College on Artificial Intelligence

Sponsored Session

Chair: Ronald L. Rardin, Purdue University, IE Dept., West Lafayette, IN 47907, rardin@ecn.purdue.edu

1) Tutorial: Artificial Intelligence & Operations Research in Discrete Optimization Heuristics from the Operations Research Perspective, ***Ronald L. Rardin***, Purdue University, IE Dept., West Lafayette, IN 47907, rardin@ecn.purdue.edu, ***Haldun S. Aytug***, ***Reha Uzsoy***

In the early 1980's, a burst of interest in AI threatened to supplant the more optimization-based OR methods in dealing with discrete optimization problems too large to be solved exactly. Naturally, such claims were greeted with more than a bit of skepticism by the OR community and the controversy raged through many meetings and papers...

ST29 Tutorial: NSF Funding Opportunities

Sponsor: Manufacturing & Service Operations Management Society

Sponsored Session

Chair: Lawrence M. Seiford, University of Massachusetts, Dept. of MIE, 219 ELAB, Box 32210, Amherst, MA 01003-2210, seiford@ecs.umass.edu

1) Funding Opportunities at NSF in Operations Research & Production Systems, ***Lawrence M. Seiford***, University of Massachusetts, Dept. of MIE, 219 ELAB, Box 32210, Amherst, MA 01003-2210, seiford@ecs.umass.edu

We will provide an overview of the National Science Foundation with a focus on programs and funding opportunities within the NSF Directorate of Engineering. In addition to selected cross-cutting foundation-wide programs, the research programs and operational procedures within design, manufacture and industrial innovation will be described.

ST30 Tutorial: The Economics of Design Quality Competition

Sponsor: Manufacturing & Service Operations Management Society

Sponsored Session

Chair: Panos Kouvelis, Washington University, Olin Sch. of Business, St. Louis, MO 63130-4899, kouvelis@mail.olin.wustl.edu

1) Tutorial: The Economics of Design Quality Competition, ***Panos Kouvelis***, Washington University, Olin Sch. of Business, St.

Louis, MO 63130-4899, kouvelis@mail.olin.wustl.edu, ***Ramesh Kini***

We examine the relationship between the firm's investments in design quality improvement and its ability to thrive or even survive in oligopolistic environments. We describe the use of a differential game theoretic approach in modeling price and design quality competition in a duopolistic environment. Our approach blends a generalized Lanchester-type combat model with a generalized Bass-type diffusion model...

Monday 08:00-09:30

MA01 MHT as a Health Profession

Cluster: **MHT as a Health Profession**
Invited Session

Chair: Ori Heller, MMT Institute, 530 South Second St., Philadelphia, PA 19147, mmtinstitute4@juno.com

1) MHT as a Health Profession: An Overview, *Ori Heller*, MMT Institute, 530 South Second St., Philadelphia, PA 19147, mmtinstitute4@juno.com

2) The Role of the MHT Advisory Board, *Ori Heller*, MMT Institute, 530 South Second St., Philadelphia, PA 19147, mmtinstitute4@juno.com

3) Criteria for MHT as a Profession, *Ori Heller*, MMT Institute, 530 South Second St., Philadelphia, PA 19147, mmtinstitute4@juno.com

4) Professional Competencies in MHT, *Ori Heller*, MMT Institute, 530 South Second St., Philadelphia, PA 19147, mmtinstitute4@juno.com

MA03 Daniel H. Wagner Prize for Excellence in Operations Research Practice

Sponsor: **CPMS Daniel H. Wagner Prize for Excellence in Operations Research Practice**
Sponsored Session

Chair: Joseph H. Discenza, Daniel Wagner Associates, 11 Canal Dr., Poquoson, VA 23662, joe@va.wagner.com, discenza@aquik.net

1) A Multi-Objective Decision Support System for Paper Manufacturing, *Pinar Keskinocak*, IBM, TJ Watson Res. Ctr., Office 04-258, Rte. 134, Yorktown Heights, NY 10598, pinar@cmu.edu

We have developed a DSS for scheduling paper manufacturing and distribution. The system, which is built on an agent-based framework called A-Teams, considers multiple scheduling objectives and different stages of paper manufacturing and distribution simultaneously in a global multicriteria optimization framework and creates multiple high quality scheduling alternatives.

MA05 Simulation I

Contributed Session

Chair: David R. Grimmett, Austin Peay State University, Dept. of Mgmt. & Dec. Sci., PO Box 4426, Clarksville, TN 37044, grimmettd@apsu01.apsu.edu

1) IceCore: Programming Environment for Agent-Based Simulation Models, *Huanrui Hu*, PricewaterhouseCoopers LLP, 1301 Ave. of the Americas, New York, NY 10019-6013, huanrui.hu@us.pwcglobal.com, ***Radoslaw A. Zapert***

We describe architecture and capabilities of IceCore, a software package developed at PricewaterhouseCoopers. IceCore is a programming environment used to create and execute in parallel large-scale simulations of multi-agent models. The OOP architecture of IceCore is based on C++ and includes object persistence through RDBMS and parallel execution of simulations.

2) Using Time-Independent Information for Estimating Time-Dependent Performance Measures in Regenerative Stochastic Models, *Perwez Shahabuddin*, Columbia University, Dept. of IEOR, 116th St. & Broadway, New York, NY 10027, perwez@ieor.columbia.edu

In most stochastic models, time-independent measures are much easier to compute, compared to time-dependent ones. We show how the easily computable time indepedent information may be used to speed the simulation of time-dependent ones, in a large class of regenerative models.

3) Computer Simulation, Complexity & Self-Organization, *Thomas F. Brady*, Purdue University North Central, 1401 S US Hwy 421, Westville, IN 46391, tbradyjr@purduenc.edu

We examine the application of principles of complex adaptive systems and self organization to supply chains using computer simulation. In particular, the emergent communication structures that develop, interact, adapt and evolve to support a discrete manufacturing process are discussed.

4) Simulating Outside the Box: A Venture into French Poetry, *David R. Grimmett*, Austin Peay State University, Dept. of Mgmt. & Dec. Sci., PO Box 4426, Clarksville, TN 37044, grimmettd@apsu01.apsu.edu, ***Karen D. Sorenson***

A SHAREWARE program was discovered that randomly generates English poetry. This information was shared with a simulation class and more than anticipated interest in the mechanics and flow of the inner workings resulted. Personal interest in French allowed for a similar program to be developed. Examples and conclusions are drawn.

MA06 Issues in New Product Development

Cluster: **New Product Development**
Sponsor: **Technology Management Section**
Sponsored Session

Chair: David Ellison, University of Pennsylvania, Wharton Sch., Dept. of OPIM, 1300 SH-DH, Philadelphia, PA 19104-6366, ellison@wharton.upenn.edu

1) Product Line Strategy & Firm Performance: The Case of Radical Technological Change in the PBX Industry, *Neil R. Jones*, University of Western Ontario, Ivey Sch. of Bus., London, Ontario, N6A 5B8, Canada, njones@ivey.uwo.ca

We test the potential of product line strategy - how sequences of related development projects are managed - to explain variation in firm performance. Product development strategies that result in longer lived products and greater numbers of products introduced are shown to be associated with higher firm performance.

2) A Comparative Study of Product Development Process Design, *Alan D. MacCormack*, Harvard Business School, Morgan Hall T39, Soldiers Field Park, Boston, MA 02163, maccormack@hbs.edu

We contrast the design of the new product development process across different environments. The evidence presented suggests that rather than being one best way to develop products, the process differs substantially, yet predictably, across environments. The data is consistent with a contingent view of the new product development process.

3) The Fundamental Attribution Error in Product Development Improvement Efforts, *Nelson Repenning*, MIT, OM/System Dynamics Group, Sloan Sch., 30 Wadsworth St., Cambridge, MA 02139, nelsonr@mit.edu, ***John Foster***

We investigate the transition problem in product development: how does an organization move from its current process to a more desirable one and why is this transition difficult? We focus on the interactions between the structures of such processes and the behaviors of the people within them.

4) The Architecture of Knowledge & Information Flows: A Comparison of New Product Development & Enterprise Resource Planning Systems, *Anil Khurana*, Boston University, Sch. of Mgmt., 595 Commonwealth Ave., Boston, MA 02215, ***P. R. Balasubramanian***

We present a framework for the architecture of knowledge management and show how an information systems environment could be modeled. We take 2 case examples, one from an Enterprise Resource Planning (ERP) system, and another from a New Product Development environment.

MA07 GIS in Public Sectors

Sponsor: **Public Programs & Processes Section**
Sponsored Session

Chair: Chengri Ding, Cleveland State University, 1737 E. Euclid Ave., Cleveland, OH 44115, chengri@wolf.csuohio.edu

1) Accessing Distributed Spatial Data in Brazos County for Landscape Planning & Design Over the Internet, *Christopher D. Ellis*, Texas A&M University, Landscape Architect & Urban, College Station, TX 77843-3137, ellis@taz.tamu.edu, ***Douglas F. Wunneburger***

2) Commuter's Route Choices: A GIS Analysis of GPS Data, *Zhong-Ren Peng*, University of Wisconsin, Dept. of Urban Planning, PO Box 413, Milwaukee, WI 53201-0413

3) Using Geographic Information Systems to Prepare for Elections in the 21st Century, ***Mark Salling***, Cleveland State University, The Urban Ctr., Levin Coll. of Urban Affairs, Cleveland, OH 44115, mark@urban.csuohio.edu

4) The Impact of Infrastructure Provision on Local Land Development: A GIS-Based Spatial Analysis, ***Chengri Ding***, Cleveland State University, 1737 E. Euclid Ave., Cleveland, OH 44115, chengri@wolf.csuohio.edu, ***Gerrit Knapp***, ***Lew Hopkins***

MA08 Manufacturing Simulation Applications

Cluster: Business & Industry Applications
Invited Session

Chair: Khaled Mabrouk, The Model Builders, Inc., 8 Heatheridge, Ann Arbor, MI 48104-2757, modelbuilders@compuserve.com

1) withdrawn - author request of 3/16, ***Jeff Leavy***, Boeing Commercial Airplane Group, PO Box 3707, MS 97-40, Seattle, WA 98124-2207, jeffrey.j.leavy@boeing.com, ***Steve Halladin***

2) A Discussion of Technical Issues in Simulation of a Full Plant Material Handling System, ***K. R. Lemanski***, Ford Motor Company, Adv. Mfg. Tech. Develop. Ctr., 24500 Glendale Ave., Redford, MI 48239, klemanski@ford.com, ***P. E. Coffman, Jr.***

The development of a discrete event simulation model of a large complex material handling system requires the resolution of several technical issues that are unique to this type of model. We will identify these technical issues and offer suggestions on addressing these issues to insure successful completion of a project.

3) Simulation of Proposed Consolidation & Schedule Sequencing in a Cabinet Component Facility, ***David Clark***, Aristokraft, Inc., One Aristokraft Square, PO Box 420, Jasper, IN 47547-0420, ***Bill Fortney***

A simulation model was developed for a proposed consolidation of 3 cabinet component manufacturing facilities. The processing, assembly and finish operations were modeled using the feed speeds and lengths of the machines, load logic as specified in ISO documentation and time standards.

4) Predicting the Behavior of Complex & Dynamic Business Processes: Limitations of Simulation & Modeling Technologies, ***Mohsen M. Fathee***, Boeing Commercial Airplane Group, PO Box 3707, MC 6C-34, Seattle, WA 98124-2207, mohsen.fathee@pss.boeing.com

The value of simulation technology tends to be contingent on creating models that can offer a systematic, well-defined way of representing the structure of a firm's business processes. However, variability and complexity of processes reduce the value of simulation technology in predictability of the behavior of such systems.

MA09 Web-Based AI

Cluster: Knowledge Discovery & Data Mining
Invited Session

Chair: Greg Madey, Kent State University, Grad. Sch. of Mgmt., Kent, OH 44242, gmadey@kent.edu

1) Web-Based Expert System Development, ***Alan T. Burns***, Kent State Univ., Admin. Science Dept., Coll. of Bus. Admin., Box 5190, Kent, OH 44242, aburns@bsa3.kent.edu, ***Greg Madey***

We propose a hybrid system of CLIPS expert system and Web technology as a means of solving ill-structured problems for Web users. The forward chaining inference capability of the expert system CLIPS, combined with Web technology features (user-friendly browser interface, interconnectivity) can create systems that provide mass production of expertise.

2) Automating Knowledge Engineering: An Experiment at Web-Based Rules Generation, ***Peter Meso***, Kent State University, Grad. Sch. of Mgmt., Kent, OH 44242, pmeso@bsa3.kent.edu, ***Greg Madey***

We present the results of an experiment at automating the task of knowledge engineering. We identify the feasibility of using Web technologies to automate knowledge engineering, the impact of such automation on the future development of knowledge management systems and the limitations of the web-technologies employed.

3) Intelligent Tutoring Systems: Solving the Training Material Sequence Problem with Artificial Intelligence, ***Jens Liegle***, Kent State University, Grad. Sch. of Mgmt., Kent, OH 44242, jliegle@bsa3.kent.edu, ***Greg Madey***

What should be taught next to a particular learner is a problem faced by all intelligent tutoring systems. Solutions range from pre-selected sequences over total user control to AI controlled (system controlled) sequences. We present an overview and real world application.

4) Design of a Web-Based Bond Rating Agent, ***Kidong Lee***, Kent State University, Dept. of Admin. Sci., Grad. Sch. of Mgmt., Kent, OH 44242, klee@bsa3.kent.edu, ***Greg Madey***

We describe the design and testing of a web-based expert system bond rating agent.

MA10 Risk & Risk-Value Models

Sponsor: Decision Analysis Society
Sponsored Session

Chair: James S. Dyer, University of Texas, CBA 5.202, Austin, TX 78712, _j.dyer@mail.utexas.edu

1) Risk Measurement Under Ambiguity, ***Hans Wolfgang Brachinger***, Universitat Fribourg, Seminar Fur Statistik, Av de Beauregard 13, Fribourg, CH-1700, switzerland, hanswolfgang.brachinger@unifr.ch

There is empirical evidence that in certain cases of ambiguity or partial probability information decision makers use some sort of mean-risk decision rule. A theory of risk under partial probability information is presented. The risk measures developed are natural generalizations of well-known measures of risk.

2) Who's Afraid of a Little Risk? Comparing Risk Attitudes Derived From Expected Utility & Risk-Value Models, ***Elke U. Weber***, Ohio State University, 142 Townshend Hall, 1885 Neil Ave., Columbus, OH 43210, weber.211@osu.edu

The risk-value decomposition of risky choice behavior allows for a conceptualization of risk attitude that factors out differences in perceptions of the riskiness of options. Perceived-risk attitudes are much more stable, and largely perceived-risk averse, across individuals, cultures and situations than risk attitudes that describe the shape of utility functions.

3) Separating Risk & Return in the Capital Asset Pricing Model: A General Utility-Based Model, ***Christian S. Pedersen***, Trinity College, Trinity St., Cambridge, CB2 1TQ, UK, cs.pedersen@econ.am.ac.uk

I propose a new utility function which captures trade-offs between general asymmetric risk measures and return while exhibiting desirable properties for a financial investor. This function is shown to be sufficient for 2-fund money separation and forms the basis for an extension the CAPM.

4) Measuring Return in Risk/Return Models, ***David Bell***, Harvard Business School, Morgan Hall 171, Boston, MA 02163, dbell@hbs.edu

The easy part of risk/return models is not so straightforward when you consider risk investment settings. This talk will review the issue.

MA11 Ground Attrition Modeling: Theory

Sponsor: Military Applications Society
Sponsored Session

Chair: James G. Taylor, Naval Postgraduate School, OR Dept., Code OR/TW, Monterey, CA 93943, jtaylor@nsp.navy.mil

1) Overview of Aggregated-Force Attrition Methods, ***James G. Taylor***, Naval Postgraduate School, OR Dept., Code OR/TW, Monterey, CA 93943, jtaylor@nsp.navy.mil

We identify and briefly review the main approaches currently used in DoD for modeling force-on-force attrition in large-scale conventional ground combat. A prototype for each approach is considered. Distinguishing characteristics of each of these are compared. Current usage within an environment of incomplete documentation of methodology is discussed.

2) Stand-Alone-Model Approach for Determining Lanchester Attrition-Rate Coefficients, ***W. Peter Cherry***, Vector Research Inc., PO Box 1506, Ann Arbor, MI 48106-1506, cherryw@vrinet.com

We describe the origins and evolution of the Bonder-Farrell attrition methodology. It emphasizes the use of stochastic processes and observable and measurable data. The continuing relevance of the original theory and its implementations to the attrition dynamics of current and future combat is described.

3) Hierarchy-of-Models Approach for Determining Lanchester Attrition-Rate Coefficients, ***Arnold H. Buss***, Naval Postgraduate School, OR Dept., Code OR/BU, Monterey, CA 93943-5000,

bussa@or.nps.navy.mil, ***Gordon M. Clark, James G. Taylor***

We examine the hierarchy-of-models approach to determining a numerical value for a Lanchester attrition-rate coefficient. The genesis and basic concept of this approach is discussed. Current usage of this basic idea (within an environment of incomplete documentation) is considered. Recent research and suggested changes in current usage are examined.

MA12 US/Japan Collaborative Research on Intelligent Design & Manufacturing

Cluster: **Engineering Cost**
Invited Session

Chair: Alice E. Smith, University of Pittsburgh, 1031 Benedum Hall, Dept. of IE, Pittsburgh, PA 15261, aesmith@pitt.edu, aesmith@engrng.pitt.edu

Co-Chair: Bryan A. Norman, University of Pittsburgh, 1048 Benedum Hall, Dept. of Ie, Pittsburgh, PA 15261, banorman@pitt.edu

1) Optimal Network Design Considering the Reliability Computation, ***Abdullah Konak***, University of Pittsburgh, Dept. of IE, Pittsburgh, PA 15261, ***Alice E. Smith, Bryan A. Norman***

Backbone design of communications networks involves choice of links when considering costs, reliability, capacities and routings. This paper gives a general heuristic approach using genetic algorithms that balances computational effort of calculating/estimating/bounding network reliability with search success.

2) Placement of Input/Output Locations in Facility Design, ***Rifat Aykut Arapoglu***, University of Pittsburgh, Dept. of IE, Pittsburgh, PA 15261, ***Bryan A. Norman, Alice E. Smith***

We describe an evolutionary approach to optimally locating the 110 locations for departments in facility layout. A distance metric of the shortest path between I/Os along department perimeters is used. The cases of single, multiple, constrained and unconstrained number of I/Os per department are considered.

3) Material Handling Considerations in Facility Design, ***Gultekin Ozdemir***, University of Pittsburgh, Dept. of IE, Pittsburgh, PA 15261, ***Bryan A. Norman, Alice E. Smith***

Incorporating aspects of material handling type during optimization of facility design can result in different block layouts and aisle structures depending on the type of handling system, such as crane, AGV or truck. A method to after constraints and objective function to customize a design for a specified handling system is presented.

4) A Tabu Search Approach to Unequal Area Block Layout, ***Sadan Kulturel***, University of Pittsburgh, 5830 Fifth Ave., Apt. 17, Pittsburgh, PA 15232, saksts3+@pitt.edu, ***Alice E. Smith, Bryan A. Norman***

A tabu search using a newly developed adaptive penalty approach is demonstrated on unequal area block layout where department shapes are constrained by maximum aspect ratio. The approach is demonstrated on several test problems from the literature.

MA13 Group Model Building for Decision & Design

Sponsor: **Group Decision & Negotiation Section**
Sponsored Session

Chair: Jeryl L. Mumpower, National Science Foundation, 4201 Wilson Blvd., Arlington, VA 22230, jmumpowe@nsf.gov

Co-Chair: Ward Edwards, Wise Decisions, Inc., 11466 Laurelcrest Rd., Studio City, CA 91604

1) Group Models for Strategic Planning & Performance Measurement, ***Thomas A. Darling***, University of Baltimore, Schaefer Ctr. for Pub. Policy, 1304 St. Paul St., Rm 300F, Baltimore, MD 21201-5779, tdarling@ubmail.ubalt.edu

We relate experiences with several model-based group techniques for use in strategic planning and developing results-oriented performance measures. These techniques clarify the interconnectedness of means (strategies) and ends (results). Models discussed include adaptations of Keeney's fundamental objectives hierarchy and meansend network and Porter's value chain.

2) Group Model Building to Support Welfare Reform in New York State, ***David F. Andersen***, Center for Policy Research, Rockefeller College, 135 Western Ave., Rm. 300, Albany, NY 12222, d.anderson@albany.edu, ***George P. Richardson, John Rohrbaugh***

Cross-agency teams of county-level managers are being challenged to implement welfare reform. We present a series of group model building results, including formal system dynamics and resource allocation models to support policy design and implementation in New York State.

3) When "Optimal" is Difficult to Verify: A Few Words on Behalf of, Agreement with, Support for, Commitment to & Ownership, ***John Rohrbaugh***, Center for Policy Research, Rockefeller College, 135 Western Ave., Rm. 300, Albany, NY 12222, rohrbaugh@albany.edu

Although group model building efforts may locate optimal policies for managing complex systems, in practice, this claim can prove difficult to support empirically. Evidence for decision makers' agreement with, support for, commitment to and ownership in these policies is ample. Is it sufficient to warrant continued refinement of such interventions?

4) Group Models For Psychiatric Emergency Room Admissions Decision Making, ***Jeryl L. Mumpower***, National Science Foundation, 4201 Wilson Blvd., Arlington, VA 22230, jmumpowe@nsf.gov, ***Bruce B. Way***

A multi-disciplinary team supported a group of psychiatrists, mental health professionals, clients and patient advocates to develop a prototypical computerized best-practice guideline for use in psychiatric emergency admissions decision making. Key tensions in group model building, especially between rationality and consensus, are discussed in terms of competing values theory.

MA14 Communications Network Problems & Discrete Programming

Sponsor: **Computing Society**
Sponsored Session

Chair: Djangir Babayev, US West Advanced Technologies, 4001 Discovery Dr., Boulder, CO 80303, dbabayev@advtech.uswest.com

1) Optimal Use of Acquired Network Facilities, ***Tony Cox***, Cox Associates, 503 Franklin St., Denver, CO 80218, tony@cox-associates.com, ***Jenny Ryan Sanchez***

Telecommunications mergers and acquisitions can reduce costs by enabling redistribution of traffic among the network facilities of the combined company. We present an integer program and an effective solution heuristic for allocating backhaul traffic among old and new facilities, given contract cancellation charges, costs of "swinging" circuits and reliability requirements.

2) Optimization Problems in the Design of Access Networks for Long Distance Communication, ***Rosemary T. Berger***, US West Advanced Technologies, 4001 Discovery Dr., Ste. 220, Boulder, CO 80303, rxberg3@advtech.uswest.com, ***Rene Seguin, S. Raghavan***

Access fees paid to LECs form approximately 80% of the transport cost of long distance service. Due to recent changes in the access pricing structure, optimizing the configuration of the access network can reduce costs significantly. We present several access network design optimization problems and describe algorithms to solve them.

3) Dynamic Call Blocking Algorithms for the Telecommunications Network, ***John Shortle***, US West Advanced Technologies, 4001 Discovery Dr., Boulder, CO 80303, jshortl@advtech.uswest.com

Internet service providers cause significant congestion in the phone network. This is due to the high volume of calls generated during a busy period. We present dynamic algorithms which block calls to such high usage customers. The algorithms significantly reduce network congestion with little service disruption to the customer.

4) Polyhedral Methods for Piecewise-Linear Functions II: The Delta Method, ***Dan Wilson***, US West Advanced Technologies, 4001 Discovery Dr., Boulder, CO 80303, dxwils3@advtech.uswest.com, ***Jon Lee***

The "delta method" is well-known for using integer linear programming methods to model separable piecewise-linear functions in the context of optimization formulations. We extend the delta method to the nonseparable case. We give theoretical results arising from this formulation for functions of 2 variables and demonstrate practical applications of the formulation.

MA15 Issues in Supply Chain Management I

Cluster: **Supply Chain Management**
Invited Session

Chair: Kyle D. Cattani, University of North Carolina, Kenan-Flagler Bus. Sch., CB 349, Chapel Hill, NC 27599-3490, kyle_cattani@unc.edu

1) The Manufacturer's Choice: Make-to-Stock or Build-to-Order?, ***Glen Schmidt***, Georgetown University, Grad. Sch. of Bus., G-4 Old North, 37th & O St. NW, Washington, DC 20057, schmidtg@gunet.georgetown.edu, ***Ely Dahan***

Manufacturers offering customized (build-to-order) products may still find it advantageous to produce some units as make-to-stock. In this setting, we explore how to set total plant capacity, and how to allocate capacity between make-to-stock and build-to-order as a way to tradeoff inventory obsolescence, cost efficiency and product mix flexibility.

2) Supply Chain Scheduling: Synchronizing Priorities across the Supply Chain, ***Wendell G. Gilland***, University of North Carolina, Kenan Flagler Bus. Sch., CB 3490, McColl Bldg., Chapel Hill, NC 27514, wendell_gilland@unc.edu

A manufacturer receives orders from customers, each of which possesses a due date and a delay penalty. Filling the orders initially requires processing by a supplier, followed by further processing at the manufacturer. We examine ways the manufacturer can minimize costs by influencing the supplier's prioritization process.

3) Implications of Cost/Price Dynamics for Inventory Management in Short Life Cycle Industries, ***Nikhil Jain***, University of Cincinnati, Coll. of Bus. Admin., PO Box 210230, Cincinnati, OH 45221, nikhil.jain@uc.edu, ***Hirofumi Matsuo***

In short life cycle industries such as the personal computer industry, both the costs of component technologies and the prices of final products decline substantially and rapidly. We discuss the implications of different cost/price profiles on the optimal inventory policy and profits.

4) Can We Buy More Time? An Analysis of the Benefits of Delaying an End-of-Life Buy, ***Kyle D. Cattani***, University of North Carolina, Kenan-Flagler Bus. Sch., CB 349, Chapel Hill, NC 27599-3490, kyle_cattani@unc.edu, ***Gilvan C. Souza***

We study the benefits of delaying an end-of-life buy. A manufacturer required to place a final, end-of-life buy for a component performs a newsvendor analysis with the possible result of significant expected overage and underage costs. If the decision can be delayed, the expected overage and underage costs are reduced.

MA16 Models for Modern Manufacturing IV

Cluster: Modern Manufacturing
Invited Session
Chair: Zhi-Long Chen, University of Pennsylvania, Dept. of Systems Eng., 220 S 33rd St., Philadelphia, PA 19104-6315, zlchen@seas.upenn.edu

1) Complexity of Single Machine Scheduling Problems with Positive Time Lags, ***Peter Brucker***, University of Osnabrueck, Fac. of Math. & Info., Osnabrueck, D-49069, Germany, peter@mathematik.uni-osnabrueck.de, ***Sigrid Knust***

There is a close relationship between identical parallel machine scheduling with preemption (unit time jobs) and single machine problems with unit time jobs and constant integer finish-start time lags. These relations are used to derive NP-hardness results for this class of single machine problems. New polynomial algorithms are also presented.

2) Improving Schedule Robustness via Stochastic Analysis & Dynamic Adaptation, ***S. David Wu***, Lehigh University, Dept. of IMSE, 200 W Packer Ave., Bethlehem, PA 18015-1582, sdw1@lehigh.edu, ***Erhan Kutanoglu***

We study methods that improve scheduling robustness under uncertain disturbances and dynamic shop conditions. We preprocess the scheduling problem using Lagrangean relaxation with added stochastic constraints. The preprocessing produces a partially resolved sequence or a Lagrangean ranking. We demonstrate the use of this ranking in an adaptive manner to improve scheduling robustness.

3) An Agent-Based Solution Approach for Multi-Machine Job Scheduling, ***Rama Akkiraju***, IBM, TJ Watson Research Ctr., Rte. 134 & Taconic, Yorktown Heights, NY 10598, akkiraju@watson.ibm.com, ***Fred Wu***, ***Sesh Murthy***, ***Pinar Keskinocak***

We describe an agent-based scheduling system for scheduling the operations in a paper manufacturing environment. The problem consists of scheduling multiple parallel machines with sequence dependent setups, job machine restrictions and downstream implications. Our system considers multiple scheduling objectives and different stages of paper manufacturing simultaneously and creates multiple high quality scheduling alternatives...

4) A Heuristic to Solve the Early/Tardy Problem with Sequence-Dependent Setup Times, ***Ghaith A. Rabadi***, University of Central Florida, 1617 Criket Club Cir., #303, Orlando, FL 32828, gar31503@pegasus.cc.ucf.edu, pegasus.cc.ucf.edu/~gar31503, ***Mansooreh Mollaghasemi***

The problem of minimizing earliness and tardiness in machine scheduling has lately gained research attention, especially after the success of JIT. However, little research has focused on the problem at hand when setup times are sequence-dependent. We present a heuristic to obtain good solutions for the problem under different scenarios.

MA17 Intelligent Systems for Spacecraft Operations

Cluster: Space Applications of Operations Research
Invited Session
Chair: Paul Chi, Bowie State University, Dept. of Computer Sci., Bowie, MD 20715, pchi@cs.bowiestate.edu

1) Role of User Modeling in Improving Conceptual Search in NASA's Space Science Databases, ***Chris Gokey***, Raytheon STX, chokey@hydrogen.stx.com, ***Bikas Das***, ***Sadanand Srivastava***

An innovative User Modeling Agent (UMA) that tracks user profile and preferences, and works as part of a search engine for NASA's distributed databases will be discussed. Also, UMA interacts with a System Modeling agent to look for concepts related to user interests and forms relevant queries.

2) Agent-Based Information Processing Systems, ***Sadanand Srivastava***, Bowie State University, Dept. of Comp. Sci., Bowie, MD 20715, ssrivas@cs.bowiestate.edu, ***Courtney Wilmott***, ***Naveen Kolli***

The agent-based information processing system (AIPS) is a prelude towards autonomous operational information ecology. AIPS consists of a group of cooperating agents, i.e., user interface agent, user modeling agent, result management agent, etc., which simulates basic human behavior such as communication, learning and reasoning to assist users obtaining information.

3) Orbit Determination Processes Driven by CLIPS, ***Paul Chi***, Bowie State University, Dept. of Computer Sci., Bowie, MD 20715, pchi@cs.bowiestate.edu, ***Manjit Bhatia***, ***David Weidow***, ***John Bristow***

Human analysts and operators are involved in running routine orbit determination processes. They handle anomalies such as system and user errors. An expert system in CLIPS is being built to emulate such human operations. The role of CLIPS and rule-based system in this application will be discussed.

4) An Agent-Based System for the Visualization, Analysis & Distribution of Data, ***John M. Cavallo***, Bowie State University, Dept. of Computer Sci., Bowie, MD 20715, cavallo@cs.bowiestate.edu, ***Manohar Mareboyana***, ***Jerome D. Bennett***, ***James Gil de Lamadrid***

A suite of agents is being developed to manage the integration of data, meta-data, and algorithms. Three classes of agents are being created to handle the retrieval of data from the archives, analysis of the data, and the distribution of the data to scientists and educators. The inter-agent and human-agent interactions will be discussed.

MA18 Recent Advances in the XPRESS-MP Optimization Software

Cluster: Linear Programming
Sponsor: Optimization Section
Sponsored Session
Chair: Erling D. Andersen, TWI/SSOR, Faculty of ITS, Mekelweg 4, Delft, 2628 CD, The Netherlands

1) Progress in XPRESS-MP's Integer Programming Solver, ***Robert C. Daniel***, Dash Associates, Blisworth House, Church Ln, Northants, NN7 3BX, UK, rcd@dash.co.uk, http://www.dash.co.uk/

The European Community MEMIPS project has led to the development of new modelling objects for integer programming. We discuss the implementation of these ideas in the XPRESS-MP IP solver, stressing the practical advantages.

2) Reducing the Running Time of the XPRESS Interior Point Optimizer (XIPO), ***Knud D. Andersen***, EKA Consulting/Dash Associates, Flat A, 12 High St., Leamington Spa, Warwickshire, CV31 3AN, UK, kda@eka.globalnet.co.uk, ***Erling D. Andersen***

The main work in one iteration of XIPO is to compute a Cholesky factorization. We will discuss how to speed up the factorization using a new ordering method based on graph patitioning and better handling of dense columns in the constraint matrix. Results are also presented.

3) The XPRESS-MP Quadratic Programming Optimizer, ***Erling D. Andersen***, TWI/SSOR, Faculty of ITS, Mekelweg 4, Delft, 2628

CD, The Netherlands, ***Knud D. Andersen***

The XPRESS-MP optimization software has recently been extended to handle quadratic and quadratically constrained optimization problems. We will discuss this extension in details. Finally, we will present computational results for a large number of test problems.

MA19 Operational Methods in Semiconductor Manufacturing

Cluster: Scheduling
Invited Session
Chair: Jeffrey W. Herrmann, University of Maryland, Inst. for Systems Research, College Park, MD 20742, jwh2@eng.umd.edu

1) Multiobjective Scheduling of Ion Implantation Processes, ***Shwu-Min Horng***, Arizona State University, 1111 E University Dr., Tempe, AZ 85281, ***John W. Fowler, Jeffery K. Cochran***

The management of ion implantation processes is a challenging problem in scheduling wafer fabrication facilities. Many factors such as sequence dependent setups, job priorities, due dates, and process times are involved. A deterministic scheduling approach to this problem is investigated, and a methodology that includes genetic algorithms and local dispatching rules is developed to solve a multiple objective version of this problem.

2) Integrating Process Models & Operational Methods, ***Jeffrey W. Herrmann***, University of Maryland, Inst. for Systems Research, College Park, MD 20742, jwh2@eng.umd.edu, ***N. Chandrasekaran, B. F. Conaghan, M. Nguyen, Gary Rubloff, R. Z. Shi***

Integrating manufacturing process models and scheduling yields operational methods that can systematically examine how process changes will affect production. Sensitivity analysis and optimization techniques incorporate response surface models, which describe the manufacturing processes, and simulation and scheduling techniques, which evaluate the manufacturing system. Current work focuses on the tungsten plug step.

MA20 Optimization Methods in the Power Industry

Cluster: Energy
Sponsor: Section on Energy, Natural Resources & Environment
Sponsored Session
Chair: Ruediger Schultz, Gerhard-Mercator University Duisburg, Dept. of Math, Lotharstr. 65, Duisburg, D-47048, Germany, schultz@zib.de

1) On Using Stochastic Programming Approaches for Estimating the Water Value in Hydrothermal Power Generation Systems, ***Laureano F. Escudero***, Universidad Complutene de Madrid, Madrid, 28040, Spain, lf.escudero@iberduola.es, ***M. Aguilar, J. Martinez, J. Salmeron***

One of the main drawbacks of many today power unit commitment solution providers for short-term, e.g. 168 hours, scheduling of hydro-thermal generation capacity is that the objective function to minimize only considers the actual costs of using thermal units and other actual costs. To prevent an excessive water using from the hydro system, lower bounds on water storage in the reservoir are considered...

2) Seasonal Planning in the Nordic Power System, ***Stefan Feltenmark***, Royal Institute of Technology, Dept. of Math., Stockholm, SE-100 44, Sweden, stefan@math.kth.se

We describe a model for seasonal planning in the Nordic power system. The Nordic power market has recently been deregulated, creating a new situation for power producers. Cost minimization has turned into profit maximization and concepts from finance such as portfolio management and pricing of derivatives have come into play...

3) Unit Commitment with Random Demand via Dual Decomposition of Stochastic Integer Programs, ***Ruediger Schultz***, Gerhard-Mercator University Duisburg, Dept. of Math, Lotharstr. 65, Duisburg, D-47048, Germany, schultz@zib.de, ***Claus C. Caroe***

We address a 2-stage stochastic programming model with integer first-stage and mixed-integer recourse for solving the unit commitment problem in power generation in the presence of uncertainty of load profiles. The solution methodology rests on a novel scenario decomposition method for stochastic integer programming. This method combines Lagrangian relaxation of non-anticipativity constraints with B&B...

MA21 The Use of Information in Internet & Electronic Commerce

Sponsor: Technical Section on Telecommunications
Sponsored Session
Chair: Joseph Bailey, University of Maryland, Smith Sch. of Bus., College Park, MD 20742, jbailey@rhsmith.umd.edu

1) Whose Data Is It? Property Rights in the Market for Data on the Internet, ***T. Lee***, MIT, Context Interchange Project, Cambridge, MA 02139, tlee@interchange.mit.edu, ***S. Bressan, L. McKnight***

2) Dynamics of Price & Quality Differentiation in Information & Computational Markets, ***J. Sairamesh***, IBM, TJ Watson Research Ctr., 30 Saw Mill River Rd., Hawthorne, NY 10532, jramesh@watson.ibm.com, ***Jeff O. Kephart***

3) Information Portals for Internet Commerce, ***P. Kavassalis***, PLEIADES, Inst. for Comp. Sci., Forth, Crete, Greece, petros@rpcp.mit.edu, ***Christos Nikolaou***

4) Dynamic Internet Pricing, ***Joseph Bailey***, University of Maryland, Smith Sch. of Bus., College Park, MD 20742, jbailey@rhsmith.umd.edu

MA22 Reverse Logistics

Cluster: Green Manufacturing
Invited Session
Chair: Moritz Fleischmann, Erasmus University, Fac. of Business Admin., PO Box 1738, Rotterdam, 3000 DR, The Netherlands

1) A Review of Case Studies on Reverse Logistic Networks, ***Rommert Dekker***, Erasmus University, Fac. of Business Mgmt., PO Box 1738, Rotterdam, 3000 DR, The Netherlands, rdekker@few.eur.nl, http://www.eur.nl/few/ei/faculty/rdekker, ***Moritz Fleischmann, H. Krikke***

We review 9 case studies on the design and analysis of reverse logistic networks. We consider problems aspects, models applied and solution methods. We identify common aspects and compare reverse logistic networks with traditional forward distribution networks. Finally, we come up with a list of issues typical for reverse logistic networks which need further research.

2) Logistics Network Design for Product Recovery, ***Moritz Fleischmann***, Erasmus University, Fac. of Business Admin., PO Box 1738, Rotterdam, 3000 DR, The Netherlands, ***J. van Nunen, Rommert Dekker***

We address logistics network design from a reverse logistics perspective. Reviewing recent case studies we identify characteristics of logistics networks in a product recovery context and compare them with traditional "forward" networks. Moreover, we present a quantitative analysis assessing the impact of product returns on appropriate network structures.

3) Integrated Logistics: Modeling the Evolution of DRP in a Remanufacturing System, ***Sergio Gallo***, University of Naples "Federico II", Dept. of Design & OR, Piazzale Tecchio, Naples, 80125, Italy, ***Teresa Murino, Liberatina Santillo***

The time has long since passed when companies can rely solely on traditional environmental and health & safety compliance techniques. With their heavy dependence on the world market, customers around the globe, and far-flung research, manufacturing and assembly facilities, firms face myriad regualtory pressures at home and abroad...

MA23 The Product Architecture - Supply Chain Interface

Sponsor: Technology Management Section
Sponsored Session
Chair: Sharon Novak, MIT, 30 Wadsworth St., E53-390, Cambridge, MA 02139, snovak@mit.edu

1) Architectures in 3D: Concurrent Product, Process & Supply Chain Development, ***Morris A. Cohen***, University of Pennsylvania, The Wharton School, Philadelphia, PA 19104-6366, cohen@upenn.wharton.edu, ***Charles Fine***

2) Supply Chain Architecture: Definition & Testing, ***Sharon Novak***, MIT, 30 Wadsworth St., E53-390, Cambridge, MA 02139, snovak@mit.edu, ***Charles Fine***

3) Investment in New Product Capacity: The Option Value of Subcontracting, ***Jan A. van Mieghem***, Northwestern University, Kellogg Sch. of Mgmt., MEDS Dept., 2001 Sheridan Rd., Evanston,

IL 60208-2001, vanmieghem@nwu.edu

4) Supplier Involvement in Design in America: How Far Have We Come?, ***Jeffrey K. Liker***, University of Michigan, Dept. of IOE, 1520 McIntyre Dr., Ann Arbor, MI 48105, liker@engin.umich.edu, ***Young Ro***, ***Laurent Langlet***

MA24 Finance: Risk Management

Contributed Session

Chair: John B. Willis, University of Virginia, Systems Eng., Thorton Hall, Charlottesville, VA 22903, jbw2a@virginia.edu

1) Convex Structures & Investments, ***Efem M. Bronshtein***, Ufa State Aviation Technical University, K.Marx Str. 12, Ufa, Bashkortostan, 450000, Russia, brem@soros.bashedu.ru, ***Semjon I. Spivak***

The main notions of convex analysis are applied to theory of investment projects. The discounted profit is accepted as a criterion of comparison of projects. This apprpoach allows staying of the set of important extreme problems.

2) The Role of Expert Systems in Credit Evaluation, ***David T. Fraser***, Ford Credit, Systems Office, PO Box 1732, Dearborn, MI 48121-1732, dfraser@ford.com, ***Brock Ken***

Credit evaluation has been extensively formulated as a statistical problem but statistical models almost always exclude some well established credit granting concepts. Expert systems can utilize these concepts in credit evaluation. Used in conjunction with statistical models, they can significantly improve the performance of the overall credit granting process.

3) Mutual Funds Selection using Data Envelopment Analysis, ***Komlan T. Sedzro***, University of Quebec, Ecole des Sci. de la gestion, Montreal, Quebec, H3C 4R2, Canada, sedzro.k@uqam.ca, ***Michel Bergeron***, ***Dina Sardano***

The growing number of mutual funds and the willingness of people to invest in the stock market have created the need for a method that could help investors select the mutual funds in accordance with their priorities. We use DEA as a selection tool to identify efficient mutual funds.

4) Optimization of Credit Union Membership Portfolios, ***John B. Willis***, University of Virginia, Systems Eng., Thorton Hall, Charlottesville, VA 22903, jbw2a@virginia.edu, ***Peter A. Beling***

Recent legislation permits a credit union to expand its field of membership to include multiple affiliation groups. We study the potential benefits of such diversification from a portfolio optimization perspective, developing a notion of pareto optimality for the inherent tradeoff between risk and return.

MA25 Implementation Issues with Combined Travel Models

Sponsor: **Transportation Science Section**
Sponsored Session

Chair: David E. Boyce, University of Illinois, Dept. Civil & Materials Eng., 842 W Taylor St., Chicago, IL 60606-7023, dboyce@uic.edu

1) Validation of a Regional Travel Forecasting Model, ***David E. Boyce***, University of Illinois, Dept. Civil & Materials Eng., 842 W Taylor St., Chicago, IL 60606-7023, dboyce@uic.edu

The implementation and initial validation of a detailed regional travel forecasting model is described. The model forecasts consistent origin-destination, mode and auto route choices for multiple user classes for the Chicago Region, based on a household travel survey for 1989-1991.

2) Parameter Estimation for a Combined Model of Travel Choice, ***Xin Tian***, University of Illinois, Dept. Civil & Materials Eng., 842 W Taylor St., Chicago, IL 60606-7023, xint@uic.edu

Combined models of travel choice are models combining 2 or more forecasting steps into one nonlinear optimization procedure to obtain consistent travel costs. The application of maximum likelihood methods to parameter estimation of this model is explored. The Newton-Raphson method is used in solving the resulting system of nonlinear equations.

3) Effect of Peak-Period Factors on Traffic Assignments, ***Monzurul Morshed***, University of Illinois, Dept. Civil & Materials Eng., 842 W Taylor St., Chicago, IL 60606-7023, amorsh1@uic.edu

Factors are derived from travel surveys to convert 24-hour trip productions and attractions into peak-period origins and destinations as inputs to a traffic assignment model. There are several ways to define and derive these factors. We review these definitions and examine their effects on model results.

4) Computational Requirements for Combined Travel Models, ***Karthik Balasubramaniam***, University of Illinois, Dept. Civil & Materials Eng., 842 W Taylor St., Chicago, IL 60606-7023, kbalas1@uic.edu, ***Hillel Bar-Gera***

Computer time and memory requirements on a large PC to solve a combined travel choice model for zone systems and networks of realistic but different sizes are described. Alternative versions of the solution algorithm are also evaluated.

MA26 Multivariate Process Control, Monitoring & Feedback Adjustment

Sponsor: **Quality, Statistics & Reliability Section**
Sponsored Session

Chair: Harriet Black Nembhard, University of Wisconsin, Dept. of IE, 1513 University Ave., Madison, WI 53706-1572, hbnem@engr.wisc.edu

1) Principal Components in Multivariate Process Control for Reduction of Startup Periods, ***Susan L. Albin***, Rutgers University, Dept. of IE, PO Box 909, Piscataway, NJ 08855, ***Robin C. Wurl***

Startup periods consume time and resources before a process can be brought into control. We adapt principal component techniques to the multivariate batch process control problem to reduce the dimensionality, find meaningful dependencies, eliminate uninformative data and ultimately find an optimal path to the in-control state of the process.

2) Detecting Malfunctions in Dynamic Systems, ***Soren Bisgaard***, Universitat St. Gallen, Inst. fur Technologiemgmt., Unterstrasse 22, St. Gallen, CH-9000, Switzerland, ***Spencer B. Graves***

New concepts and methods are developed to extended computer controls to include monitoring schemes for diagnosing system malfunctions. Our example is on new automobiles that legally must have "on-board diagnostics" designed to detect malfunctions in the powertrain. We outline general principles for designing malfunction detection systems and discuss evaluation criteria.

3) Process Control of the Transient Phase, ***Christina Mastrangelo***, University of Virginia, Dept. of Systems Eng., ***Harriet Black Nembhard***

Monitoring and adjustment of continuous processes during the transient phase is a difficult problem. We present a statistically-based monitoring and control mechanism that integrates a PI controller and a moving centerline EWMA control chart. We explore the capability of this design to improve system performance during the startup period.

4) An SPC Chart System by using Haar Transform, ***Baocheng Sun***, University of Michigan, Dept. of IOE, Ann Arbor, MI 48109-2117, ***Jianjun Shi***

We propose a new SPC chart system which can monitor a class of non-iid processes with joint-iid distribution among samples. This SPC chart system utilizes Haar transform as a feature extraction tool to obtain useful information from a sample. It can automatically detect the magnitude and location of mean-shifts.

MA27 Reliability & Maintenance Models

Sponsor: **Applied Probability Society**
Sponsored Session

Chair: Hayriye Ayhan, Georgia Institute of Technology, Sch. of ISyE, 765 Ferst Dr., Atlanta, GA 30332-0205, hayhan@isye.gatech.edu

1) Characterization of Degradation & Lifetime: A Thermodynamic Approach, ***Martin A. Wortman***, Texas A&M University, Dept. of IE, College Station, TX 77843, wortman@acs.tamu.edu

We introduce a mathematical framework characterizing the relationship between reliability and the thermodynamic principles that govern degradation. We identify a fundamental physical characterization of remaining life and expose the probabilistic framework connecting degradation physics with lifetime prediction. This approach to understanding degradation and lifetime provides a modeling paradigm that allows a variety of environmental circumstances within a single mathematical framework.

2) Maintenance Policies during Two-Dimensional Warranty, ***Tom Chen***, i2 Technologies, Irving, TX 75039, tom_chen@i2.com, ***Elmira Popova***

Two-dimensional warranty has been used extensively in the auto industry. Designing a good maintenance policy which accompanies the warranty is an important issue. We propose a maintenance policy under 2-dimensional warranty. The policy's control limits are established via a

simulation-optimization interface. Their stability is analyzed. Due to the high mathematical complexity of the problem, no results are available so far...

3) A Maintenance Strategy for Electrical Distribution Equipment, ***Anton J. Kleywegt***, Georgia Institute of Technology, Sch. of ISyE, Atlanta, GA 30332-0205, anton@isye.gatech.edu, ***Hayriye Ayhan***

Electrical distribution equipment has historically been maintained based on an average maintenance interval regardless of environmental exposure or operational conditions. In order to optimize maintenance expenditures, we developed an inspection and maintenance strategy that takes into account historical failure data and location factors such as severe environment and high fault current.

4) An Approach for Computing Tight Numerical Bounds on Renewal Functions, ***Hayriye Ayhan***, Georgia Institute of Technology, Sch. of ISyE, 765 Ferst Dr., Atlanta, GA 30332-0205, hayhan@isye.gatech.edu, ***Jorge Limon-Robles, Martin A. Wortman***

We present a method for computing tight lower and upper bounds for the renewal function. Our method based on Riemann-Stieltjes integration, also provides bounds for the solution of certain renewal equations used in the study of availability. Three examples are explored that demonstrate the accuracy of computed numerical bounds.

MA28 Logistics: Supply Chain Issues

Contributed Session

Chair: Mehmet Barut, Clemson University, 101 Sirrine Hall, Clemson, SC 29634, mbarut@clemson.edu

1) Do Lean Suppliers have Lean Logistics?, ***Yenchun J. Wu***, University of Michigan, 1520 McIntyre Dr., Ann Arbor, MI 48105, yenchun@umich.edu, ***Jeffrey K. Liker***

As American companies have been moving to JIT systems, suppliers are expected to deliver smaller, more frequent shipments of parts and to maintain less inventory in the auto maker assembly plants. Using a sample of auto parts suppliers, we show that the implementation of lean manufacturing has improved logistics performance.

2) Supply Chain Management Survey, ***Rosida Coowar***, University of Central Florida, 12424 Research Parkway, Ste. 478, Orlando, FL 32826, coowar@pegasus.cc.ucf.edu, ***Mansooreh Mollaghasemi***

Through an extensive literature review, we present the methodologies and techniques that have been used in the implementation of supply chain management in the service and manufacturing industries. Case studies are presented.

3) Impacts of Information Sharing & Price Discount on Supply Chains, ***Zhao Xiande***, City University of Hong Kong, Dept. of MS, Kowloon, Hong Kong, mszhao@cityu.edu.hk, http://personal.cityu.edu/hk/~mszhao/, ***Lai Fujun***

We are concerned with how price discount and information sharing affect supply chain performances. We propose alternative information sharing methodologies, e.g., order information sharing, demand information sharing, etc. Various price discount schemes and demand patterns related to price and/or lead time are considered.

4) Yield Management in Supply Chain Restructuring, ***Mehmet Barut***, Clemson University, 101 Sirrine Hall, Clemson, SC 29634, mbarut@clemson.edu, ***Ahmet S. Ozkul, V. Sridharan***

Yield management is used to discriminate between different classes of customers when faced with capacity shortage. When capacity is not scarce, the firm can improve yield by downsizing the downstream of its supply chain. We discuss how yield management can be beneficial in restructuring the downstream to improve the yield.

MA29 Call Center Operations Management

Sponsor: **Manufacturing & Service Operations Management Society Sponsored Session**

Chair: Patrick T. Harker, University of Pennsylvania, The Wharton Sch., OPIM, 3620 Locust Walk, 1300 SH-DH, Philadelphia, PA 19104, harker@opim.wharton.upenn.edu

1) Characterizing the Value of Cross-Training Practices in Call Centers, ***Zeynep Aksin-Karaesmen***, INSEAD, Boulevard de Constance, Fontainebleau, 77305, France, zeynep.aksin@insead.fr, ***Fikri Karaesmen***

2) What is the Cost of Making Customers Wait in a Queue?, ***Noah F. Gans***, University of Pennsylvania, OPIM Dept., Wharton Sch., 3620 Locust Walk, Ste. 1300, Philadelphia, PA 19104-6366, gans@wharton.upenn.edu

3) Setting Staffing Requirements in Call Centers, ***Linda V. Green***, Columbia Business School, 423 Uris Hall, New York, NY 10027, lvg1@columbia.edu, ***Peter J. Kolesar***

4) The Efficiency-Quality Tradeoff of Cross-Trained Workers, ***Edieal J. Pinker***, University of Rochester, Simon School, Rochester, NY 14627, pinker@ssb.rochester.edu, ***Robert Shumsky***

MA30 Supply Chain Planning & Scheduling in Practice

Sponsor: **Manufacturing & Service Operations Management Society Sponsored Session**

Chair: Scott T. Webster, Syracuse University, Sch. of Mgmt., Syracuse, NY 13244-2130, stwebste@syr.edu

1) Trends in Scheduling from the Perspective of a Large Commercial Supply Chain Software Vendor, ***Scott A. Moses***, i2 Technologies, 909 E Las Colinas Blvd., Ste 1600, Irving, TX 75039

I discuss trends in planning and scheduling from the viewpoint of a large commercial supply chain software vendor. These trends will present opportunities for some scheduling researchers, particularly as research and development by commerical planning and scheduling software vendors continues to rapidly increase.

2) Perspectives on Scheduling: Approaches, Weakness & Opportunities, ***Mani Agrawal***, Manugistics, Inc., Shady Grove Executive Ctr., 9231 Corporate Blvd., Bldg. 3, Rockville, MD 20850-3255, magrawal@manu.com

We will review some approaches to scheduling problems today, discuss weaknesses with these approaches and identify issues in need of research.

3) Capacity Reservation Planning Methodology at IBM Corporate Logistics, ***Yung-Joon Lee***, IBM-Mfg. Supply Chain Solutions Integration, 404 Wyman St., MR 406, Cambridge, MA 02254, yjlee@us.ibm.com, ***Christophe Begue***

We report results of a pilot to evaluate the feasibility of using i2 Technology's Rhythm Supply Chain Planner for planning applications at IBM Corporate Logistics. The problems addressed are capacity reservations for externally supplied parts, and for internally produced technology parts as well as conditioning the supply chain.

4) Advanced Supply Planning for Semiconductor Industries, ***Roger R. Gung***, IBM-TJ Watson Research Center, 17 Skyline Dr., Hawthorne, NY 10532, rgung@us.ibm.com

The project relates to a computer-implemented resource planning and decision-support tool in which a solver generates an optimal projected supply plan (PSP). The tool generates an intelligent PSP match between existing assets and demands across multiple manufacturing facilities within the boundaries established by the manufacturing specifications and process flows and business policies.

MA31 Facilities Planning & Design

Contributed Session

Chair: Marco Lara, Purdue University, Sch. of IE, 201 Nimitz Dr., Apt.4, W. Lafayette, IN 47906, lara@ecn.purdue.edu

1) Generalized Multicommodity Distribution System Design, ***Ki Hyoung Son***, Chonnam National University, Dept. of Business Admin., 300 Yong Bong Dong Buk-Gu, Kwangju, 500-757, Rep. of Korea, khson@chonnam.chonnam.ac.kr, ***James G. Morris, Ju-Long Chen***

We generalize a classic 2-stage distribution system design problem to problems that include plant location and develop a solution method which combines an integer L-shaped method with the traditional Benders decomposition method to suit the purpose. Test results will also be reported.

2) Impact of a Short Cut on the Circular Path for AGVs, ***Ardavan Asef-Vaziri***, University of Southern California, Dept. of ISE, GERO 240, Los Angeles, CA 90089, ardasef@usc.edu, ***Gilbert Laporte***

We develop a 2-phase binary integer programming model. The first phase designs a circular path to minimize the total loaded and empty AGV trips. The second phase evaluates the impact of adding a short-cut to the proposed circuit.

3) Algorithms for the Uncapacitated Facility Relocation Problem, ***Qian Wang***, SUNY, 342 Bell Hall, Buffalo, NY 14260, qwang@acsu.buffalo.edu, ***Rajan Batta, Joyendu Bhadury,***

Christopher M. Rump

We present a model for relocating (opening and closing) service facilities in order to minimize the total customer travel time subject to constraints on the relocation budget and the maximum number of facilities. An exact solution procedure for small problem instances and several heuristic methods will be presented.

4) Conflict Resolution Support System for Collaborating Designers, ***Marco Lara***, Purdue University, Sch. of IE, 201 Nimitz Dr., Apt.4, W. Lafayette, IN 47906, lara@ecn.purdue.edu, ***Shimon Y. Nof***

FDL/CR is a multi-agent architecture with learning capabilities for resolution of potential conflicts arising among collaborating, distributed designers. It is a necessary extension to FDL, Facility Description Language developed at Purdue University. Conflict resolution is achieved through the interaction of multiple agents representng the designers, a mediator agent, adaptation of past conflict-solving experiences to the conflict at hand, and persuasion mechanisms.

MA32 Electronic Commerce

Cluster: Telecommunications & Electronic Commerce
Invited Session

Chair: Danny Fernandes, Carnegie Mellon University, The Heinz Sch., Pittsburgh, PA 15213, danny@andrew.cmu.edu

1) Directories: Opportunities for a Telecommunications Carrier in Electronic Commerce, ***Shawn D. Ambwani***, France Telecom R&D, 1000 Marina Blvd., Ste. 300, Brisbane, CA 94005, shawn.ambwani@rd.francetelecom.com

We identify strategic roles that a telecommunications carrier can play in facilitating retail and business-business EC.

2) Intelligent Agents for Electronic Commerce: Some Experiences with Digital Products, ***Danny Fernandes***, Carnegie Mellon University, The Heinz Sch., Pittsburgh, PA 15213, danny@andrew.cmu.edu

We report simulation results for an intelligent intermediary market prototype for model development. The results are based on investigating 2 market mechansims for the agents - auction and prize.

3) Business Negotiations on the Internet, ***Manoj Kumar***, IBM Research Division, TJ Watson Research Ctr., Yorktown Heights, NY 10598, mkumar@watson.im.com

We explain the commonality in the structure of different price negotiation mechanisms such as fixed price sales, various forms of auctions and brokerages. We then discuss various kinds of auctions. Next we describe the steps of an auction process and the functionality required in each step. Finally, we briefly present the design elements of a generic auction application.

MA33 Data Mining in NCR Corporation

Cluster: Novel Applications of Statistics
Invited Session

Chair: Robert A. Nisbet, NCR Corporation, 7126 Armstrong Rd., Goleta, CA 93117, robert.nisbet@losangeles.ca.ncr.com

1) withdrawn - committee request of 3/29, ***Carlos Ordonez***, NCR Corporation, Human Interface Tech. Ctr., 5 Executive Park Dr. NE, Atlanta, GA 30329, carlos.ordonez@atlantaga.ncr.com

Case-based reasoning is extended using temporal databases theory to improve data analysis. Two temporal data representations are analyzed contrasting their advantages and disadvantages. Several approaches to perform case matching are discussed. An example regarding a medical case library is described in detail.

2) Active Templates Comprehensive Support for the Knowledge Discovery Process, ***Randy Kerber***, NCR Corporation, Human Interface Tech. Ctr., 5 Executive Park Dr. NE, Atlanta, GA 30329, kerber@best.com

An active template is a hyper-linked information structure that tightly integrates actions (executable programs), results, datasets, models, forecasts, etc. and documentation (reports) for data mining projects. The NCR active template approach provides more closely focused data mining projects and facilitates ease of reuse.

3) withdrawn - committee request of 3/29, ***Bill Smart***, NCR Corporation, Human Interface Technology Ctr, 5 Executive Park Dr. NE, Atlanta, GA 30329, bill.smart@atlantaga.ncr.com

4) The Strategic Value of Data Warehouse/Data Mining-Enabled Customer Relationship Management for the Communications Industry, ***Yancy Oshita***, NCR Group, 485 Route 1 South, Woodbridge, NJ 08830, yancy.oshita@woodbridgenj.ncr.com

Many data warehousing/data mining "solutions" in CRM fail to consider that many investments fail during the first 18 months and that they are a core capability, not a technology. A framework is presented for understanding the strategic value of data warehouse/data mining-enabled CRM solutions to gaining a sustainable competitive advantage.

5) Comparison of Neural Nets to Parametric Statistics for Predicting Consumer Choice, ***Robert A. Nisbet***, NCR Corporation, 7126 Armstrong Rd., Goleta, CA 93117, robert.nisbet@losangeles.ca.ncr.com

Unlike parametric statistical procedures, neural nets can easily capture non-linear relationships and factor interactions. Often incorrectly viewed as "black boxes", the mathematical foundations are just as well-defined as for parametric statistical procedures. Two studies show that neural nets generally outperform standard parametric statistical procedures for modeling of consumer choice processes.

6) Bayesian Networks for Reusable Analysis Application Development, ***Scott Cunningham***, NCR Corporation, Retail Merchandising & Mktg., 5 Executive Park Dr. NE, Atlanta, GA 30329, scott.cunningham@atlantaga.ncr.com

Bayesian belief networks provide a framework for analyzing discrete, continuous, static and dynamic data with the same analysis system that is transparent and interpretable by users. This system can be expressed as an object-oriented library of analytical functions written in Java that encapsulate key statistical assumptions and are highly reusable.

MA34 Rail Applications I: National Planning Models

Sponsor: Railroad Applications Special Interest Group
Sponsored Session

Chair: To be announced

1) Use of a GIS Interface for a Rail Capacity Planning System Developed for the Indian Railways, ***Peter Cook***, GIS Trans. Ltd., 8555 16th St., Ste. 700, Silver Spring, MD 20910, pcook@gistrans.com

A large-scale DSS was developed and used for capacity planning by the Indian Railways. The system, which features a GIS interface, estimated freight flows over a multi-modal network based upon modal performance capabilities.

2) Calibrating a Freight Demand Model for Freight Transportation in India, ***Andreas Aeppli***, A&L Associates, Inc., 101 Rogers St., Ste. 403, Cambridge, MA 02142, aaeppli@ibm.net, ***Carl D. Martland***, ***Marc Warner***

A freight demand model based upon logistics costs was calibrated and validated using extensive data collected from a broad range of industries in India. The model was used to support capacity planning on the Indian Railways.

MA35 Issues in Establishing & Maintaining an Academic Program in Supply Chain Management

Sponsor: Forum on Education
Sponsored Session

Chair: James J. Cochran, Miami University, Farmer Coll. of Bus. Admin., Dept. of DS/MIS 311 Upham Hall, Oxford, OH 45056, cochrajj@econqa.cba.uc.edu

1) Supply Chain Management Programs at Stanford, ***Warren H. Hausman***, Stanford University, IE/EM Dept., Terman Eng. Ctr., Rm. 350, Stanford, CA 94305-4024, hausman@stanford.edu

We summarize the various supply chain academic programs at Stanford University. We review the history of the activities, what worked well and what didn't and what we see as the vision for the future.

2) Supply Chain Management Program at Michigan State University, ***Morgan L. Swink***, Michigan State University, MSC Dept., Broad Coll. of Business, East Lansing, MI 48824, swinkm@pilot.msu.edu

We address the integration of marketing, purchasing, operations and logistics functions in the development of an SCM curriculum. The components of the SCM program at Michigan State University are described, along with the challenges confronted in its development and the benefits accrued.

3) Evolution, Interaction & Development: Supply Chain Management Programs at Arizona State University, ***Susan D. Amundson***, Arizona State University, Dept. of Mgmt., Box 874006, Tempe, AZ 85287-4006, susan.amundson@asu.edu

We will discuss the evolution of ASU's SCM programs. The strength of the undergraduate program, including its relationships with leading SCM practitioners, has contributed to the development of the MBA concentrations. Additionally, the PhD program emphasizes the integrated nature of the supply chain.

MA37 Software Demonstration I

Chair: To be announced

1) Software Demonstration: Duxbury Press, *Sam L. Savage*, Stanford University, Dept. of EES/OR, 417 Terman Eng. Ctr., Stanford, CA 94305-4023, savage@leland.stanford.edu

INSIGHT.xla: Excel add-ins and text covering simulation, DA, queueing, Markov chains, optimization and forecasting. Text provides fundamental concepts, tutorials and exercises. INSIGHT.xla is appropriate for courses in OR/MS and for professionals wanting simple analytical tools. The author will demonstrate how he uses INSIGHT in his own classes.

2) Software Demonstration: Irwin/McGraw Hill, *Mark F. Millsaps*, Irwin/McGraw Hill, 1333 Burr Ridge Parkway, Burr Ridge, IL 60521-6489, mark_millsaps@mcgraw-hill.com

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Monday 09:45-10:45

IP36 Plenary: Logistics Modeling - From the Classroom to the Boardroom

Plenary Session

Chair: Michael Magazine, University of Cincinnati, Coll. of Bus. Admin., Cincinnati, OH 45221-0130, mike.magazine@uc.edu

1) Plenary: Logistics Modeling - From the Classroom to the Boardroom, *H. Donald Ratliff*, Georgia Institute of Technology, School of ISyE, 765 Ferst Dr., Atlanta, GA 30332

A trend toward global customers, an increasing demand for customer service, a growing awareness of the huge logistics cost to provide this service and the remarkable technological advances related to computing are revolutionizing logistics. The key components to gaining a competitive advantage using logistics are "strategy" and "technology." There is currently a huge investment being made in technology for automatically capturing logistics data, tracking material and processing logistics related transactions. This creates the opportunity for taking advantage of better quality, more detailed and more timely information. It also poses the threat of logistics managers being buried under an avalanche of data or to the automation of bad decision making. In order to achieve the potential of new logistics technology, it must be integrated with good logistics strategy and decision making. This presentation will discuss the growing availability of this new information technology, its impact on logistics strategies and the concepts and tools necessary to utilize it for competitive advantage.

Monday 13:00-14:30

MC01 A Model Curriculum in MHT

Cluster: MHT as a Health Profession

Invited Session

Chair: Ori Heller, MMT Institute, 530 South Second St., Philadelphia, PA 19147, mmtinstitute4@juno.com

1) Developing a Model Curriculum in MHT, *Ori Heller*, MMT Institute, 530 South Second St., Philadelphia, PA 19147, mmtinstitute4@juno.com

2) The T-Model: The Case of Telecommunications Management, *Ramesh Sharda*, Oklahoma State University, Coll. of Bus. Admin., Stillwater, OK 74078-0555, sharda@okstate.edu

MC03 Panel: Opportunities for Applied Operations Research Worldwide

Sponsor: CPMS/IFORS

Sponsored Session

Chair: Andres Weintraub, University of Chile, Dept. of IE, PO Box 2777, Santiago, Chile, aweintra@dii.uchile.cl

1) Panel: Opportunities for Applied Operations Research Worldwide, *Laureano F. Escudero*, Universidad Complutene de Madrid, Madrid, 28040, Spain, lf.escudero@iberduola.es, ***Michael A. Florian*,** University of Montreal, CRT, CP 6128, Succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, mike@crt.umontreal.ca, ***Yoshiro Ikura*,** SAITECH, Inc., 1301 Hwy 36, Hazlet, NJ 07730, ***Frederic Semet*,** LIMAV, Universite de Valenciennes & CRT, BP 311, Le Mont HOUY, Valenciennes Cedex, 59304, France, frederic@crt.umontreal.ca

Opportunities and challenges abound for applied OR work in many parts of the world. Projects are supported by industry, government and international organizations. This panel, sponsored jointly by CPMS and IFORS, will explore how cultural, social and economic characteristics affect opportunities for OR practitioners and how these characteristics vary in different parts of the world..

MC04 Cone-Linear Optimization

Cluster: Linear Programming

Sponsor: Optimization Section

Sponsored Session

Chair: Tamas Terlaky, Delft University of Technology, Faculty of ITS/TWI/SSOR, Mekelweg 4, Delft, 2628 CD, The Netherlands, t.terlaky@twi.tudelft.nl

1) Duality in Cone- LPs: A Simple Approach, *Gabor Pataki*, Columbia University, Dept. of IE/OR, Comp. Opt. Research Ctr., New York, NY 10027, gabor@ieor.columbia.edu http://www.ieor.columbia.edu/~gabor

We provide simple proofs for duality results in cone-LPs, including the facial reduction algorithm of Borwein & Wolkowicz, the extended dual and the corrected primal for SDPs of Ramana and of Ramana & Freund; a characterization of instances with a duality gap.

2) Global Error Bounds for Convex Conic Problems, *Shuzhong Zhang*, Erasmus University, Econometric Institute, PO Box 1738, Rotterdam, 3000 DR, The Netherlands

Lipshitzian-type error bounds are derived for general convex conic problems under various regularity conditions. Specifically, it is shown that if the recession directions satisfy Slater's condition, then a global Lipshitzian-type error bound holds. Alternatively, if the feasible region is bounded, then the ordinary Slater condition guarantees a global Lipshitzian-type error bound...

3) CSDP: A C Library for Semidefinite Programming, *Brian T. Borchers*, New Mexico Tech., Dept. of Math., Weir Hall, 801 LeRoy Blvd., Socorro, NM 87801-4796, borchers@nmt.edu

CDSP is a library of routines that implements a predictor corrector variant of the semidefinite programming algorithm of Helmberg, Rendl, Vanderbei & Wolkowicz. We discuss the algorithm used, its computational complexity and storage requirements. Finally, we present some computational results.

MC05 Simulation II

Contributed Session

Chair: Sadan Kulturel, University of Pittsburgh, 5830 Fifth Ave., Apt. 17, Pittsburgh, PA 15232, saksst53+@pitt.edu

1) Developing a Simulation Toolkit to Analyze Electric Grid Reliability & Infrastructure Interdependencies, *Kevin L. Stamber*, Sandia National Lab., PO Box 5800, MS 1363, Albuquerque, NM 87109, klstamb@sandia.gov

Sandia National Laboratories has developed an agent-based microsimulation model of the US economy to analyze economic policies. Extending this model to include object-oriented representations of electric power supply and demand will provide a powerful new simulation tool for analyzing system vulnerabilities caused by complex infrastructure interdependencies.

2) Human Resource Impact in Flexible Job Shops, *Brian D. Neureuther*, Texas Tech University, Coll. of Bus. Admin., Area of ISQS/MS 2101, Lubbock, TX 79409-2101, otbri@coba.ttu.edu www.ba.ttu.edu/~otbri, ***James R. Burns***

With the current downfall of the Asian market, many semiconductor firms are examining the possibility of reducing their labor force. A simulation of an existing semiconductor wafer manufacturing process is developed and the reduction of labor is examined with respect to product throughput, product cycle time and WIP inventory levels.

3) Experimental Investigation of 2 Shared Storage Assignment Policies in Automated Storage/Retrieval Systems under (Q,r) Inventory Policy, *Sadan Kulturel*, University of Pittsburgh, 5830 Fifth Ave., Apt. 17, Pittsburgh, PA 15232, saksst53+@pitt.edu, ***Nur E. Ozdemirel, Canan Sepil***

Three class turnover and duration of stay-based storage assignment policies are

compared in an end of aisle AS/RS. The AS/RS is assumed to operate under the continuous review, order quantity, reorder point (Q,r) inventory policy. Average transportation time of the AS/R machine, balance of the system and average backorder are used as main performance measures...

4) Simulation for MDP Model Generation, ***Christopher W. Zobel***, Virginia Tech., 1007 Pamplin Hall, Blacksburg, VA 24061, czobel@vt.edu, http://www.msci.vt.edu/faculty/zobel, ***William T. Scherer***

We discuss a simulation-based approach to generating aggregated MDP models which we call the simulation for model generation (SMG) algorithm. Following a description of the theoretical basis for the algorithm, its application to several different problem areas is discussed and some preliminary results presented.

MC06 Continuity, Change & the Product Development Process

Cluster: New Product Development
Sponsor: Technology Management Section
Sponsored Session
Chair: Susan Walsh Sanderson, National Science Foundation, Innovation & Org. Change Prog., 4201 Wilson Blvd., Arlington, VA 22230, ssanders@nsf.gov

1) Impact of Information Sharing on the Distortion of Demand, ***Shanling Li***, McGill University, Fac. of Management, 1001 Sherbrooke St. W, Montreal, Quebec, H3A 1G5, Canada, li@management.mcgill.ca, ***Afshin Afshari***

We examine the impact of information sharing in a supply chain model. We propose a sophisticated forecasting technique that updates the demand information over the product life cycles. The demand information may be shared among retailer, manufacturer and supplier. The resulted performance is compared with no information sharing.

2) Drivers of New Product Development Success: Multivariate Results from PDMA's Best Practices Research, ***Abbie Griffin***, University of Illinois, 350 Commerce West, Champaign, IL 61820, abbieg@uiuc.edu

We present several multivariate analyses of success drivers in NPD using an extensive data set from 383 US firms. We also present a multi-stage model of NPD factors, analyzed using the same data set. The model and data cover NPD processes, organizations, tools and outcomes.

3) Discontinuous Change, Disruptive Technologies & the Challenge of Developing New Products, ***Susan Walsh Sanderson***, National Science Foundation, Innovation & Org. Change Prog., 4201 Wilson Blvd., Arlington, VA 22230, ssanders@nsf.gov

This research looks at the challenge of developing new products in the context of discontinuous change and disruptive new technologies. Studies of firms in the digital photography market help elucidate the elements that lead to success or failure in a dynamic industry.

4) Setup Strategies in Flexible Manufacturing Environments, ***Valerie Tardif***, University of Texas, Graduate Program in OR/IE, Dept. of Mech. Eng., Austin, TX 78712-1063, vtardif@mail.utexas.edu, ***Wei-Liang Lin***

We consider different setup strategies in a flexible PCB assembly line experiencing uncertainty in demand. This is especially important at the beginning of a new product life cycle, when demand volume is low or medium and quite difficult to predict. We present computational results and insights obtained.

MC07 Public Sector Productivity Assessment: Alternative Applications using DEA

Sponsor: Public Programs & Processes Section
Sponsored Session
Chair: Kingsley E. Haynes, George Mason University, Inst. of Public Policy MS3C6, 4400 University Dr., Fairfax, VA 22030-4444, khaynes@gmu.edu

1) An Analysis of the Efficiency of Jordanian Police Systems, ***William M. Bowen***, Cleveland State University, Levin Coll. of Urban Affairs, 1737 Euclid Ave., Cleveland, OH 44115, bowen@wolf.csuohio.edu, ***Mustasem A. Almajali***

2) Efficiency of US Doctorate Granting Institutions by States: 1972-1994, ***Mustafa Dinc***, Cleveland State University, Levin Coll. of Urban Affairs, 1737 Euclid Ave., Cleveland, OH 44115, mdinc@gmu.edu, ***Kingsley E. Haynes***, ***Roger R. Stough***

3) Relative Efficiency of NIH Laboratories, ***Stephane Philogene***, George Mason University, 4400 University Dr. MS3C6, Fairfax, VA 22003, gphiloge@gmu.edu

4) Measuring Organizational Flexibility, ***Fred Phillips***, Oregon Graduate Institute of Science & Technology, PO Box 91000, Portland, OR 97291-1000, fphillips@admin.ogi.edu, ***Kingsley E. Haynes***, ***Mustafa Dinc***, ***Somik V. Lall***

MC08 Innovations in Strategic Global Supply Chain Analysis & Design

Cluster: Business & Industry Applications
Invited Session
Chair: Glenn Wegryn, Procter & Gamble, 2 P&G Plaza, PO Box 5559, Cincinnati, OH 45201-5559, wegryn.gw@pg.com

1) Modeling Global Supply Chains, ***Donald B. Rosenfield***, MIT, Sloan Sch. of Mgmt., E40-419, 77 Massachusetts Ave., Cambridge, MA 02139, donrose@mit.edu, ***Martin Haugh***

The advent of global corporations has led to a series of challenges in managing supply chains. These include exchange rate fluctuations, trading blocs and barriers and local and regional customization. We explore some of the complexities of modeling global supply chains and review a recent project in identifying data sources for global models.

2) The Option Value of Production Hedging, ***Burak Kazaz***, Loyola University, Water Tower Campus, 820 N Michigan Ave., Chicago, IL 60611, ***Maqbool Dada***

We consider a multinational manufacturer whose revenues are influenced by fluctuations in exchange rates. We show that under significant exchange-rate risk, it can be optimal to produce less than the total demand. When this is the case, we determine the value of utilizing a financial instrument, e.g., options. We illustrate our findings by using data from a multinational manufacturer.

MC09 Java-Based Simulation Modeling

Cluster: Utilizing JAVA in OR
Invited Session
Chair: Arnold H. Buss, Naval Postgraduate School, OR Dept., Code OR/BU, Monterey, CA 93943-5000, bussa@or.nps.navy.mil

1) Java-Based Object-Oriented Simulation Using Silk, ***Kevin J. Healy***, ThreadTec., Inc., PO Box 7, St. Louis, MO 63017, healy@threadtec.com, ***Richard A. Kilgore***

Silk is a new simulation language based on Java and its well-designed object-oriented framework, multi-threaded execution, and support for Internet communication protocols. The combination of Silk and JavaBeans-based visual development environments provide unique integrated visual and programming-based modeling capabilities.

2) Modkit: A Software Component Standard for Recursive Composition, ***Arent Arntzen***, Oerland Hovedflysrasjon, Brekstad, 7130, Norway

Modkit defines a simple yet powerful component standard for implementing OR models in Java. Modkit's component standard supports extremely very generic recursive composition that gives the modeler much flexibility. Applications include simulation of an Integrated Air Defense System (IADS).

3) An Object-Oriented Discrete-Event Simulation of Logistics: Modeling Focused Logistics, ***John L. Ruck***, OPNAV N-81, The Pentagon, Washington, DC 20301

The flexible experimental logistics simulator, FLEXLOGS, is an object-oriented discrete-event simulation package. FLEXLOGS implements the draft logistical conceptual object model being developed as part of the Focused Logistics Study by OSD PA&E and has been utilized to evaluate the Navy's proposed operational maneuver from the sea.

4) Component Simulation Modeling Using Simkit, ***Arnold H. Buss***, Naval Postgraduate School, OR Dept., Code OR/BU, Monterey, CA 93943-5000, bussa@or.nps.navy.mil

Simkit enables discrete-event simulation (DES) to be performed in Java using a component-based modeling approach. During the past 18 months, Simkit has been successfully used at NPS both in the classroom and in a number of master's theses evaluations of radar algorithms to simulating aircraft maintenance policies.

MC10 Identifying Roots: The Fundamental Ideas to Help People Make Better Decisions

Sponsor: Decision Analysis Society
Sponsored Session

Chair: Ralph L. Keeney, University of Southern California, Ctr. for Telecom. Mgmt., 101 Lombard St., Ste. 704W, San Francisco, CA 94111, keeneyr@aolcom

1) The Essential Ideas to Improve Decision Making, ***Ralph L. Keeney***, University of Southern California, Ctr. for Telecom. Mgmt., 101 Lombard St., Ste. 704W, San Francisco, CA 94111, keeneyr@aolcom

What are the essential ideas of decision analysis that should be communicated to a much broader audience? Hammond, Raiffa, and I distill this knowledge in Smart Choices, a book of core concepts and practical advice for anyone. I summarize these essential ideas and mention the more advanced ideas omitted.

2) Towards the Teaching of a Behavorial Decision Analysis, ***George Wu***, University of Chicago, Grad. School of Bus., 1101 E 58th St., Chicago, IL 60637, george.wu@gsb.uchicago.edu

The teaching of decision analysis and behavioral decision theory has not been especially well-integrated to date in MBA programs. Some steps toward integrating the two are outlined.

3) Building on All the Decider Knows & Values, ***Rex Brown***, George Mason University, Inst. of Public Policy, 2018 Lake Breeze Way, Reston, VA 22090, rbrown@gmu.edu

For a decision aid to improve on existing practice, it needs, at the very least, to take account of everything the decider already knows and values. We caution against commonly misapplied quantitative methods which fail this test -- often with grievous consequences.

4) Teaching the Essence of How to Make Better Decisions, ***Howard Raiffa***, Harvard Business School, Soldiers Field Rd., Boston, MA 02163

Making good decisions is a fundamental life skill. We suggest several concepts and techniques that offer depth in simplicity to promote good decision-making. The suggestions concern how to teach the ideas, how to learn them on our own, and how to master them to develop good decision-making habits.

MC11 Ground Attrition Modeling: Practice

Sponsor: Military Applications Society
Sponsored Session

Chair: James G. Taylor, Naval Postgraduate School, OR Dept., Code OR/TW, Monterey, CA 93943, jtaylor@nsp.navy.mil

1) The VECTOR Series of Combat Models, ***W. Peter Cherry***, Vector Research Inc., PO Box 1506, Ann Arbor, MI 48106-1506, cherryw@vrinet.com

The Vector series of theater and campaign models have been extensively used for conflict and campaign analysis. We describe the evolution of the models, discuss their application in past and on-going studies and analyses and address some of the theoretical issues associated with their development and use.

2) The Integrated Theater Engagement Model, ***Vern F. Wing***, SAIC, 10260 Campus Pt. Dr., San Diego, CA 92121, vern.f.wing@cpmx.saic.com

We give an overview of the Integrated Theater Engagement Model (ITEM), currently DoD's only joint-warfare campaign analysis. We describe the evolution of the models, discuss their application in past and on-going studies and analyses and address some of the theoretical issues associated with their development and use.

3) Panel Discussion, ***Vernon M. Bettencourt***, US Army Modeling & Simulation Office, 1111 Jefferson Davis Hwy, Crystal Gateway N, Ste. 503E, Alexandria, VA 22202, bettvm@hqda.army.mil, ***Vincent P. Roske, Alfred G. Brandstein, Seth Bonder, Kevin L. Murphy***

Many people feel that many of the problems plaguing the use of combat models for decision support stem from incomplete documentation of basic methodology, inadequate communication between the various players. Do model users and managers share such views? A distinguished panel will discuss such issues, particularly future challenges and directions.

MC12 Japan/US Collaborative Research on Genetic Algorithm-Based Intelligent Design

Cluster: Engineering Cost
Invited Session

Chair: Mitsuo Gen, Ashikaga Institute of Technology, Dept. of Industrial ISE, Ashikage, 326-8558, Japan, gen@genlab.ashitech.ac.jp

Co-Chair: Bryan A. Norman, University of Pittsburgh, 1048 Benedum Hall, Dept. of Ie, Pittsburgh, PA 15261, banorman@pitt.edu

. Kenichi Ida

1) A Hybrid Genetic Algorithm for Bicriteria Reliability Design, ***Mitsuo Gen***, Ashikaga Institute of Technology, Dept. of Industrial ISE, Ashikage, 326-8558, Japan, gen@genlab.ashitech.ac.jp, ***JongRyul Kim***

A bicriteria reliability appointment problem for a series system with time-dependent reliability is manipulated. This problem is formulated as a bicriteria nonlinear MIP problem, subject to several design constraints - A hybrid genetic algorithm is used here to find an optimal or near optimal solution. We also propose the method searching the Pareto solutions of bicriteria reliability design problems.

2) Bicriteria Local Area Network Design using Spanning Tree-Based Genetic Algorithms, ***JongRyul Kim***, Ashikaga Institute of Technology, Dept. of Industrial ISE, Ashikage, 326-8558, Japan, ***Mitsuo Gen, Kenichi Ida***

LAN is commonly used as the communication infrastructure that meets the demands of the users in local environment. We propose a spanning tree-based GA for solving bicriteria LAN design problems minimizing connection cost and average message delay, using the feature that the interconnection between LANs must yield spanning tree configuration.

3) A Hybrid Genetic Algorithm for Solving the Fixed Charge Transportation Problem, ***Mitsuo Gen***, Ashikaga Institute of Technology, Dept. of Industrial ISE, Ashikage, 326-8558, Japan, gen@genlab.ashitech.ac.jp, ***Kenichi Ida, Yin-Zhen Li, Junoh Choi***

Many practical distribution and transportation problems such as the minimum cost network flow (transshipment) problem in logistics can be formulated as a fixed charge transportation problem. The fixed charge transportation problem is much more difficult to solve due to the presence of fixed costs which causes discontinuities in the objective function...

4) Genetic Algorithms for Solving Bicriteria Shortest Path Problems with Fuzzy Coefficients, ***Mitsuo Gen***, Ashikaga Institute of Technology, Dept. of Industrial ISE, Ashikage, 326-8558, Japan, gen@genlab.ashitech.ac.jp, ***Kenichi Ida, Junoh Choi***

We describe a new approach of the genetic algorithm for solving the BSP problem with fuzzy coefficients. The BSP problem deals with finding shortest distance between selected pairs of nodes. The ranking fuzzy numbers with integral value was used to evaluate chromosomes. We use a priority based encoding method for the BSP because it can potentially represent all possible paths in a graph.

MC13 Procedural Approaches to Group Decision & Negotiation

Sponsor: Group Decision & Negotiation Section
Sponsored Session

Chair: D. Marc Kilgour, Wilfrid Laurier University, Dept. of Math, Ctr. for Military Studies, Waterloo, Ontario, N2L 3C5, Canada, mkilgour@machl.wlu.ca

1) Artificial & Human Agents in Bargaining, ***Rachel Croson***, University of Pennsylvania, Wharton Sch. of Bus., Dept. of OPIM, 1322 SH-DH, Philadelphia, PA 19104-6366, crosonr@opim.wharton.upenn.edu, ***James Laing***

A bargaining experiment with human subjects is compared to a bargaining simulation using artificial agents. Artificial agents achieved outcomes closer to the game-theoretic solution but human agents had fewer impasses and were more efficient at extracting surplus. The implications of these results for artificial agents and equilibrium predictions are discussed.

2) Preference Orderings, Voting & Bargaining, ***James Bradley***, Calvin College, Dept. of Math & Comp. Sci., 3201 Burton St. SE, Grand Rapids, MI 49546, braj@calvin.edu, ***D. Marc Kilgour***

Models and procedures for group choice typically decide a single question. To address more questions simultaneously, they must be assumed "separable" to justify treating them independently. But group decisions often involve multiple overlapping issues. Recent results on violations of separability and their implications for choice procedures are presented.

3) Competitive Fair Division, ***Steven J. Brams***, NYU, Dept. of Politics, 715 Broadway, 4th Fl., New York, NY 10003-6806, steven.brams@nyu.edu, ***D. Marc Kilgour***

When fallback bargaining is applied to the allocation of discrete items, disputants rank subsets and descend through their rankings, in lockstep, until mututally consistent subsets are found. Though Pareto-optimal, the resulting division may not be envy-free; some disputant may prefer another's allocation.

Conditions for envy-freeness are identified and assessed.

4) Fair Negotiation Procedures, ***Matthias Raith***, Universitaet Bielefeld, Inst. of Mathematic Economics, Postfach 100131, Bielefeld, D-33501, Germany, mraith@wiwi.uni-bielefeld.de

By viewing negotiation problems as problems of fair division, one can apply intuitive procedures to complex conflicts. We go in the opposite direction and reformulate fair-division algorithms as cooperative negotiation procedures in order to apply them to a more general class of multiple-issue negotiations.

MC14 Panel: Metaheuristics - Some New Directions

Sponsor: Computing Society
Sponsored Session

Chair: Bruce L. Golden, University of Maryland, Smith Sch. of Bus., College Park, MD 20742

1) Panel: Metaheuristics: Some New Directions, ***Bruce L. Golden***, University of Maryland, Smith Sch. of Bus., College Park, MD 20742, ***Michel Gendreau***, Universite de Montreal, DIRO/CRT, CP 6128, succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, michelg@crt.umontreal.ca, ***Alice E. Smith***, University of Pittsburgh, 1031 Benedum Hall, Dept. of IE, Pittsburgh, PA 15261, aesmith@pitt.edu, aesmith@engrng.pitt.edu, ***Erik Rolland***, Ohio State University, Fisher Coll. of Bus., Acct. & MIS, 1775 College Rd., Columbus, OH 43210, rolland.1@osu.edu

Metaheuristics such as simulated annealing, genetic algorithms, and tabu search have already had a major impact on our ability to solve complex optimization problems. The purpose of this session is to explore new techniques and directions within this framework of approaches.

MC15 Managing Supply: Information & Coordination I

Cluster: Supply Chain Management
Invited Session

Chair: Alexander Brown, Vanderbilt University, Owen Grad. Sch. of Mgmt., Nashville, TN 37203, aob@leland.stanford.edu

1) Optimal Ordering Decisions with Uncertain Cost & Demand Updating, ***Haresh B. Gurnani***, HKUST, Dept. of Info. & Sys. Mgmt., Clear Water Bay, Kowloon, Hong Kong, mnharesh@ust.hk, ***Christopher S. Tang***

We consider the situation where a retailer can order a product from a manufacturer at two instants prior to the start of the selling season. Facing the prospect of an unknown (possibly higher) unit cost but using more accurate (updated) demand information at the second instant, we determine the optimal purchasing strategy for the retailer at both instants.

2) Mid-Life & End-of-Life Returns Policies, ***Terry A. Taylor***, Stanford University, Dept. of IE/EM, Stanford, CA 94305, ttaylor@leland.stanford.edu, ***Hau L. Lee***

While much of the literature on returns has restricted its attention to returns at the end of the life-cycle, firms frequently allow returns during a product's life-cycle as well. We explore the effects of mid-life returns policies and the potential of various returns policies for achieving channel coordination.

3) Why is the Fashion Industry Typically Ordering Less than the Newsvendor Quantity?, ***Nils Rudi***, University of Pennsylvania, Dept. of OPIM, SH-DH 1300, The Wharton Sch., Philadelphia, PA 19104-6366, rudi24@opim.wharton.upenn.edu, ***David F. Pyke***, ***Taylor R. Randall***

The fashion industry is typically ordering less than the newsvendor quantity. Are they missing an opportunity to improve profits, or does the news/vendor model not capture their reasons? We address these questions using both analytical and empirical investigations.

4) The Win-Win Nature of "Pay-to-Delay" Capacity Reservation Arrangements, ***Alexander Brown***, Vanderbilt University, Owen Grad. Sch. of Mgmt., Nashville, TN 37203, aob@leland.stanford.edu, ***Hau L. Lee***

We consider an advanced capacity reservation arrangement between a manufacturer and subcontractor. Each unit of capacity is reserved at the subcontractor with the purchase of either a firm commitment or an option. We illustrate the win-win nature of such an arrangement, showing that a contract that increases the expected profit of both parties can always be constructed.

MC16 Aggregation & Disaggregation in Operations Research

Cluster: Aggregation & Disaggregation in Operations Research
Invited Session

Chair: Larry B. Weinstein, Wright State University, 3640 Colonel Glenn Highway, MSIS Dept., 271 Rike, Dayton, OH 45430, lweinstein@wright.edu

1) Localization of the Optimal Solution & a Posteriori Bounds for Aggregation, ***Igor S. Litvinchev***, Russian Academy of Sciences, Computing Ctr., Vavilov 40, Moscow, 117967, Russia, igor@ccas.ru

The bounds on the suboptimality of the disaggregated solution are presented for convex programming problems. The extremal characterization of the bound is given, which depends on the initial localization of the optimal solution set. It is shown that many classic bound computation approaches can be derived this way...

2) Integrating Maintenance & Production Decisions in a Hierarchical Production Planning Process, ***Larry B. Weinstein***, Wright State University, 3640 Colonel Glenn Hwy, MSIS Dept., 271 Rike, Dayton, OH 45430, lweinstein@wright.edu, ***Chen H. Chung***

We present a 3-part model to evaluate organization maintenance policy. The aggregate production plan and master production schedule are developed using a model suggested by Chung & Krajewski (1984). Work center loading requirements, determined through rough cut capacity planning using resource profiles, are then used to simulate equipment failures during the aggregate production planning horizon.

MC17 Theory & Applications of Network Flows

Cluster: Network Flows
Sponsor: Optimization Section
Sponsored Session

Chair: Ravindra K. Ahuja, University of Florida, Dept. of ISE, 303 Weil Hall, Gainesville, FL 32611, ahuja@ise.ufl.edu

1) 1-Flowing Clutters, ***Gerard Cornuejols***, Carnegie Mellon University, Grad. Sch. of IA, Pittsburgh, PA 15213-3890, gc0v@andrew.cmu.edu, ***Bertrand Guenin***

In 1981, Seymour introduced 1-flowing clutters. They comprise the clutters of odd circuits in weakly bipartite graphs and the clutters of T-cuts in general graphs. e prove a decomposition theorem for 1-flowing clutters and we relate this result to Seymour's conjecture on minimally nonideal binary clutters.

2) Tree Traversal Techniques for Finding Association Rules in Data Mining, ***Charu C. Aggarwal***, IBM, TJ Watson Research Ctr., 30 Saw Mill River Rd., Hawthorne, NY 10532, charu@watson.ibm.com, ***V. V. V. Prasad***, ***Viviane Crestana***, ***Ramesh Agarwal***

We propose algorithms for generation of large item sets by successive construction of the nodes of a lexicographic tree of item sets. We discuss different strategies in generation and traversal of the lexicographic tree. These techniques provide different trade-offs in terms of the I/O, memory and computational time requirements.

3) The Pseudoflow-Simplex Algorithm for the Maximum Flow Problem, ***Dorit S. Hochbaum***, University of California, Dept. of IEOR, Haas Sch. of Bus., Berkeley, CA 94720-1777, dorit@hochbaum.ieor.berkeley.edu

We introduce a new simplex algorithm for the maximum flow problem that is based on manipulating pseudoflows. The algorithm is a variant of the pseudoflow algorithm [Hochbaum 97] and its solves similarly the maximum s-excess problem. Its complexity, even for parametric analysis, is O(mn log n).

4) Combinatorial Algorithms for Inverse Network Flow Problems, ***Ravindra K. Ahuja***, University of Florida, Dept. of ISE, 303 Weil Hall, Gainesville, FL 32611, ahuja@ise.ufl.edu, ***James B. Orlin***

In inverse problems, we are given a solution of an optimization problem and we wish to make it optimal by causing minimum change in the objective function. We consider inverse shortest path problem, assignment, minimum cut and minimum cost flow problems and propose highly efficient algorithms.

MC18 IP, Theory, Algorithms & Applications

Cluster: Integer Programming
Sponsor: Optimization Section
Sponsored Session

Chair: Gerald L. Thompson, Carnegie Mellon University, GSIA, Pittsburgh, PA 15213-3890, gt04@andrew.cmu.edu

1) An Algorithm for Nonlinear Unconstrained Bivalent Optimization, ***Benjamin T. Smith***, University of Montreal, CP 6079, Succ. A, Montreal, Quebec, H3C 3A7, Canada, ***Yves Nobert***, ***Jean-Claude Picard***

A B&B algorithm is proposed for the maximization of the general unconstrained polynomial objective function in zero-one variables. Bounds are provided by a linear relaxation which is the problem of finding the maximum closure in a bipartite graph, which can be easily solved as a maximum flow problem.

2) A Branch & Cut Approach for the Frequency Assignment Problem, ***Tekogan Hemazro***, Ecole Polytechnique, Dept. of Math. & IE, CP 6079, Succ. Centre-ville, Montreal, Quebec, H3C 3A7, Canada, tekogan@crt.umontreal.ca, ***Brigitte Jaumard***, ***Odile Marcotte***, ***Tsevi Vovor***

We discuss a 0-1 column generation model with a large number of rows for the channel assignment problem. Different tightening constraints, embedded in a branching scheme, are presented for reducing the integrality gap. Preliminary numerical results are examined for some medium size urban networks provided by Bell Mobilite.

3) Solution of Matching Problems using the Integral Simplex Method, ***Gerald L. Thompson***, Carnegie Mellon University, GSIA, Pittsburgh, PA 15213-3890, gt04@andrew.cmu.edu

It is easy to see that the perfect matching problem is a set partitioning problem, and hence a good candidate for solution by use of the author's recently developed integral simplex method. A complete description of its solution and computational results will be given.

4) Branch & Bound Methods for Scheduling the Hybrid Flowshop, ***Omar Moursli***, Catholic University of Louvain, 1 place de Doyens, Louvain-La-Neuve, 1348, Belgium, moursli@qant.ucl.ac.be, www.qant.ucl.ac.be/qant/membres/om/om.html

We study 2 B&B algorithms for scheduling the hybrid flowshop. We compare improved versions of the sequence enumeration algorithm (Brah & Hunsucker, 1991) and the so-called interval method (Moursli & Pochet, 1997). Different bounding strategies are tested on different hybrid flowshop configurations with reasonable sizes (15 to 30 jobs).

MC19 Scheduling I

Contributed Session

Chair: Jaime M. Bustos, Lehigh University, Dept. of IMSE, Mohler Lab., W Packer Ave., Bethlehem, PA 18015, jmb9@lehigh.edu http://www.lehigh.edu/~jmb9

1) Minimizing Makespan on Unrelated Parallel Machines with Setup Times, ***Robert L. Armacost***, University of Central Florida, Dept. of IE, PO Box 162450, Orlando, FL 32816-2450, armacost@pegasus.cc.ucf.edu, ***Ameer H. Salem***

We investigate the problem of minimimzing makespan on unrelated parallel machines with sequence-dependent setup times. A heuristic will be introduced to find good solutions efficiently.

2) Job-Shop Scheduling of Perishable Items, ***Dario Pacciarelli***, Universita di Roma Tre, Dipart. di Info. & Automazione, via della Vasca Navale 84, Roma, 00146, Italy, pacciare@dia.uniroma3.it, http://www.dia.uniroma3.it/~pacciare/, ***Alessandro Mascis***

An important class of machine scheduling problems is characterized by the decay of items under process. A general framework for modeling job-shop scheduling problems under such restrictions will be presented. The goal is the makespan minimization. Computational results will be given for quick heuristics as well as for exact algorithms.

3) Tabu Search for Minimizing Total Tardiness in a Job Shop Scheduling Problem, ***Cintia R. Scrich***, LAC-INPE, Av. dos Astronautas 1758, CP 515, Sao Jose dos Campos, 12201-970, Brazil, cintia@lac.inpe.br, ***Vinicius Armentano***

We address a TS approach to minimize total tardiness for the job shop scheduling problem. The method uses dispatching rules to obtain an initial solution and searches for new solutions in a neighborhood based on the critical paths of the jobs. The method performance is compared with 2 heuristics.

4) Sequencing in the Job Shop with Stochastic Processing Times, ***Jaime M. Bustos***, Lehigh University, Dept. of IMSE, Mohler Lab., W Packer Ave., Bethlehem, PA 18015, jmb9@lehigh.edu http://www.lehigh.edu/~jmb9, ***Robert H. Storer***

We discuss the sequencing problem in a job shop with stochastic processing times. An efficient heuristic to find robust sequences is presented. Computational efficiency is achieved by using orthogonal polynomials to represent the distribution functions of the random variables.

5) Minimizing Total Absolute Deviation from a Common Due Date, ***Pei-Chun Lin***, Purdue University, 216-15 Nimitz Dr., West Lafayette, IN 47906, peichun@ecn.purdue.edu, http://gilbreth.ecn.purdue.edu/~peichun, ***Jen-Hung Wang***

We build a JIT scheduling model for the general single machine problem and tested it with 3 different heuristics. Different from classic studies, the JIT approach gives penalties not only to tardiness but to earliness. Because of the NP-hard characteristic of the problem, it is not practical to solve the optimal solutions. We investigated the efficiency of SA, TS and the V-shaped heuristic...

MC20 Optimization in Energy Markets

Cluster: Energy

Sponsor: Section on Energy, Natural Resources & Environment Sponsored Session

Chair: Andrew Philpott, University of Auckland, Dept. of Eng. Science, Private Bag 92019, Auckland, New Zealand, a.philpott@auckland.ac.nz

1) Optimal Offer Strategies for a Price-Taker Electricity Generator, ***Golbon Zakeri***, Argonne National Laboratory, Math & Comp. Sci. Division, 9700 S. Cass Ave., Argonne, IL 60439-4844, zakeri@mcs.anl.gov, ***Geoff Pritchard***

We will present a model for generating optimal offer strategies for a hydro-electric power generation firm in a wholesale electricity market. We assume that the firm is a price-taker. We will also present numerical results of this study.

2) Constructing Offer Stacks in Electricity Markets to Maximize Expected Return, ***Edward Anderson***, University of New South Wales, Australian Grad. Sch. of Mgmt., Sydney, 2052, Australia, eddiea@agsm.unsw.edu.au, ***Andrew Philpott***

We consider optimal strategies for generators making offers into wholesale electricity markets in circumstances where the demand and competitor behavior is unknown, but can be represented by a probability distribution. We show how to represent the stochastic elements of this problem in a single function of price and quantity and derive necessary conditions for an optimal strategy...

3) Using Supply Functions for Offering Generation into an Electricity Market, ***Andrew Philpott***, University of Auckland, Dept. of Eng. Science, Private Bag 92019, Auckland, New Zealand, a.philpott@auckland.ac.nz, ***Edward Anderson***

We consider generators making offers into wholesale electricity markets where demand is unknown in advance. Assuming smooth supply functions in a duopoly, we derive conditions under which a supply function can represent an optimal response to a competing offer over a range of demands and briefly discuss the existence of symmetric equilibria in a single-shot game.

MC21 Telecommunications Network Design I

Sponsor: Technical Section on Telecommunications Sponsored Session

Chair: Richard T. Wong, AT&T Labs., 200 Laurel Ave., Rm. D5-3D23, Middletown, NJ 07748, rtwong@att.com

1) Optical Fiber Network Design & Routing for a Multimedia Telecommunication Service, ***Byungha Lim***, University of San Francisco, McLaren Sch. of Bus., 2130 Fulton St., San Francisco, CA 94117-1080, ***June S. Park***, ***Lihua Zhu***

2) Tabu Search for a Network Loading Problem with Multiple Facilities, ***S. Raghavan***, University of Maryland, Smith Sch. of Bus., College Park, MD 20742, sr141@umail.umd.edu, suraghav@rhsmith.umd.edu, ***Bernard Gendron***, ***Jean-Yves Potvin***, ***Patrick Soriano***, ***David Berger***

3) On Capacity Penalties of Various Network Survivability Architectures, ***Yufei Wang***, Bell Labs. Lucent Technologies, 101 Crawfords Corner Rd., Rm. 3J-322, Holmdel, NJ 07733, ywang@lucent.com

4) Designing Logical Networks Subject to Node or Link Failures, ***Hanan Luss***, BELLCORE, 444 Hoes Ln, RRC-4A1166, Piscataway, NJ 08854, ***Richard T. Wong***

MC22 Environmental Issues II

Contributed Session

Chair: Fouzia Siddiq, University of Waterloo, Dept. of Systems Design Eng., Waterloo, Ontario, N2L 3G1, Canada, fsiddiq@engmail.uwaterloo.ca

1) Optimal Air Pollution Control Strategies: The Retrofitting Problem, *Riyadh Ahmed*, University of Kuwait, Dept. of Chemical Eng., PO Box 5969, Safat, 13060, Kuwait, ***Ali Elkamel***

A binary integer program that selects the best pollution control strategy to achieve a given pollution reduction level is presented. The objective is to mnimize the pollution abatement cost. The model takes into account the retrofit selection case. If new sources are developed, emissions increased or regulations changed, the model presents the best adaptive strategy...

2) Optimization of Tree Species Allocation in a Forest Station Area by Means of Self-Organization, *Niels Strange*, KVL, Dept. of Econ. & Natural Res., Rolighedsvej 23, Frederiksberg, 1958, Denmark, nst@kvl.dk, http://www.flec.kvl.dk/nst, ***Henrik Meilby***

We present a cellular automation approach to optimizing the choice of tree species in a forest station. A Danish case study is analyzed. A 2-dimensional automation containing approximately 100,000 active cells is used to optimize the land use setup in this area. Finding the optimal solution constitutes a tremendous combinatorial problem. Obviously, no heuristic is able to solve such a problem...

3) Selection of Policy Instruments for Reducing Nonpoint Source Water Pollution from Agricultural Runoff, *Fouzia Siddiq*, University of Waterloo, Dept. of Systems Design Eng., Waterloo, Ontario, N2L 3G1, Canada, fsiddiq@engmail.uwaterloo.ca, ***Mitali De, Keith W. Hipel***

Agriculture is the primary source of nonpoint source (NPS) water pollution. The selection of appropriate policy instrument(s) for reducing agricultural NPS water pollution is crucial. We provide an assessment of policy instruments for controlling NPS pollution with respect to a few relevant criteria by using the MCDM technique.

4) Waste Minimization by Modification in Petrochemical Processes, *Erdogen Alper*, University of Kuwait, Chem. Eng. Dept., PO Box 5969, Safat, 13060, Kuwait, ealper@kuc01.kuniv.edu.kw, ***Ghanima Sharrah, Imad Al-Atiqui***

An integrated optimization study that incorporates separation and purification needs is carried out on a petrochemical plant manufacturing acrylonitrile. We take into account energy, waste treatment and associated economics. The effect of temperature and residence time are discussed and the conditions leading to minimum waste are obtained...

MC23 Technology Management in Rapidly Changing Environments

Sponsor: Technology Management Section
Sponsored Session

Chair: Nikhil Jain, University of Cincinnati, Coll. of Bus. Admin., PO Box 210230, Cincinnati, OH 45221, nikhil.jain@uc.edu

1) Managing High-Tech Knowledge Workers in Growing Markets, *Edward G. Anderson, Jr.*, University of Texas, Mgmt. Dept., CBA 4.202, Austin, TX 78712, edanderson@mail.utexas.edu

2) Industry Clockspeed & the Pace of New Product Development, *Janice E. Carrillo*, Washington University, CB 1133, One Brookings Dr., St. Louis, MO 63130-4899, carrillo@wuolin.wustl.edu

3) Managing Uncertainty in New Product Development of High Technology Products, *Shantanu H. Bhattacharya*, INSEAD, Dept. of Tech. Mgmt., Blvd. de Constance, Fontainebleau Cedex, 77305, France, shantanu.bhattacharya@insead.fr

4) Using Real Time Sales Information to Manage Inventory for Technology-Based Short Life Cycle Products, *Nikhil Jain*, University of Cincinnati, Coll. of Bus. Admin., PO Box 210230, Cincinnati, OH 45221, nikhil.jain@uc.edu, ***Hirofumi Matsuo***

MC24 Finance: Theory

Contributed Session

Chair: Peter Berling, Lund University, Dept. of IE, PO Box 118, Lund, 22100, Sweden, peter.berling@ie.lth.se

1) Impacts of News & Announcement on the Selection of Treasury Bond Price Forecasting Techniques, *Lai Fujun*, City University of Hong Kong, Dept. of MS, Kowloon, Hong Kong, mslai@cityu.edu.hk, http://personal.cityu.edu.hk/~msfjlai/, ***Shi Weihua***

We study the performance of forecasting techniques evaluated in Treasury Bond price forecasting accuracy. GARCH, neural network, GA and chaos models are considered. News and macro announcements effects on the forecasting performance are studied.

2) The Capital Cost of Holding Inventory: Exact & Approximate Approaches, *Peter Berling*, Lund University, Dept. of IE, PO Box 118, Lund, 22100, Sweden, peter.berling@ie.lth.se

A significant financial cost of holding inventory is due to the stochastic nature of the replenishment cost. The optimal is computed from an extended option-valuation framework and compared to a simple approximation where the risk premium is included in the opportunity cost of holding inventory.

3) Evaluating the Performance of Taiwan's Mutual Funds, *Kuo-Ping Chang*, National Tsing Hua University, Dept. of Economics, Hsinchu 300, Taiwan ROC, kpchang@faculty.nthu.edu.tw, ***Mei-Hsiu Chen***

We have used Chang's (1998) minimum input and maximum output sets approach to evaluate the performance of Taiwan's mutual funds. Empirical results are compared with the Treynor & Sharpe indexes. It is found that the market is informationally efficient, the funds have performed worse than the TSE index and the funds don't have the ability of selectivity and market timing.

4) On the Inefficiency of the Forward Foreign Exchange Market, *Nicolas Gressis*, Wright State University, Finance Dept., Rike 244, Dayton, OH 45435, ngressis@wright.edu, ***Richard Williams, Robert J. Sweeney***

The literature on the unbiased forward rate hypothesis (UFRH) has produced conflicting results. Instead of focusing on econometrics, we consider the risk-neutral speculator's performance under the random walk hypothesis for spot rates and under the UFRH. We find that performance results under the random walk hypothesis are statistically superior to those under the UFRH.

MC25 Routing & Scheduling

Sponsor: Transportation Science Section
Sponsored Session

Chair: Michel Gendreau, Universite de Montreal, DIRO/CRT, CP 6128, succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, michelg@crt.umontreal.ca

1) An Optimization System for the Operational Crew Scheduling Problem, *Mirela Stojkovic*, Ecole Polytechnique de Montreal, GERAD, 3000 Cote-Ste-Catherine, Montreal, Quebec, H3T 2A7, Canada, mirela@crt.umontreal.ca, ***Francois Soumis***

We mathematically formulated the problem as an integer nonlinear multi-commodity network flow model with (or without) time windows and supplementary constraints and solved it by using a Dantzig-Wolfe decomposition combined with a B&B method. Different cost structures have been used depending on the traffic type (long or short haul operations)...,

2) Simultaneous Vehicle & Crew Scheduling, *Guy Desaulniers*, Ecole Polytechnique de Montreal, GERAD, 3000 Cote-Ste-Catherine, Montreal, Quebec, H3T 2A7, Canada, guyd@crt.umontreal.ca, ***Knut Haase***

We consider the problem of simultaneously computing vehicle and crew schedules so as to accomplish a set of tasks at minimum cost. We present a new formulation and propose to solve it by a column generation approach where only crew schedules need to be generated. Vehicle schedules are derived in a polynomial-time post-processing phase...

3) Aircraft Routing & Scheduling, *Nicolas Belanger*, Ecole Polytechnique de Montreal, GERAD, 3000 ch. Cote-Ste-Catherine, Montreal, Quebec, H3C 2A7, Canada, nicolasb@crt.umontreal.ca, ***Francois Soumis***

Many optimization methods have been proposed to solve the aircraft routing and scheduling problem. However, they do not consider an important fact: flights with the same origin and destination might compete each other if their departure times are too close. We present a mathematical programming model and discuss our results.

4) Combined Real-Time Commercial Vehicle Fleet Operations Strategy, *Yongjin Kim*, University of Texas, Dept. of Civil Eng. & MS/IS, Austin, TX 78712, ***Patrick Jaillet, Hani S. Mahmassani***

We present a real-time strategy for commercial vehicle fleet operations that combines a fast initial assignment algorithm with an improved reassignment methodology of previously assigned loads using CPLEX under time windows. Performance of the strategy is evaluated. We also examine several heuristics to further improve the strategy.

5) Diversion in Real-Time Vehicle Dispatching, *Michel*

Gendreau, Universite de Montreal, DIRO/CRT, CP 6128, succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, michelg@crt.umontreal.ca, ***Soumia Ichoua, Jean-Yves Potvin***

We study the benefits that can be gained in real-time dispatching systems by allowing vehicles to be diverted from their current destination to a newly arrived request. Our analysis is based on a series of computational experiments performed in a simulated pick-up only environment.

MC26 Model-Based Statistical Process Control & Diagnosis

Sponsor: **Quality, Statistics & Reliability Section**
Sponsored Session

Chair: Daniel W. Apley, Texas A&M University, Dept. of IE, College Station, TX 77843-3131, apley@engin.umich.edu

1) Waveform Signal Decomposition using a Process-Oriented Basis for Progress Die Condition Monitoring, *Jionghua Jin*, University of Michigan, Dept. of IOE, IPQI Lab., Ann Arbor, MI 48109-2117, ***Jianjun Shi***

A new algorithm is developed by using wavelet analysis to decompose a total waveform signal into a set of non-orthogonal process-oriented basis. The projection coefficents can be used to monitor changes corresponding to each idnvidual basis. The methodology and real implementation in the progress die condition monitoring are studied.

2) A Simple Control Scheme for Continuous Flow Processes, *William G. Ferrell, Jr.*, Clemson University, Dept. of IE, 110 Freeman Hall, Box 340920, Clemson, SC 29634-0920, fwillia@ces.clemson.edu, ***Althea J. D'Souza***

Controlling continuous flow processes requires differentiating between perturbations due to the time-dependent process mean, those due to assignable causes and random noise. Recently, researchers have suggested that integrating statistical process control ideas with the techniques underlying automatic process control successfully addresses this problem...

3) Model-Based Factor Rotation for Diagnosing Root Causes of Variation in Multivarate Processes, *Daniel W. Apley*, Texas A&M University, Dept. of IE, College Station, TX 77843-3131, apley@engin.umich.edu

In complex production processes where large quantities of multivariate data are obtained through automated in-process sensing, interpretation of alarm signals can be difficult. A method is presented for monitoring and root cause diagnosis of variation sources in multivariate processes. Application of the method to the autobody assembly process demonstrates that incorporation of a suitable model can greatly improve factor intrepretability...

4) Retrospective Statistical Process Control, *Doug Barrett*, Texas A&M University, Dept. Economics & Finance, College Station, TX 77843

Statistical monitoring of processes consists of the retrospective and prospective phases. During the retrospective phase, we determine the appropriate monitoring method and obtain the estimates of process parameters. Retrospective statistical process control methods are similar for continuous and count data. The analysis of means procedures are applicable for continuous and count data and are fairly simple...

MC27 Adaptive Stochastic Models

Sponsor: **Applied Probability Society**
Sponsored Session

Chair: Elmira Popova, University of Texas, Dept. of Mech. Engineering, Austin, TX 78712, elmira@mail.utexas.edu

1) Adaptive Control of Markov Processes via Randomization, *Apostolos N. Burnetas*, Case Western Reserve University, Dept. of OR, WSOM, 10900 Euclid Ave., Cleveland, OH 44106-7235, atb4@po.cwru.edu

Consider a controlled Markov chain with unknown parameters and possibly side constraints. We develop a class of asymptotically efficient policies based on adaptive randomization schemes, that combine ideas from stochastic approximation and multi armed bandit problems.

2) Markov Decision Processes with Decentralized Information, *Ulrich Rieder*, Universitaet Ulm, Dept. of OR, Abteilung Mathematik VII, Ulm, 89069, Germany, rieder@mathematik.uni-ulm.de

We consider Markov decision processes with 2 decision makers. We first introduce 2 methods of reducing the decentralized problem to a centralized one. Then, we derive monotonicity results for a decentralized queueing problem by means of the reduced models.

3) Multi-Parameter Maintenance Optimization via the Marginal Cost Approach, *Rommert Dekker*, Erasmus University, Fac. of Business Mgmt., PO Box 1738, Rotterdam, 3000 DR, The Netherlands, rdekker@few.eur.nl, http://www.eur.nl/few/ei/faculty/rdekker

We show how the marginal cost approach can be used to optimize multi-parameter maintenance optimization models. We illustrate the approach for the so-called (t,T) rule in an opportunity-based age replacement model. In this model, an item is replaced preventively at the first opportunity after age t, and if no such opportunity occurs, at age T at higher costs...

4) The Variability Associated with Heuristic Adaptive Replacement Policies, *John G. Wilson*, Wake Forest University, Babcock Sch. of Mgmt., Box 7659 Reynolds Station, Winston-Salem, NC 27109, john.wilson@mba.wfu.edu, ***Elmira Popova***

The literature on replacement/maintenance policies for systems of stochastically failing machines generally assumes that the failure time parameters are known. The objective is to find a replacement policy that minimizes expected cost per unit time. A class of policies is analyzed where the manager is allowed to adapt the replacement policy according to statistical information obtained while operating the machines...

5) Adaptive Stochastic Optimization for Employee Scheduling on a Single Machine, *Elmira Popova*, University of Texas, Dept. of Mech. Engineering, Austin, TX 78712, elmira@mail.utexas.edu, ***David Morton***

We exploit the strengths of Bayesian prediction and stochastic programming in a rolling-horizon approach that can be applied to solve real-world problems. We illustrate the methodology on an employee scheduling problem with uncertain up-times of manufacturing equipment and uncertain production rates. Computational results indicate the value of our approach.

MC28 Logistics Applications I

Contributed Session

Chair: Richard L. Powers, Eastern Kentucky University, Mgmt. & Mktg. Dept., 215 Combs, Richmond, KY 40475, cbopower@acs.eku.edu

1) Analysis & Algorithms for a Joint Pricing/Distribution Model, *Julie L. Swann*, Northwestern University, 1017 W Byron, Apt. 2W, Chicago, IL 60613, j-swann@nwu.edu, ***David Simchi-Levi***

We consider a distribution problem with a number of suppliers, warehouses and retail outlets geographically distributed in a given area. Limited inventory for a single product is available at different facilities. The objective is to find a distribution strategy and a produc pricing policy to maximize profit.

2) Hong Kong's Warehousing in Transition: From Traditional Storage Facility to Regional Distribution Center, *Judy Tong*, HKUST, Dept. of IEEM, Clear Water Bay, Kowloon, Hong Kong, judy@ust.hk, http://homeust.hk/~judy, ***Raymond K. Cheung***

We review the role of Hong Kong's warehousing along the supply chain and its resource management. An activity-based-costing model to assess the value of transforming warehouses to distribution centers is presented. We also discuss the impact of the economic changes in Asian Pacific to Hong Kong's warehousing industry.

3) Negotiating in Multi-User Logistics & Allocation Problems, *Pitu B. Mirchandani*, University of Arizona, SIE Dpt., PO Box 210020, Tucson, AZ 85721, pitu@sie.arizona.edu, ***Ling Shen***

New challenging problems arise where users (or customers) seek to utilize a common set of resources to meet requirements. We will give a general overview of such problems and provide examples where these problems are "solved" up to the point of formulating and obtaining nondominated solutions over which the users can negotiate.

4) Functional Overlap Between Logistics, Production & Marketing in Small Firms, *Richard L. Powers*, Eastern Kentucky University, Mgmt. & Mktg. Dept., 215 Combs, Richmond, KY 40475, cbopower@acs.eku.edu, ***Kambiz Tabibzadeh***

We examine the degree of overlap of logistics into operations and marketing areas in small businesses. A survey of 105 firms was conducted, and the results analyzed using discriminant analysis and cross-tabulation. The findings indicated no strong relationship between size and the overlap of logistics activities.

5) Postponement & Speculation Strategies: Choosing the Right Strategy, *Martha C. Cooper*, Ohio State University, 514 Fisher Hall, 2100 Neil Ave., Columbus, OH 43210, cooper.7@osu.edu, ***Janus D. Pagh***

Only a few substantial efforts have been made to operationalize the theory of postponement and speculation in a way useful for managerial decision making.

Generic postponement and speculation strategies are suggested and a diagnostic framework for selecting an appropriate strategy presented.

MC29 Supply Chain Applications

Sponsor: Manufacturing & Service Operations Management Society Sponsored Session

Chair: Stephen C. Graves, MIT, 77 Massachusetts Ave., Rm. E40-439, Cambridge, MA 02139-4307, sgraves@mit.edu, http://mit.edu/sgraves/www

1) Responsive Supply Chain for Caterpillar, ***Sridhar Tayur***, Carnegie Mellon University, GSIA, Pittsburgh, PA 15213, stayur@grobner.gsia.cmu.edu, ***Uday S. Rao***, ***Alan Scheller-Wolf***

For a new line of products and the associated work tools, being introduced in 98-99 in US and Europe, we design a supply chain that takes into account customer patience, variability in demand, multiple sources and transshipment points, international traffic and tariff requirements, that maximizes the profit. We optimize over modes of transportation, inventory levels and alternate sourcing choices...

2) Price-Directed Inventory Routing, ***Daniel Adelman***, University of Chicago, Grad. Sch. of Bus., 1101 E 58th St., Chicago, IL 60637, dan.adelman@gsb.uchicago.edu, ***Anton J. Kleywegt***

Based on work with an industrial gas distributor implementing vendor managed inventory, we present a price-directed mechanism for routing vehicles from a central depot to customers requiring inventory replenishment. The objectives are to minimize transportation, holding and stockout costs.

3) Optimal Supply Chain Configuration Strategies for New Products, ***Sean P. Willems***, University of Cincinnati, Dept. of QAOM, 531 Linder Hall, PO Box 210130, Cincinnati, OH 45221-0130, sean.willems@uc.edu, ***Stephen C. Graves***

In practice, the dominant criterion when choosing suppliers for a new product is unit manufacturing cost. We present a model that incorporates other relevant supply-chain costs, including inventory and time-to-market costs. We illustrate possible new insights for designing supply chains with examples from industry.

4) A Decision Support Model for the Inventory Management of Product Options, ***Hari S. Abhyankar***, MIT, Sloan Sch. of Mgmt., 42 Phillips St., Apt. 4, Boston, MA 02114, hsabhyan@mit.edu, ***Stephen C. Graves***

A manufacturer of test equipment produces a product family, where products differ based on their option content. We develop a model for planning the inventory for long lead-time subsystems that define the product options. The model schedules the procurement of subsystems to assure that the firm can meet random demand within some specified time window.

MC30 Modeling & Analysis of Health Care Problems

Sponsor: Manufacturing & Service Operations Management Society Sponsored Session

Chair: Lawrence M. Wein, MIT, Sloan Sch. of Mgmt., E53-343, Cambridge, MA 02139, lwein@mit.edu

1) Hold Everything! Evaluating Policies for Protecting Blood & Plasma Supplies, ***Edward H. Kaplan***, Yale University, Sch. of Organization & Mgmt., Box 208200, New Haven, CT 06520-8200, edward.kaplan@yale.edu, ***Glen Satten***

In spite of advances in testing technologies for detecting infections such as HIV, HBV and HCV, occasionally infectious blood or plasma enters the supply on account of false negative screening errors. We will consider a holding policy for further reducing the number of infectious units that enter the supply...

2) A Queueing Analysis of the Paired-Kidney Exchange Program, ***Stefanos Zenios***, Stanford University, Grad. Sch. of Business, Stanford, CA 94305-5015, stefzen@leland.stanford.edu

The paired-kidney exchange program is expected to increase the supply of living kidneys through exchanges between pairs of donors and recipients. We analyze this program using a multiclass stochastic population system that explicitly captures the exchange process. Asympototic analysis leads to closed-form expressions for the stationary waiting time.

3) Resource Allocation for Epidemic Control over Short Time Horizons, ***Margaret L. Brandeau***, Stanford University, Dept. of IE/EM, Stanford, CA 94305, brandeau@stanford.edu, ***Gregory S. Zaric***

We develop and solve a model for the optimal allocation of resources for epidemic control over a short time horizon. The goal is to minimize the number of infections averted, subject to a budget constraint.

4) Modeling & Analysis of a Virus that Selectively Kills Tumor Cells, ***Lawrence M. Wein***, MIT, Sloan Sch. of Mgmt., E53-343, Cambridge, MA 02139, lwein@mit.edu, ***David H. Kim***

ONYX has developed a replication-competent adenovirus that kills p53-deficient tumor cells. We develop, analyze and validate a spatial mathematical model, which consists of 6 partial differential equations along with a moving boundary condition, of a virus-infected tumor. An approximate analysis reveals a 3-dimensional traveling wave of infection.

MC31 Operations Management I

Contributed Session

Chair: Donna L. Retzlaff-Roberts, University of Memphis, Fogelman College, Memphis, TN 38152, retzlaff@memphis.edu

1) Stock Rationing in Make-to-Stock Production Systems, ***Albert Y. Ha***, Yale School of Management, 135 Prospect St., New Haven, CT 06511-3729, albert.ha@yale.edu

We consider the problem of finding the optimal stock rationing policy for a make-to-stock system with multiple customer classes, Poisson arrivals and Erlang production times. Numerical results will be presented on the effectiveness of a simple critical stock level policy.

2) Global Supply & Distribution Network Design with Price & Supplemental Channels, ***Wei-yu Chiang***, University of Illinois, 350 Commerce West, 1206 S 6th St., Champaign, IL 61820, wchiang@uiuc.eduhttp://www.students.uiuc.edu/~wchiang, ***Rachel B. Yang***

Managing global supply chains faces unique international diversity such as regional and national differences. A network model with price and quantity variables and the possibility of supplemental channels is proposed for multinational manufacturing firms to form coherent strategies of plant location, production switching, market entry and degree of centralized planning.

3) Multi-Echelon Supply Chains with Production Constraints, ***Edward W. Chan***, Cornell University, School of OR&IE, Rhodes Hall, Ithaca, NY 14853-3801, chan@orie.cornell.edu http://www.orie.cornell.edu/~chan, ***John A. Muckstadt***

We consider a supply chain consisting of a production facility, a central warehouse and a system of distribution centers that face stochastic demand. We explore the effects of minimum and maximum production constraints on inventory levels and present a computationally efficient method for determining production and inventory decisions.

4) Using Computer Simulation to Reengineer a Reverse Logistics Process, ***Donna L. Retzlaff-Roberts***, University of Memphis, Fogelman College, Memphis, TN 38152, retzlaff@memphis.edu, ***Mohammad Amini***

Computer simulation is used to analyze a reegineered reverse logistics process for a major direct marketer. The objectives of the new process include improving customer service by reducing the cycle time of customer refunds/exchanges as well as increasing the efficiency of processing customer returns.

MC32 Applications of Data Envelopment Analysis

Cluster: Data Envelopment Analysis

Invited Session

Chair: Joe Zhu, Worcester Polytechnic Institute, Dept. of Mgmt., 100 Institute Rd., Worcester, MA 01609, jzhu@wpi.edu

1) Productivity Indices of Fortune 500 Companies using Data Envelopment Analysis, ***Agha Iqbal Ali***, University of Massachusetts, Sch. of Mgmt., Finance & Op. Mgmt., Amherst, MA 01003, aiali@som.umass.edu, ***Yao Chen***

We use Fortune 500 rankings that are published annually to produce 3 indices of performance that are computed using DEA. By combining the data in 3 different ways, we define a labor efficiency index, an operation leanness index and a resource utilization index. The interpretation of these indices is illustrated for 2 industries: motor vehicle and computer and office equipment.

2) Benchmarking the Performance of US Banks, ***Richard S. Barr***, SMU, Dept. of Comp. Sci. & Eng., SIC 306, Dallas, TX 75275, barr@seas.smu.edu, ***Thomas F. Siems***, ***Sheri L. Zimmel***

DEA is the basis for a benchmarking study of the entire US banking industry. The performance model includes judgement elicited from experts, was applied to 7500 institutions, with results that were validated by bank examiner ratings.

3) The Fixed Weighting Nature of Cross-Evaluation, ***Timothy R. Anderson***, Portland State University, Engineering Mgmt. Program, PO Box 751, Portland, OR 97207-0751, tima@emp.pdx.edu, ***Lane***

Inman, Keith B. Hollingsworth

Cross-evaluation has been touted as a powerful extension of DEA. It is demonstrated, in the single input, multiple output case, cross-evaluation implicity uses a single fixed set of weights which may still be unrealistic. Also these weights can be highly influenced by the presence/exclusion of a single DMU.

4) Data Envelopment Analysis as a Recruiting Tool, ***Joe Zhu***, Worcester Polytechnic Institute, Dept. of Mgmt., 100 Institute Rd., Worcester, MA 01609, jzhu@wpi.edu, ***Sharon A. Johnson***

DEA is originally developed as a methodology for measuring relative efficiency among peer units. By using the Pareto concept, the current study shows that DEA can actually be used to determine qualified candidates for job recruiting. Different selection criteria are classified into DEA inputs and outputs. It is shown that the use of DEA can improve the recruiting efforts.

MC33 Monte Carlo Simulation Approaches to Complex Problems at Glaxo-Wellcome

Cluster: Novel Applications of Statistics
Invited Session

Chair: F. Lee Hodge, Glaxo Wellcome, 5 Moore St., PO Box 13398, RTP, NC 27709, flh51252@glaxo.com

1) Monte Carlo Analysis & the Unmanageable Problem, ***F. Lee Hodge***, Glaxo Wellcome, 5 Moore St., PO Box 13398, RTP, NC 27709, flh51252@glaxo.com

We discuss how Monte Carlo simulation was used to simplify the otherwise unwieldly calculation of probabilities used in a larger decision analytic model. We also discuss the benefits and costs of this application, as well as the basic approach.

2) Research Strategy Analysis, ***Wei Meng***, Glaxo Wellcome, 5 Moore St., PO Box 13398, RTP, NC 27709, wm97031@glaxo.com

Using a decision tree, Monte Carlo simulation, influence diagram and sensitivity analysis to help scientists to improve their strategies and productivity for early R&D projects. The ultimate goal is to minimize risk and optimize return by choosing a strategy that has the highest expected values.

MC34 Rail Applications II: Discussion of Line Capacity Modeling Issues

Sponsor: Railroad Applications Special Interest Group
Sponsored Session

Chair: Carl D. Martland, MIT, Dept. of Civil & Environ. Eng., Rm. 1-153, Cambridge, MA 02139, martlan@mitvma.mit.edu

Co-Chair: William H. VanMarter, Canadian Pacific Railway, 159 Macewan Valley Mews,NW, Calgary, Alberta, T2P 4Z4, Canada

1) Discussion of Line Capacity Modeling Issues, ***Carl D. Martland***, MIT, Dept. of Civil & Environ. Eng., Rm. 1-153, Cambridge, MA 02139, martlan@mitvma.mit.edu, ***William H. VanMarter***

This session will provide a forum for the discussion of modeling issues related to railroad line capacity, dispatching and related issues. The intent is to encourage a lively discussion involving all participants.

MC35 Education in OR

Contributed Session

Chair: George M. Huntley, US Army Log. Mgt. College, 315 North Temple Ave., Fort Lee, VA 23801-1705, huntleyg@lee.army.mil, http://www.almc.army.mil

1) Combining Distance Learning with Classroom Instruction, ***James Otto***, Villanova University, Mgmt. Dept., 800 Lancaster Ave., Villanova, PA 19085, jotto@cf_faculty.vill.edu www.villanova.edu/~comfin/faculty/otto.html, ***Mohammad K. Najdawi, Bill Wagner***

The impact of combining distance learning with traditional classroom instruction is discussed. We present and analyze a survey of student opinions on the benefits and disadvantages of combining the 2 pedagogies. We also discuss these issues from a faculty perspective.

2) A General Approach to Effectively Utilize Current School Information Systems, ***Yun Wang***, Mercy College, Math/CIS Dept., 555 Broadway, Dobbs Ferry, NY 10522, ywang@mercynet.edu

With massive technology investment in US educational institutions, effective utilization of information systems to improve education standard has increasingly become a critical national topic. This research is devoted to establish a general approach to the above topic by analyzing factors of school information systems, such as IT personnel, technology, student body, faculty members and surrounding community.

3) Modernizing & Modularizing College Training in Decision & Risk Analysis, ***George M. Huntley***, US Army Log. Mgt. College, 315 North Temple Ave., Fort Lee, VA 23801-1705, huntleyg@lee.army.mil, http://www.almc.army.mil

The Decision Analysis Course and Risk Analysis Course are modernized week-long courses evolving from a 2-week Decision Risk Analysis course. Whereas the 2-week course was previously for scientists/engineers, the new courses are designed for any interested personnel. The reasoning, mechanics and implications of this split up and modernization are discussed.

4) Student Perceptions of the Effectiveness of Internet-Based Technology in a Graduate Engineering Course, ***Rosemarie M. Evans***, Wright State University, MSIS Dept., Dayton, OH 45435, rosemarie.evans@wright.edu, ***Susan L. Murray***

In 1997, the Engineering Management Department of the University of Missouri-Rolla offered its first internet-based graduate level course. This course, Advanced Production Management, was designed to utilize a combination of the latest internet-based tools. We present the results of a survey of more than 100 students on the effectiveness of these tools.

MC37 Software Demonstration II

Chair: To be announced

1) Software Demonstration: Introducing DPL 4.0, Decision Analysis Software, ***Christy Downs***, Applied Decision Analysis LLC, 2710 Sand Hill Rd., Menlo Park, CA 94025, http://www.adainc.com

Applied Decision Analysis LLC, a wholly-owned subsidiary of PricewaterhouseCoopers LLP, introduces DPL, the professional DA software using influence diagrams, decision trees and spreadsheets. Graphical outputs include Rainbow Diagrams, Tornado Diagrams, Risk Profiles, Policy Trees and Policy Summaries. New in DPL 4.0: a new Win95 interface, strategy tables, graphical value of perfect information and control and more!

2) Software Demonstration: Stochastic Programming Applications, ***Gyana Parija***, IBM Corporation, Optimization Group, 522 South Rd., Poughkeepsie, NY 12601, parija@us.ibm.com

IBM will discuss developing stochastic programming applications and the use of the Parallel Extensions product to deliver faster solution times. Installation and configuration of Parallel Extensions will be presented along with tips and techniques for optimizing stochastic model structure for parallel execution.

Monday 14:45-15:45

MP36 MAS Plenary

Plenary Session

Chair: Bruce W. Fowler, US Army Aviation Missile Command, ATTN: AMSAM-RD-AS, Redstone Arsenal, AL 35898-5242, fowler-bw@redstone.army.mil

1) MAS Plenary: The Art of Analysis, ***Glenn A. Kent***, RAND Corporation, 1333 H St. NW, Washington, DC 20005-4707

The central purpose of analyses is to illuminate complex problems; to provide insight so that analysts and decision makers alike have a common understanding of what outcome we seek and a mental grasp of what factors affect that outcome - and why and to what extent. Many seemingly complex problems can be collapsed so that the role of the various factors (players) in achieving the outcome becomes quite transparent and obvious - even to those who are not card-carrying analysts. Collapsing problems is especially useful for cases where both of the antagonists can do better by adapting what they are about to do in reaction to information about the course of action to which the enemy now seems committed. The problem being, however, that in most interesting cases, that information is not available to either side in time. Here, the collapsing agent is the game-theoretic solution. Some analysts seem to believe that illuminating problems and collapsing problems are a matter of computational capacity, and in the new era of unlimited capacity, the analyst is king. I believe that collapsing problems is an art form - the art of analysis - and has little to do with computational capacity. And an art form not on the rise but rather on the wane. One way to put renewed energy into this art form is to study cases of the past - where analytic methods have collapsed important problems to the point where the illumination is intense, the role of various factors is completely transparent and the decision maker is informed. The purpose of this session is to illustrate how to briefly review selected cases of the past in the hope of instilling new energy into this form of analysis.

Monday 16:00-17:30

MD01 Panel: A Model Curriculum in MHT I

Cluster: MHT as a Health Profession
Invited Session
Chair: Ori Heller, MMT Institute, 530 South Second St., Philadelphia, PA 19147, mmtinstitute4@juno.com

1) Panel: A Model Curriculum in MHT I

MD03 International Challenge of Quality & Costs in Health Care Delivery

Sponsor: CPMS/IFORS
Sponsored Session
Chair: Andres Weintraub, University of Chile, Dept. of IE, PO Box 2777, Santiago, Chile, aweintra@dii.uchile.cl

1) Challenge of Quality & Costs in Health Care Delivery: International Challenge of Improving Quality & Costs in Health Care Delivery, *William P. Pierskalla*, UCLA, Anderson Sch., Ste. F407, 110 Westwood Plaza, Box 951481, Los Angeles, CA 90095-1481, wpierska@anderson.ucla.edu

Managing the quality and costs of health care services delivery is a challenge in every nation. Part of the challenge stems from the explosion of technological and knowledge processes. Part stems from the difficulty of trying to measure what, for many years, has been thought of as intangible outcomes. Part stems from the lack of consistent information and information systems. Part stems from the cultures of the country and the lack of physicians' interest in changing their behavior. And part stems from the virtually unlimited demand for improved health. We will address current knowledge and research on these issues related to the quality and costs of care and will raise questions as to some of the many things needed to be done.

MD04 Optimization Techniques V

Contributed Session
Chair: Samuel F. Coppage, Old Dominion University, Information Systems Dept., Norfolk, VA 23509, scoppage@oeu.edu, http://www.odu.edu

1) A New Efficient Approach to Genetic Algorithms, *Renyou Wang*, Carnegie Mellon University, Dept. of Eng. & Public Policy, 5000 Forbes Ave., Pittsburgh, PA 15213, renyou@andrew.cmu.edu, ***Urmila Diwekar***

GAs use random mutation and crossover for generation movement. We will incorporate the constrained and stratified sampling techniques, such as Latin hypercube sampling method, median Latin hypercube sampling method and especially Hammersley sampling method, into GAs to improve their performance.

2) A New Algorithm in Average Cost Neuro-Dynamic Programming: Convergence Analysis & Numerical Results, *Abhijit Gosavi*, University of South Florida, ENB 118, IMSE Dept., 4202 East Fowler Ave., Tampa, FL 33620, gosavi@eng.usf.edu, ***Tapas K. Das***

Neuro-dynamic programming, aka reinforcement learning, is a relatively new simulation-based technique to solve semi-Mrkov decision problems. A new algorithm that solves semi-Markov decision problems is presented with an analysis of its convergence properties and some numerical results.

3) The Use of a New Sampling Technique for Multiobjective Optimization, *Yan Fu*, Carnegie Mellon University, Dept. of Eng. & Public Policy, 5000 Forbes Ave., Pittsburgh, PA 15213, yfu@andrew.cmu.edu, http://www.andrew.cmu.edu/~yfu, ***Urmila Diwekar***

All design must satisfy multiple goals. We address a new multiobjective optimization algorithm based on the Hammersley sequence sampling technique. Results show that using this novel multiobjective optimization method can greatly save the CPU time compared with the other major sampling techniques.

4) Decision Regions for Multi-Stage Allocations, *Samuel F. Coppage*, Old Dominion University, Information Systems Dept., Norfolk, VA 23509, scoppage@oeu.edu, http://www.odu.edu

Decision regions for multi-stage allocation vectors can determine a highly complex choice region geometry. We examine one such problem set and its regions.

MD05 Simulation III

Contributed Session
Chair: David F. Munoz, Instituto Tecnologico Autonomo de Mexico, Camino a Santa Teresa #930, Mexico, DF, 10700, Mexico, davidm@master.ster.itam.mx

1) The Coast Guard's Maritime Operations Simulation, *Michael S. Migdail-Smith*, MicroSystems Integration, Inc., 158 South Broad St., Ste. C, Pawcatuck, CT 06379-1925, mikem@msi-ct.com, ***Patrick J. Ryan***, ***Kevin Downer***

MarOpsSim, a flexible object oriented simulation, enables Coast Guard analysts to evaluate asset performance and tactical decisions by modeling their maritime operations. A Web-based scripting process and dynamic database link make MarOpsSim ideal for modeling the Coast Guard's multi-mission approach within the contraints of their computing environment.

2) The Use of Neural Networks Simulation Metamodeling as a Decision Support Tool, *Mahdi Nasereddin*, 10236 Dylan St. #226, Orlando, FL 32825, mahdi@writeme.com, ***Mansooreh Mollaghasemi***

The use of neural networks to build a reverse-simulation metamodel is explored. A neural network is trained to perform the inverse of simulation: given a set of performance measures, the neural network metamodel will suggest the appropriate values for the system design parameters.

3) Optimization of Stochastic Systems using Simulation, *Mohamed A. El-Wakeel*, Kuwait University, Dept. Stats. & OR, Safat, 13060, Kuwait, wakeel@kuc01.kuniv.edu.kw

We develop 3 strategies of a new iterative search procedure for finding the optimal configuration of a stochastic system where the objective function must be estimated through Monte Carlo simulation. We show that the configuration that has been visited most often in the first m iterations converges almost surely to an optimum solution.

4) Control Variates for Quantile Estimation in Steady-State Simulation, *David F. Munoz*, Instituto Tecnologico Autonomo de Mexico, Camino a Santa Teresa #930, Mexico, DF, 10700, Mexico, davidm@master.ster.itam.mx

We present a general framework under which the validity of control variates techniques for quantile estimation in steady-state simulation can be analyzed. Experimental results from our proposed methodology will be discussed.

MD06 Panel: Discussion on Teaching Product Development

Cluster: New Product Development
Sponsor: Technology Management Section
Sponsored Session
Chair: Durward K. Sobek, II, Montana State University, Dept. of MIE, 220 Roberts Hall, Bozeman, MT 59715-3800, dsobek@ie.montana.edu

1) Panel: Teaching Product Development, *Abbie Griffin*, University of Illinois, 350 Commerce West, Champaign, IL 61820, abbieg@uiuc.edu, ***Anil Khurana***, Boston University, Sch. of Mgmt., 595 Commonwealth Ave., Boston, MA 02215, ***Viswanthan Krishnan***, University of Texas, Dept. of Mgmt., CBA 4.202, Austin, TX 78712, krishnan@mail.utexas.edu, ***Susan Walsh Sanderson***, National Science Foundation, Innovation & Org. Change Prog., 4201 Wilson Blvd., Arlington, VA 22230, ssanders@nsf.gov, ***Stefan Thomke***, Harvard Business School, Morgan Hall T63, Soldiers Field, Boston, MA 02163, sthomke@hbs.edu

MD07 Models for Improving Library Operations

Sponsor: Public Programs & Processes Section
Sponsored Session
Chair: Michael E. Gleeson, Indiana University, Sch. of Publ. Environ. Affairs, Indianapolis, IN 46202-5152, gleeson@iupui.edu

1) Optimizing Textual Retrieval: Weights, Boolean Queries & Machine Learning, *Donald H. Kraft*, Louisiana State University, Dept. of Comp. Sci., 286 Coates Hall, Baton Rouge, LA 70803-4020, kraft@bit.csc.isu.edu

2) An Actuarial Survival Model for Library Inventory, *A. Grant Hemphill*, Indianapolis Life Insurance Company, 2960 N. Meridian St., Indianapolis, IN 46208, aghemphi@uipui.edu

3) Applying Data Envelopment Analysis to Research Libraries, *Paul B. Kantor*, RUTCOR, 4 Huntington St., New Brunswick, NJ

08905-1071, kantor@scils.rutgers.edu, ***Wonsik Shim***

4) A Model for Measuring & Improving the Effectiveness of Public Libraries, ***Michael E. Gleeson***, Indiana University, Sch. of Publ. Environ. Affairs, Indianapolis, IN 46202-5152, gleeson@iupui.edu, ***Jonathan P. Caulkins***

MD08 Business & Industry Applications

Cluster: Business & Industry Applications
Invited Session

Chair: Srinivas Bollapragada, GE Corporate R&D, 1 Research Circle, K1-5C22A, Schenectady, NY 12309, srinivas.bollapragada@crd.ge.com

1) Uncertainty Modeling & Management in MRP Systems, ***Ramesh Bollapragada***, Lucent Technology Bell Labs., 101 Crawfords Corner Rd., Rm. 2L-515, Holmdel, NJ 07733, rbollapragada@lucent.com, ***Uday S. Rao***

We examine an MRP environment with demand and supply uncertainty, capacity limits and service level requirements. A stochastic program of the static, finite horizon problem is presented. For feasible instances, we develop optimal/heuristic solutions that are tested computationally; otherwise, we identify good, feasible combinations of capacity and service.

2) The Inventory Matching Problem in the Process Industry, ***Jayant Kalagnanam***, IBM, TJ Watson Research Ctr. 01-133, PO Box 218, Yorktown Heights, NY 10598, jayant@watson.ibm.com, ***Milind Dawande, Mark Trumbo, Ho Soo Lee***

We introduce 2 problems that arise from operations planning applications in the process industry. These problems involve matching an order book against surplus inventory as a preprocessing step to production planning. We describe the problems, their formulations and the heuristic solutions developed to solve them.

3) Using Economic Indicators to Forecast Sales, ***Venkatesh Narayan***, Avery Dennison, 150 North Orange Grove Blvd., Pasadena, CA 91106, v.narayan@averydennison.com

We describe the use of economic indicators to forecast sales. The product being relatively mature, was very predictable using economic indicators published by the Conference Board.

4) An Algorithm for Scheduling On-Air Promotions on Network Television, ***Srinivas Bollapragada***, GE Corporate R&D, 1 Research Circle, K1-5C22A, Schenectady, NY 12309, srinivas.bollapragada@crd.ge.com

Television networks schedule on-air promotions to increase the audience for their shows. Promotions are short advertisements for shows and typically consist of a scene from the show and an announcement of air date and air time. We present a math programming algorithm for efficiently scheduling promotions.

MD09 Dynamic, Distributed Modeling Architectures

Cluster: Utilizing JAVA in OR
Invited Session

Chair: Gordon H. Bradley, Naval Postgraduate School, OR Dept., Code OR/TW, Monterey, CA 93943, bradley@nps.navy.mil

1) Dynamic, Distributed Modeling Architectures, ***Leroy A. Jackson***, US Army, TRADOC Analysis Ctr., Monterey, CA 93943, jacksonl@mtry.trac.nps.navy.mil

OR modeling and analysis in high tempo, network-based systems requires a supporting architecture. We present a conceptual architecture for dynamic, distributed modeling and demonstrate the architecture's features with several implementation examples including a graph and network modeling component, a dynamic programming framework and a military planning system.

2) Dynamic, Distributed Map-Based Military Planning, ***Gordon H. Bradley***, Naval Postgraduate School, OR Dept., Code OR/TW, Monterey, CA 93943, bradley@nps.navy.mil, ***Arnold H. Buss, Charles H. Shaw, III***

A "loosely coupled component" architecture for dynamic, distributed modeling is demonstrated in a prototype map-based system for special operations mission planning. For unanticipated, time-critical missions, an analyst can access resources, i.e., data, maps, models, algorithms and people, etc., over a network, compose models and perform analysis in support of a high-tempo stream of decisions.

3) Implementing Dynamic, Distributed Modeling Architectures, ***Leroy A. Jackson***, US Army, TRADOC Analysis Ctr., Monterey, CA 93943, jacksonl@mtry.trac.nps.navy.mil

We present the critical implementation details for dynamic, distributed modeling architectures and highlight the capabilities that distinguish these architectures from others. We show how these simple, robust and adaptable architectures support platform independent, real-time OR modeling and analysis as an integral part of a larger networked IS.

MD10 New Developments in Modeling Risk & Uncertainty

Sponsor: Decision Analysis Society
Sponsored Session

Chair: Craig Fox, Duke University, Fuqua Sch. of Bus., Durham, NC 27708, cfox@mail.duke.edu

Co-Chair: George Wu, University of Chicago, Grad. School of Bus., 1101 E 58th St., Chicago, IL 60637, george.wu@gsb.uchicago.edu

1) Testing Composition Rules in Original & Cumulative Prospect Theory, ***George Wu***, University of Chicago, Grad. School of Bus., 1101 E 58th St., Chicago, IL 60637, george.wu@gsb.uchicago.edu, ***Richard Gonzalez***

Original and cumulative prospect theory differ in the composition rule used to combine the probability weighting function and the value function. We test these and other composition rules by estimating two-outcome cash equivalents and using these estimates to predict three-outcome cash equivalents under the assumption of different composition rules.

2) Associative vs. Rule-Based Processing of Uncertainty Information, ***Elke U. Weber***, Ohio State University, 142 Townshend Hall, 1885 Neil Ave., Columbus, OH 43210, weber.211@osu.edu, ***Paul D. Windschitl***

Three experiments demonstrate that precise numeric forecasts ("70%") are as susceptible to context effects as vague verbal forecasts ("good chance"). Associative rather than or in addition to rule-based processing of uncertainty information best explains why perceptions of uncertainty vary with context even when precise and credible numeric forecasts are provided.

3) Familiarity Bias in Relative Likelihood Judgment, ***Craig Fox***, Duke University, Fuqua Sch. of Bus., Durham, NC 27708, cfox@mail.duke.edu, ***Jonathan Levav***

Respondents in several studies were biased to view more familiar events (and their complements) as "more likely" than less familiar events (and their complements). This familiarity bias may be less pronounced among people who are asked to judge the probability of each event. The relationship with support theory is discussed.

4) An Empirical Investigation of the Reducibility Principle, ***David V. Budescu***, University of Illinois, Dept. of Psychology, 603 East Daniel St., Champaign, IL 61820, dbudescu@s.psych.uiuc.edu, ***Ilan Fischer***

According to the principle of reducibility, a DM should be indifferent when choosing between a multi-stage lottery and its reduced, single-stage form. We present experimental results documenting systematic violations of this principle for gains and losses. These violations illustrate the DMs' sensitivity to various properties of the lottery's chance mechanism.

MD11 Applications of OR in Weapon System Tests & Evaluations

Sponsor: Military Applications Society
Sponsored Session

Chair: Robert G. Hinkle, Office Under Secretary of the Army, 102 Army Pentagon, Rm. 1E653, Washington, DC 20310-0102, hinklrg@hqda.army.mil

Co-Chair: Wayland E. Parker, US Army Operational Test & Evaluation, 1700 Defense Pentagon, Rm. 1C670, Washington, DC 20301-1700, parkerw2dote.osd.mil

1) Using Test Data, ***Carl T. Russell***, Joint National Test Facility, JNTF/SE, 730 Irwin Ave., Falcon AFB, CO 80912-7300, russellc@jntf.osd.mil

The DoD collects data from many different kinds of tests. Those data are used in various ways. Increased digital storage and emergence of data warehousing/mining concepts makes huge bodies of data widely accessible. Traditional uses of test data are examined in the context of this emerging technology.

2) Issues in Acquisition Analysis, ***Paul H. Deitz***, US Army

Material Systems Analysis Activity, Combat Integration Division, APG, MD 21005-5071

The scope of weapons analysis includes weapons design, weapons capability, and military utility. Ideally these elements are examined with respect to multiple missions as well as cost. We will discuss how these classes of information are related, which involve measurable metrics, the implications for model/test strategies, and areas for improvement.

3) Integrating Modeling & Simulation into the Operational Test & Evaluation Process, ***Cyrus Staniec***, Logicon RDA, 2100 Washington Blvd., Arlington, VA 22204-5706, cstaniec@logicon.com, ***Lambert Sebastiani***

The DoD has initiated a program to integrate testing, training and modeling and simulation in an effort to obtain efficiencies in time and dollars for weapon system acquisition, as well as to provide the best possible information to acquisition officials. The objective is to develop management tools and procedures to assist in the DoD integration process...

4) No Title Supplied, ***Dean Dewolfe***, Institute of Defense Analysis, 1801 N. Beauregard St., Alexandria, VA 22311-1772, ddewolf@ida.org

No abstract supplied.

5) Optimizing Limited Longbow Hellfire Missile Shots for Evaluation, ***Rosemary Mirabelle***, US Army OPTEC, CSTE-EAC, 4120 Susquehanna Ave., APG, MD 21005-3013, mirabellroe@optec-hq.army.mil

Sometimes "users" find new methods to successfully employ a system during an operational test. Resources to explore the operational parameters of the "new method" are usually limited. Modeling and simulation can be an effective way to optimize the amount the useful data gathered from limited live missile shots.

MD12 Genetic Algorithms and Cellular Manufacturing

Cluster: Engineering Cost
Invited Session

Chair: Gursel A. Suer, University of Puerto Rico, Dept. of IE, Mayaguez, PR 06681-5000, Puerto Rico, a_suer@rumac.upr.clu.edu

Co-Chair: Gursel A. Suer, University of Puerto Rico, Dept. of Ie, Mayaguez, PR 06681-5000, Puerto Rico, a_suer@rumac.upr.clu.edu

1) A General Framework for CM Design & Control, ***Gursel A. Suer***, University of Puerto Rico, Dept. of IE, Mayaguez, PR 06681-5000, Puerto Rico, a_suer@rumac.upr.clu.edu

We discuss all relevant issues involved in the design and control of a cellular manufacturing system. Indeed, the design of a cellular system cannot be considered independently from a process layout and/or dedicated lines. The framework also includes how to identify the right conditions for a cellular manufacturing system.

2) Genetic Algorithms for the Identification of Remainder Parts & the Remainder Cell, ***Ramon Vazquez***, University of Puerto Rico, Dept. of IE, Mayaguez, PR 06681-5000, ***Miguel Cortes***, ***Gursel A. Suer***

It is assumed that the number of desired families is already known. This assumption is valid in the companies operating in focused environments where the organization has been already formed around a fixed number product families. The required number of machine types is (m). The objective is to assign (n) products to (I) families...

3) Genetic Algorithms in the Pan Family Formation, ***Gursel A. Suer***, University of Puerto Rico, Dept. of IE, Mayaguez, PR 06681-5000, Puerto Rico, a_suer@rumac.upr.clu.edu, ***Ramon Vazquez***, ***Yolando Pena***

This study is a continuation of a previous work where Gas are used in the part family formation. The proposed GA scheme is used for a given number of families and corresponding families are identified. Later, the number of families is changed to a new value and the same computation is repeated...

4) Genetic Algorithms for Loading Cells in Cellular Manufacturing, ***Gursel A. Suer***, University of Puerto Rico, Dept. of IE, Mayaguez, PR 06681-5000, Puerto Rico, a_suer@rumac.upr.clu.edu, ***Juan Carlos Tapia***

Cellular manufacturing has received substantial attention among researchers during the last decades. While this has been an area of interest, within CM, cell loading can benefit from further studies. Cell loading refers to determining to which cell(s), among the feasible cells, products of that family should be assigned, how many units should be produced and in what order.

MD13 GDN Research in Context: The Context of Negotiation

Sponsor: Group Decision & Negotiation Section
Sponsored Session

Chair: Rachel Croson, University of Pennsylvania, Wharton Sch. of Bus., Dept. of OPIM, 1322 SH-DH, Philadelphia, PA 19104-6366, crosonr@opim.wharton.upenn.edu

1) The Group Ultimatum Game: Self-Serving Bias in the Prediction of One's Own Behavior, ***Michael Raynor***, Harvard Business School, Morgan Hall 462, Boston, MA 02163, mraynor@hbs.edu, ***Robert Robinson***

We compare individual and group behavior in the ultimatum game. No differences in offers or acceptances were observed. Individuals claimed thay would make fair offers more frequently than observed, groups' claims were consistent with observed behavior. We conclude that individuals exhibit bias when predicting their own behavior but groups do not.

2) How High Can You Go? Preliminary Findings on the Perils & Benefits of Negotiator Confidence in Distributive Bargaining, ***Hannah Riley***, Harvard Business School, Morgan Hall 142, Boston, MA 02163, hriley@hbs.edu, ***Robert Robinson***

We investigate the tradeoffs between individual performance and risk of bargaining breakdown as negotiator confidence rises. Results demonstrate target settlements are positively correlated with indicators of negotiator confidence; rising negotiator confidence is associated with enhanced invidual performance. However, as negotiator confidence rises, so does the likelihood of bargaining impasse.

3) Technology Mediated Communication & Negotiation: Do Relationships Matter?, ***Zoe Barsness***, Texas A&M University, Dept. of Mgmt., College Station, TX 77843, zbarsness@tamu.edu, ***Ann Tenbrunsel***

We examine the impact of relationships and technologically-mediated communication on negotiation process outcomes. Results suggest that individuals have biases about the effect that relationships and communication medium will have on negotiation processes and outcomes and that technologically-mediated communication negatively influences negotiation processes.

4) The Effect of Reputations in Negotiations: Outcome & Tactics, ***Rachel Croson***, University of Pennsylvania, Wharton Sch. of Bus., Dept. of OPIM, 1322 SH-DH, Philadelphia, PA 19104-6366, crosonr@opim.wharton.upenn.edu, ***Steven Glick***

Three studies investigate the effect of reputations in negotiations. The first demonstrates the existence of robust reputations in a classroom setting. The second presents evidence on the link between reputations and outcomes in the negotiations. Finally, the third demonstrates the use of different tactics against counterparts of different reputations.

MD14 Recent Algorithmic Results in Computational Optimization

Sponsor: Computing Society
Sponsored Session

Chair: Alper Atamturk, University of California, Dept. of IEOR, Berkeley, CA 94720-1777, atamturk@ieor.berkeley.edu

1) Scheduling & Reliable Lead Time Quotation for Orders with Availability Intervals, ***Pinar Keskinocak***, IBM, TJ Watson Res. Ctr., Office 04-258, Rte. 134, Yorktown Heights, NY 10598, pinar@cmu.edu, ***Sridhar Tayur***, ***R. Ravi***

We consider a single server for which different types of orders arrive over time. The type of an order is a specification of its revenue, processing time and start time deadline. To ensure reliability, the processing of an order must start within the quoted lead time. We study competitive analyses of several algorithms for the off-line and on-line versions of this problem.

2) Computational Experience with the Pseudoflow Algorithm for the Maximum Flow Problem, ***Charles L. Anderson***, University of California, Dept. of IEOR, Berkeley, CA 94720-1777, cander@ieor.berkeley.edu, ***Dorit S. Hochbaum***

The pseudoflow algorithm, (Hochbaum 1997) is a new algorithm that solves the maximum flow problem. We report on computational study of the lowest label phase implementation of that algorithm. We compare the performance of this implementation with implementations of the push/relabel algorithm.

3) Algorithms for Capacity Allocation & Subcontracting Problems, ***Alper Atamturk***, University of California, Dept. of IEOR,

Berkeley, CA 94720-1777, atamturk@ieor.berkeley.edu, ***Dorit S. Hochbaum***

We study the structure of optimal solutions to multi-period capacity allocation and subcontracting problems, where we face a tradeoff between allocating a constant capacity for the planning horizon, holding inventory and subcontracting the excess demand at a variable cost. We present efficient algorithms for some special cases involving linear and concave costs.

MD15 Managing Supply: Information and Coordination II

Cluster: Supply Chain Management
Invited Session

Chair: Alexander Brown, Vanderbilt University, Owen Grad. Sch. of Mgmt., Nashville, TN 37203, aob@leland.stanford.edu

1) Decentralizing Cross Functional Decisions: Coordination through Internal Markets, ***Panos Kouvelis***, Washington University, Olin Sch. of Business, St. Louis, MO 63130-4899, kouvelis@mail.olin.wustl.edu, ***Martin Lariviere***

We develop a framework of an internal market mechanism to coordinate a class of multi-stage decision problems with multiple agents in a stochastic environment. A centralized optimal solution can be implemented in a decentralized manner if the principal uses a set of linear prices to buy the intermediate goods from the agents in an upstream stage...

2) Acquiring Demand Information through Price Discounts, ***Fangruo Chen***, Columbia University, Grad. Sch. of Bus., 3022 Broadway, Uris Hall Rm. 4, New York, NY 10027-6902, fc26@columbia.edu

It is well known that demand information and inventory are substitutes. But demand information is usually not free. We study the trade-off between the cost of acquiring demand information and the benefit of inventory reduction. The goal is to determine an effective mechanism for information acquisition and to quantify its impact on supply chain performance.

3) Partnering to Minimize Supply Risk: A Mutually-Beneficial Capacity Exchange Arrangement, ***Alexander Brown***, Vanderbilt University, Owen Grad. Sch. of Mgmt., Nashville, TN 37203, aob@leland.stanford.edu, ***Hau L. Lee***

We consider collaboration between 2 non-competing customers that share the same supplier. The customers make advanced capacity reservations with the supplier, agreeing to sell their excess capacity to each other. Treating the customers' reservation decision process as a non-cooperative game, we illustrate strong equilibrium properties, prove the beneficial nature of the arrangement...

MD16 Cellular Manufacturing

Contributed Session

Chair: Behnam Malakooti, Case Western Reserve University, Dept. of ES, Comp. Eng. & Sci., Olin 611, Cleveland, OH 44106, bxm4@po.cwru.edu

1) A Decomposition Heuristic for Designing Cellular Manufacturing Systems with Assembly Considerations, ***P. P. C. Rao***, Case Western Reserve University, 2696 Trojan Dr. #C-14, Green Bay, WI 54304, prp3@po.cwru.edu, ***Vira Chankong***

The cell formation model for designing CMS with assembly considerations is decomposed into 3 sub problems. The proposed decomposition approach is integrated into an algorithmic procedure to obtain a heuristic solution. The implications of designing production systems with assembly aspects have been analyzed.

2) Grouping & Clustering of Discrete Multiple Criteria Alternatives with Application to Machine-Part Cell Formation, ***Behnam Malakooti***, Case Western Reserve University, Dept. of ES, Comp. Eng. & Sci., Olin 611, Cleveland, OH 44106, bxm4@po.cwru.edu

Theory and algorithms are developed for clustering a set of discrete multiple criteria alternatives into mutually exclusive groups based on similar features of alternatives. Such clustering of multiple criteria alternatives facilities and simplifies the decision making process. An application to the machine-part cell formation problem is presented.

3) Expectations for Manufacturing Effectiveness: An Automotive Case Study, ***Robert B. Robinson***, University of Waterloo, 10 Ashwood Crescent, Brampton, Ontario, L6T 1M2, Canada, rbrobinson@engmail.uwaterloo.ca

At this very moment, corporations are re-forming their skirmish lines of knowledge woarkers as volatile events ignite an explosive dislocation of processes. Often, traditional initiatives can create organizational breaches of their own. Another approach is offered from a case study of TRW's cellular manufacturing methods...

4) Sequence-Dependent Part Family Formation: Comparison of Hierarchical Clustering Methods with Fuzzy ART Neural Network, ***Sungjune Park***, SUNY, Sch. of Mgmt., 325 Jacobs Mgmt. Ctr., Buffalo, NY 14260, spark1@acsu.buffalo.edu, ***Nallan C. Suresh***

The design of flow-line cells requires the formation of families of parts with similar operation sequences. We present an experimental comparison of hierarchical clustering methods such as single linkage (SLINK) with fuzzy ART neural network after developing appropriate similarity coefficients and experimental procedures.

5) Partial Implementation of Cellular Manufacturing, ***Steven B. Kramer***, University of Maryland, Smith Sch. of Business, College Park, MD 20745-1815, skramers@erols.com, ***Arjang A. Assad, Bharat K. Kaku***

In the cellular manufacturing literature, jobs shops are often compared to fully converted cell shops including a possible remainder cell. We evaluate partial conversions where only a subset of desirable cells is formed. Using cell formation techniques and associated data sets from the literature, we use simulation models to identify scenarios where partial conversion is superior to full conversion.

MD17 Network Applications

Cluster: Network Flows
Sponsor: Optimization Section
Sponsored Session

Chair: Eva K. Lee, Georgia Institute of Technology, Sch. of ISyE, Atlanta, GA 30332-0205, evakylee@isye.gatech.edu

1) Inconsistent Movements in a Shortest Path-Based Routing System for Railroads, ***Jeff D. Day***, Georgia Institute of Technology, Sch. of ISyE, Atlanta, GA 30332-0205, jday@isye.gatech.edu, ***Eva K. Lee, George L. Nemhauser, Erick Wikum***

A shortest-path based system for routing railroad traffic movements (waybills) seeks arc costs such that the "correct" path for each waybill has the least cost. When two waybills have different "correct" paths, they are deemed inconsistent. We determine inconsistent pairs of waybills and minimize manual overrides.

2) A Branch & Bound Algorithm for a Network Design Problem on a Tree, ***David Mazur***, JHU, Dept. of Math. Sci., 3400 N. Charles St., Baltimore, MD 21218, mazur@mts.jhu.edu, ***Tamra Carpenter, Leslie Hall***

We present a B&B algorithm for the fiber-to-the-curb network design problem on a tree. Our algorithm uses Lagrangian relaxation to obtain bounds while making extensive use of problem structure to narrow the search. We discuss computational experience with this algorithm on large instances.

3) Using Heuristic Information for Stochastic & Dynamic Path Calculation, ***James Bander***, University of Michigan, 1205 Beal Ave., Ann Arbor, MI 48105, jim.bander@umich.edu, ***Chelsea C. White, III***

We analyze a shortest path problem that arises when providing logistics services for Just-in-Time manufacturing. Efficient computational techniques for the problem exploit the availability of domain-specific information, such as the transportation network's structure.

MD18 Integer Programming: Theory & Computations

Cluster: Integer Programming
Sponsor: Optimization Section
Sponsored Session

Chair: Warren Adams, Clemson University, Dept. of Math. Sci., Clemson, SC 29634, wadams@clemson.edu

1) A Unifying Framework for Categorizing & Strengthening Valid Inequalities, ***Robin Lougee-Heimer***, IBM TJ Watson Research Ctr., Rte. 134, PO Box 218, Yorktown Heights, NY 10598, robinlh@us.ibm.com, ***Warren Adams***

We show how various "coefficient adjustment" tightening strategies for 0-1 linear programs with covering structures can be readily obtained via a technique called conditional logic. This categorization, based on the construction of redundant nonlinear restrictions, exposes a rich family of valid inequalities, and does not rely on any problem structure.

2) Block Norms in Discrete Multicriteria Optimization, ***Bernd Schandl***, Clemson University, Dept. of Math Sci., Clemson, SC 29634-1907, bschand@clemson.edu, ***Margaret M. Wiecek, Kathrin***

A. Klamroth

We propose to use block norms to generate nondominated solutions of discrete multiple criteria programs and introduce the new concept of the oblique norm to handle this class of problems. We also discuss the applicability of oblique norms in multicriteria decision making.

3) Parametrization of the Pareto Set of the Binary Bicriteria Knapsack Problem, ***Matthew J. Saltzman***, Clemson University, Dept. of Math. Sci., Clemson, SC 29634-1907, mjs@math.clemson.edu, ***Margaret M. Wiecek***

We parametrize the Pareto set of the binary bi-criteria knapsack problem (BBCKP) by means of the weights of the corresponding weighted-Tchebycheff scalarization. We also study relationships between the parametrized Pareto solutions and the BBCKP coefficients. Preliminary computational results are included.

4) A Time-Dependent Multicriteria Knapsack Problem, ***Margaret M. Wiecek***, Clemson University, Dept. of Math Sci., Clemson, SC 29634, wmalgor@clemson.edu, ***Kathrin A. Klamroth***

We introduce a time-dependent multiple criteria knapsack problem and propose a dynamic-programming-based algorithm to finding its nondominated solutions defined as sequences of elements to be chosen at different times in a decision process. We also discuss various applications of the model.

MD19 Scheduling II

Contributed Session

Chair: Shrikant S. Panwalkar, South Dakota School of Mines & Technology, IE Program, Rapid City, SD 57701-3995, spanwalk@silver.sdsmt.edu

1) Minimizing Total Tardiness in the Case of the Family Scheduling Model, ***Jaideep T. Naidu***, Philadelphia College of Textiles & Science, Sch. of Bus. Admin., Sch. House Ln. & Henry Ave., Philadelphia, PA 19144, nnaiduj@philacol.edu

Grouping similar jobs together considerably reduces the large number of setups involved between any 2 consecutive dissimilar jobs. We develop a heuristic algorithm to minimize the single machine total tardiness problem with sequence dependent family setups. Certain properties of a beneficial neighborhood group interchange will also be discussed.

2) The Home & Away Athletic Event Scheduling Problem, ***Hyoung-Ro Lee***, Iowa State University, 205 Engineering Annex., MB 28, Ames, IA 50011, yulee@iastate.edu www.public.iastate.edu/~yulee, ***Douglas D. Gemmill***

We present a 0/1 integer program formulation for the scheduling of home and away athletic event problems. The problem consists of n players and n sites. A multi-echelon simulated annealing algorithm is implemented to search for the schedule that minimizes total distance traveled.

3) Scheduling Rules: An Updated Survey, ***Shrikant S. Panwalkar***, South Dakota School of Mines & Technology, IE Program, Rapid City, SD 57701-3995, spanwalk@silver.sdsmt.edu, ***Surya D. Liman***

It has been more than 20 years since the first major survey of scheduling rules was published in 1977. Most earlier works were based on studies involving conventional job shops. Since then, a large body of work involving FMSs has been developed. New approaches include expert systems, neural networks, SA, TS and others. Has this new knowledge helped to understand scheduling rules?...

MD20 Market Power in Electricity Restructuring

Cluster: Energy

Sponsor: Energy, Natural Resources & Environment Sponsored Session

Chair: Yves Smeers, Universite Catholique de Louvain, 34 voie du Roman Pays, La Neuve, B-1348, Belgium, smeers@core.ucl.ac.be

1) Modeling of Strategic Behavior in the Electric Reliability Council of Texas System, ***Ross Baldick***, University of Texas, Dept. of Elect. & Comp. Eng., Eng. Sci. Bldg. 143, Austin, TX 78712-1084, baldick@ece.utexas.edu, ***Martin Lin***, ***Martin L. Baughman***

A model of bilateral trade for the ERCOT is augmented to represent strategic behavior in wholesale trade between utilities. Base generation data is derived from a commercially available database, tariffs are modeled based on ERCOT transmission rules and mutually beneficial trades are consumated between utilities...

2) Strategic Behavior by Generators in a Simple Congested Electricity Network, ***Steven C. Anderson***, Harvard University, Belfer Hall 316, 79 John F. Kennedy St., Cambridge, MA 02138, steven_anderson/student/ksg@ksg.harvard.edu

We analytically model the competitive effects of transmission congestion and loop flow in a simple 3-node electricity network. We assume that electricity generators own 1 or more plants on this network. Further, we assume that each generator bids a supply function of a certain class, e.g., linear, stepped, etc. The model seeks a pure strategy Nash equilibrium in these functions...

3) Models of Cournot Competition in Bilateral & POOLCO-Based Power Markets, ***Benjamin F. Hobbs***, JHU, Dept. of Geo. & Environ. Eng., 3400 N. Charles St., Baltimore, MD 21218, bhobbs@jhu.edu

LCP-based formulations of Cournot competition among power producers in 2 different types of power markets are presented and their results contrasted with each other and with other models of imperfect competition. The use of such models for market power assessment and merger screening is described.

4) Investment in a Competitive Electricity System under Uncertainty: The Open Loop Problem, ***Yves Smeers***, Universite Catholique de Louvain, 34 voie du Roman Pays, La Neuve, B-1348, Belgium, smeers@core.ucl.ac.be

Most investigations in electricity restructuring deal with short-term efficiency, that is, market simulation with fixed capacity. We take stock of these models and encompass them into an investment problem. In this setup, agents in competition invest and operate their capacities so as to reach a Nash equilibrium in an uncertain world...

MD21 Telecommunications Network Design - II

Sponsor: Technical Section on Telecommunications Sponsored Session

Chair: Jeffery L. Kennington, SMU, Dept. of Comp. Sci. & Eng., PO Box 150122, Dallas, TX 75275-0122, jlk@seas.smu.edu, http://www.seas.smu.edu/~jlk

1) A Comparison of Two Modern Metaheuristics on Solving a Star-Star Local Access Network Design Problem, ***Bernard T. Han***, Western Michigan University, ***V. T. Raja***

2) Designing Long Distance Access Networks, ***S. Raghavan***, University of Maryland, Smith Sch. of Bus., College Park, MD 20742, sr141@umail.umd.edu, suraghav@rhsmith.umd.edu, ***Rosemary T. Berger***

3) Multiplex Bundling: A Mathematical Model & Solution Technique, ***Jeffery L. Kennington***, SMU, Dept. of Comp. Sci. & Eng., PO Box 150122, Dallas, TX 75275-0122, jlk@seas.smu.edu, http://www.seas.smu.edu/~jlk, ***Furrukh Fahim***, ***Maya G. Petkova***

4) Analytical Properties of Dynamic Network Loading Operators, ***Ding Zhang***, SUNY, School of Bus., Oswego, NY 13126-2529, zhang@oswego.edu, ***Jiahao Wu***, ***Michael A. Florian***

We show that in a dynamic transportation network, the time-dependent arc traffic volumes, arc travel times, and path travel times continuously depend on the time-dependent path departure rates, under the arc FIFO assumption. These results serve for the purpose of sensitivity analysis of the network loading operator and for the study of the existence of dynamic traffic equilibrium.

MD22 Analyzing Risk in Forest Investments

Cluster: OR/MS in Forestry

Sponsor: Energy, Natural Resources & Environment Sponsored Session

Chair: Richard J. Brazee, University of Illinois, 503 Turner Hall, 1102 S. Goodwin, Urbana, IL 61801, r-brazee@uiuc.edu

1) Valuation of a Forest Stand as a Contingent Claim on Timber when Interest Rates are Stochastic, ***Jonathan Rubin***, Royal Danish Veterinary & Agricultural University, Unit of Forestry, Rolihedsvej 23, Frederiksberg C, 1958, Denmark, jlr@kvl.dk, ***Bo Jellesmark Thorsen***

The value of a forest is modeled as a contingent claim on timber with stochastic interest rates. With appropriate assumptions regarding the short-rate/yield-curve process, forest stand value is analogous with a contract for the forward delivery of a commodity with a convenience yield, carrying costs, and a residual land value.

2) Valuation of a Forest under Uncertainty & Flexible Management Options, ***Bo Jellesmark Thorsen***, Royal Danish Veterinary & Agricultural University, Unit of Forestry, Rolihedsvej 23, Frederiksberg C, 1958, Denmark, bjt@kvl.dk

Price is modeled as a Brownian motion. Inventory is modeled as a Poisson process, which mimics calamities. Managers may closedown and reopen. If calamities occur, salvage harvesting is required. Using the Bellman Equation a nonlinear partial differential equation is obtained for the value of the forest, which is numerically simulated.

3) Stochastic Timber Markets & Competitive Behavior, ***Richard J. Brazee***, University of Illinois, 503 Turner Hall, 1102 S. Goodwin, Urbana, IL 61801, r-brazee@uiuc.edu

The impacts of stochastic timber markets on industry structure and competitive behavior are examined. Competitive behaviors of interest include entry-exit decisions, pricing behavior, and levels of land holdings. A dynamic programming framework theoretically describes the impacts of stochastic timber markets. Selected impacts are numerically simulated using US data.

MD23 Managing Innovation in Health Care

Sponsor: Technology Management Section
Sponsored Session

Chair: Amy Edmondson, Harvard Business School, Morgan Hall T-87, Boston, MA 02163, aedmondson@hbs.edu

1) A Model for the Adoption of New Technology in Cardiac Surgery, ***Richard Bohmer***, Harvard Business School, Morgan Hall T-17, Boston, MA 02163, rbohmer@hbs.edu

2) The Effects of Team Stability & Teamwork Norms on the Successful Adoption of Innovation in Hospitals, ***Amy Edmondson***, Harvard Business School, Morgan Hall T-87, Boston, MA 02163, aedmondson@hbs.edu

3) High Performance Practices under Conditions of Task Interdependence: An Examination of Patient Care, ***Jody Hoffer Gittell***, Harvard Business School, Beker 185, Soldiers Field, Boston, MA 02138, jgittell@hbs.edu, ***Jon A. Chilingerian***

4) A Study of Process Improvement in Surgical Units & the Influence of Physician Best Practices in CABG Surgery

MD24 Risk Analysis

Contributed Session

Chair: Julia Pet-Edwards, University of Central Florida, Dept. of IE & Mgmt. Systems, PO Box 162450, Orlando, FL 32816-2450, jedwards@mail.ucf.edu

1) Risk Analysis & Log Normal Random Variables for Mechanical Failure Analysis, ***Douglas V. Horacek***, Aviation & Missile Command, Redstone Arsenal, AL 35898, horacek-dv@redstone.army.mil

Modeling crack growth and detection by the sum of 2 log normal random variables. Developed software for both sum and difference calculating both probabilities and observations and used the calculations for 3 other probabilities.

2) Potential Risk Measures for Stochastic Resource Constrained Project Scheduling, ***Julia Pet-Edwards***, University of Central Florida, Dept. of IE & Mgmt. Systems, PO Box 162450, Orlando, FL 32816-2450, jedwards@mail.ucf.edu, ***Robert L. Armacost, Basma Selim***

The expected value of project duration, which assumes that the decision maker is risk neutral, is commonly used in project scheduling under uncertainty. We compare and contrast several measures, including the semi-variance, conditional expectation, characteristic largest value, task criticality and task cruciality as alternative measures of risk in project scheduling.

3) Programatic Risk Management at Hanford, ***Mark A. Robershotte***, Pacific NW National Laboratory, MS AO-21, Federal Bldg., 825 Jadwin Ave., Richland, WA 99352, mark.robershotte@pnl.gov

The US DoE is undertaking a $7 billion privatized contract for the clean-up of a portion of the highly radioactive nuclear waste produced as part of the plutonium production process and stored in underground storage tanks at Hanford, Washington. We detail the extensive risk management process used in this project.

MD25 Traffic Network Equilibrium

Sponsor: Transportation Science Section/IFORS
Sponsored Session

Chair: Jane N. Hagstrom, University of Illinois, Dept. of Info. & Dec. Sci., 601 S. Morgan, MC 294, Chicago, IL 60607, hagstrom@uic.edu

1) Two Numerical Methods for the Continuous Dynamic Network Loading Problem, ***Jose M. Rubio-Ardanaz***, University of Montreal, CRT, CP 6128, Succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, jose@crt.umontreal.ca, ***Jiahao Wu, Michael A. Florian***

The continuous dynamic network loading consists of determining, on a congested network, time-dependent arc volumes, arc travel times and path travel times given path flow rates for a finite times horizon. We present 2 new methods respecting the FIFO condition for the problem, and compare these methods with previous implementations.

2) Properties of Origin-Based Solutions for Network Assignment, ***Hillel Bar-Gera***, University of Illinois, Dept. Civil & Materials Eng., 842 W Taylor St., Chicago, IL 60606-7023, hbarge1@uic.edu, ***David E. Boyce***

Existing solution methods for network assignment are mainly link-based or route-based. Advantages of the intermediate, origin-based approach are discussed, namely detailed solutions using reasonable amount of memory and faster convergence to high accuracy. Properties of the resulting solutions are described. Possible extensions to combined models are explored.

3) Traffic Equilibrium: Link Flows, Path Flows & Weakly/ Strongly Acyclic Solutions, ***Jane N. Hagstrom***, University of Illinois, Dept. of Info. & Dec. Sci., 601 S. Morgan, MC 294, Chicago, IL 60607, hagstrom@uic.edu, ***Paul Y. Tseng***

We analyze the effects of nonnegativity and monotonicity of a travel-time cost function on whether a flow between an origin-destination pair can use all arcs of a directed cycle. We then establish when a formulation purely in terms of link flows is equivalent to one in terms of path flows.

4) Rapid Estimation of Network Flows, ***Geun-Young Kim***, Seoul Development Institute, Seoul, Korea, ***James E. Moore, II***

Traffic counts collected before, during, and after the opening of the Glen Anderson Freeway in Los Angeles and the 1994 Northridge earthquake reflect unusual changes in network configuration. These counts are used to test an associative memory technique for rapid estimation of empirical flows.

MD26 Multivariate Statistical Process Control and Diagnosis

Sponsor: Quality, Statistics & Reliability Section
Sponsored Session

Chair: Daniel W. Apley, Texas A&M University, Dept. of IE, College Station, TX 77843-3131, apley@engin.umich.edu

1) withdrawn - author request of 4/8, ***Enrique Del Castillo***, Pennsylvania State University, 207 Hammond Bldg., Dept. IME, University Park, PA 16802, exd13@psu.edu

2) Model-Based Diagnostics for Compliant Beam Structure Assemblies, ***Qiang Rong***, University of Michigan, Dept. of Eng., Ann Arbor, MI 48109, rongq@engin.umich.edu, ***Darek Ceglarek, Jianjun Shi***

Beam-based modeling procedures and diagnostic algorithms are proposed for the dimensional root cause isolation of compliant parts during assembly process. This method uses measurement data to isolate dimensional faults of compliant parts caused by part fabrication error and part-to-part interferences. Fault signatures are modeled by the diagnostic vector derived from the inverse stiffness matrix of the assembled structure.

3) Multivariate SPC Methods for Combined Attribute & Variable Data, ***Sowmya Murthy***, Sabre Decision Technologies, sowmya@psu.edu, ***Russell R. Barton***

Multivariate SPC methods have focused on variable (quantitative) data. Yet, many processes have both quantitative and qualitative quality measures. We present a methodology to monitor a process which has both quantitative and qualitative variables that are not independent. We illustrate the methodology with a few examples.

4) On-Line Multivariate Control Charts with Variable-Interval Sampling, ***J. Rene Villalobos***, University of Texas, Dept. of MIE, El Paso, TX 79968, renev@vlobos.me.utep.edu

We present results of the use of variable sampling periods with multivariate control charts and focus on different implementations of multivariate EWMA and CUSUM charts that use information from real-time inspection of SMD components using computer vision. We discuss the relation of the variable sampling period with the inspection allocation system controlling data acquisition for the whole SMD quality environment.

MD27 Forecasting & Decision Making Over Time

Sponsor: Applied Probability Society
Sponsored Session

Chair: Sarah M. Ryan, University of Nebraska, 175 Nebraska Hall, Dept. of IMSE, Lincoln, NE 68588-0518

1) Stochastic Infinite Horizon Optimization with Average Cost Criterion, ***Allise Wachs***, Management Resources International, PO Box 160, Saline, MI 48176-0160, awachs@pub1.tln.lib.mi.us, ***Robert L. Smith***

We consider a stochastic infinite horizon optimization problem with average cost criterion. Observe that any solution which makes poor decisions for any finite amount of time and then selects wisely can be average optimal. We exclude these types of average optimal solutions from consideration. Instead, we present a method for finding average optimal solutions with effective short-term and long-term behavior.

2) Demand Forecast Updating: Fluctuation & Accuracy, ***Suresh Sethi***, University of Texas, Sch. of Mgmt., MS J04.7, Box 830688, Richardson, TX 75083-0688, sethi@utdallas.edu, ***Houmin Yan***

We study demand forecast processes and their updates for a high-tech company. These processes are characterized by increasing forecast variances and diminishing forecast errors as the forecasting horizon decreases. We provide theoretical results to explain these characteristics along with managerial insights leading to better demand and supply management.

3) Adaptive Forecasting of Demand in Multistage Production Systems, ***Matthew J. Sobel***, Case Western Reserve University, Dept. of OR & Op. Mgmt., WSOM, 10900 Euclid Ave., Cleveland, OH 44106-7235, mjs13@po.cwru.edu

Simply structured and easily computed policies are optimal in some multistage production networks with end item demands which are an ARMA process. This presentation concerns the effects on inventory and production levels of adaptive estimation of the ARMA process. Similar results are indicated for models of multireservoir river basins.

4) Adaptive Inventory Control for Partially Observed Demand, ***James T. Treharne***, Auburn University, ISE Dept., 207 Dunstan Hall, Auburn, AL 36849, trehajt@eng.auburn.edu, ***Charles R. Sox***

Market demand is often characterized by a high degree of uncertainty. The underlying demand distribution in effect is usually not known with certainty but is estimated as information is collected. We model this problem as a partially observed Markov decision process and present both optimal and suboptimal control policies to solve it.

5) Forecast-Adaptive Logistics Policies, ***Ralph D. Badinelli***, Virginia Tech., Dept. of MS & Info. Tech., Blacksburg, VA 24060, ralphb@vt.edu

The fact that forecast accuracy is a function of forecast horizon is rarely considered in production and inventory control models. We investigate the behavior of various policies for multi-echelon, capacitated logistics systems when forecasts are updated each review period. Relevant performance measures are cost, customer service and stability. Some recommendations for adaptive and stable policies are derived.

MD28 Logistics Applications II

Contributed Session

Chair: Jeffrey D. Camm, University of Cincinnati, QAOM Dept., Cincinnati, OH 45221, jeff.camm@uc.edu

1) Performance Evaluation for a Central Warehouse in a Distribution Chain, ***Frank Y. Chen***, National University of Singapore, Dept. of Dec. Sciences, 10 Kent Ridge Crescent, Singapore, 119260, Singapore, fbachenf@nus.edu.sg, ***Youyi Feng***

We consider a distribution chain with retail sites at the lowest level facing interdependent demand across them. Storage and consolidation facilities are between the central warehouse and retailers. We show that if each facility uses the lot-size reorder-point policy, the system's inventory positions are uniformly distributed under mild assumptions...

2) Time-Window Fill Rate & Response Time in the Two-Echelon Inventory System with Interdependent Demand, ***Youyi Feng***, National University of Singapore, Dept. of IS, Sch. of Computing, Singapore, 119260, Singapore, fengyy@iscs.nus.edu.sg, ***Frank Y. Chen***

We consider one-supplier multi-retailer systems, in which retailers experience stochastic and interdependent demand across them. All facilities replenish their stocks with the continuous-review, lot-size reorder point policies. This study characterizes the time-window fill rate and response time of each facility.

3) Core Carrier Selection, ***Jeffrey D. Camm***, University of Cincinnati, QAOM Dept., Cincinnati, OH 45221, jeff.camm@uc.edu, ***Michelle B. Knepper***, ***Carl C. Offhaus***

Companies utilizing common carriers today recognize the benefits of a core carrier program. Having a large percentage of total volume awarded to the core set can lower cost, increase service and lower overhead. We present an integer-programming model used to help choose the set of core carriers.

4) Reverse Logistics Planning for Post-Use Home Appliances, ***Li-Hsing Shih***, Cheng Kung University, Dept. of Resources Eng., Tainan, 701, Taiwan, lhshih@mail.ncku.edu.tw

A reverse logistics system including collection, storage, recycling and disposal is studied for the post-use electrical home applications disposition in Taiwan. An MIP model is proposed for the optimal system planning. The results, including optimal transportation routes and facility site selection, will be discussed.

MD29 Cellular Manufacturing

Sponsor: Manufacturing & Service Operations Management Society
Sponsored Session

Chair: Charles T. Mosier, Clarkson University, Sch. of Bus., Box 5790, Potsdam, NY 13699-5790, mosierc@icarus.som.clarkson.edu

Co-Chair: Farzad Mahmoodi, Clarkson University, Box 5790, Potsdam, NY 13699-5790, mahmoodi@icarus.som.clarkson.edu

1) Facility Layout with Layout Modules: A Novel Extension of the Concepts of Hybrid Cellular Layouts, ***Shahrukh A. Irani***, Ohio State University, Dept. of IWSE, 210 Baker Systems Eng. Bldg., Columbus, OH 43210-1271, irani4@osu.edu, ***H. Huang***, ***J. Zhou***

2) A Genetic Algorithm Implementation of an Optimal Clustering Model for Cellular Manufacturing, ***Shailesh S. Kulkarni***, University of Cincinnati, Dept. QAOM, Cincinnati, OH 45221-0130, kulkarsh@econqa.cba.uc.edu, ***David F. Rogers***

We develop a new math programming model for optimal clustering. We develop a GA-based solution procedure to solve realistically sized problems to optimality. The structure of the model and the proposed solution methodology make it attractive for simultaneous clustering of parts and machines in a cellular manufacturing environment.

3) Part-Machine-Labor Grouping for Cellular Manufacturing: Problem Formulation & a Pragmatic Solution Procedure, ***Nallan C. Suresh***, SUNY, Sch. of Mgmt., 325K Jacobs Mgmt. Ctr., Buffalo, NY 14260-4000, ncsuresh@acsu.buffalo.edu, ***Jannes Slomp***, ***Eric Molleman***

Traditionally, design of cellular layouts starts with a grouping of parts and machines, without addressing the problem of labor reallocation to cells. We present a synthesized procedure, utilizing problem-size reduction methods using neural networks and an integer goal programming formulation that groups parts, machines and labor based on several practical objectives we've encountered in firms that have implemented cellular manufacturing.

4) A Simulation Study of Virtual Cells in Circuit Board Assembly, ***Charles T. Mosier***, Clarkson University, Sch. of Bus., Box 5790, Potsdam, NY 13699-5790, mosierc@icarus.som.clarkson.edu, ***Farzad Mahmoodi***

MD30 Panel: Teaching International Operations

Sponsor: Manufacturing & Service Operations Management Society
Sponsored Session

Chair: Timothy L. Smunt, Wake Forest University, Babcock Grad. Sch. of Mgmt., PO Box 7659, Winston-Salem, NC 27109-7659, tim.smunt@mba.wfu.edu

1) Panel: Teaching International Operations, ***Timothy L. Smunt***, Wake Forest University, Babcock Grad. Sch. of Mgmt., PO Box 7659, Winston-Salem, NC 27109-7659, tim.smunt@mba.wfu.edu, ***Amiya K. Chakravarty***, Tulane University, Freeman Sch. of Business, New Orleans, LA 70118-5669, ***Ricardo Ernst***, Georgetown University, Sch. of Bus., 37th & O St. NW, Washington, DC 20057, ernstr@gunet.georgetown.edu

International Operations Management courses are becoming more popular and, perhaps, more appropriate as globalization of industry expands. A few textbooks specific to this topic are now also in print, but there is no one definitive model for framing this course since this subject matter is relatively new to business school programs...

MD31 Operations Management II

Contributed Session

Chair: Sal R. Agnihothri, Binghamton University, School of Mgmt., Binghamton, NY 13902-6015, agni@binghamton.edu http://som.binghamton.edu/faculty.agnihothri.html

1) Simulation: The Forgotten Tool of Total Quality Management, ***Kambiz Tabibzadeh***, Eastern Kentucky University, College of Business, 215 Combs, Richmond, KY 40475, cbotabib@acs.eku.edu, ***Terri Friel***

While examples of the successful use of simulation in activities that are relevant to, or can be part of a TQM program exist, its potential in integrated, system-wide TQM applications is often overlooked. Integration of simulation as a system-wide tool will lead to significant improvements in TQM efforts.

2) Design for the Environment: A Quality-Based Model for Green Product Development, ***Chialin Chen***, University of Illinois, 1206 S 6th St., #350, Champaign, IL 61820, cchen3@uiuc.edu

A quality-based model is developed to jointly analyze the marketing, design and policy isues concerning green product development, which has received significant attention from consumers, manufacturers and governments around the world. A major finding shows that green product development and stricter environmental standards might not necessarily benefit the environment.

3) The House of Flexibility, ***Martin West***, Linkoping Institute of Technology, Dept. of Production Economics, Linkoping, S-58183, Sweden, martin.west@ipe.liu.se, http://www.ipe.liu.se/mw/mw.htm, ***Jan Olhager***

We use the methodology for quality function deployment for modeling the deployment of the need for flexibility from the customers' viewpoint into manufacturing flexibility at various aggregate levels. This approach is used as a framework for linking manufacturing flexibility to market requirements and is illustrated with a case study.

4) Flexibility in Field-Based Service Operations, ***Donald E. Simmons***, Binghamton University, School of Mgmt., Binghamton, NY 13902-6015, br00513@binghamton.edu, ***Sal R. Agnihothri***

The importance of manufacturing flexibility is well-documented in the literature. However, service flexibility has not received much attention. We focus on defining and measuring flexibility related to field-based service operations. We introduce a framework to highlight the critical dimensions of flexibility and their implications for managing field service.

MD32 Panel on DEA: Selling the Results to Management

Cluster: **Data Envelopment Anaylsis**

Invited Session

Chair: Lawrence M. Seiford, University of Massachusetts, Dept. of MIE, 219 ELAB, Box 32210, Amherst, MA 01003-2210, seiford@ecs.umass.edu

1) Panel on DEA: Selling the Results to Management, ***Joseph C. Paradi***, University of Toronto, CMTE Industrial Eng., 4 Taddle Creek Rd., Toronto, Ontario, M5S 1A4, Canada, paradi@ie.utoronto.ca, ***James E. Storbeck, Lawrence M. Seiford***

A host of articles have been published on the theory and application of DEA. However, most operations researchers realize that the most difficult part of a project occurs after the analysis in communicating the findings to management. The panelists will relate their experiences in successfully communicating results to management.

MD33 Statistical Theory

Contributed Session

Chair: George Michailidis, University of Michigan, 1440 Mason Hall, Ann Arbor, MI 48109, gmichail@umich.edu

1) Robust Parameter Estimation for the Mixed Generalized Gamma Distribution, ***W. Paul Murdock, Jr.***, Air Force Institute of Technology, Grad. Sch. of Eng., Dept. OS, 2950 P. St., Bldg. 640, WPAFB, OH 45433-7765, wmurdock@afit.af.mil, ***Dean G. Boerrigter, Edward A. Pohl, Albert H. Moore***

Parameter estimation is applied to the mixed generalized gamma distribution using the method of maximum likelihood and the method of minimum distance. First, several single component distribution parameters were tested including the exponential, gamma and the Weibull distribution. Next, some mixture of exponentials and Weibulls with/without known locations were estimated...

2) When is the R-Square in a Multiple Regression Super-Additive, ***Walter O. Rom***, Cleveland State University, 1860 E. 18th St., Cleveland, OH 44114, w.rom@popmail.csuohio.edu

There has been very little discussion in the literature regarding conditions which allow the contribution of a variable in a multiple regression model to increase as other variables are included in the model. We present a comprehensive approach which shows how this phenomenom can occur.

3) A Location Approach to Robust Regression, ***Joseph W. Coleman***, Wright State University, Administrative Wing, 3640 Colonel Glenn Hwy., Dayton, OH 45435, joseph.coleman@wright.edu

An analysis of the linear regression model using location theory methodologies provides insight into alternate model formulations. An alternative approach is suggested for the case where both the independent and dependent variables contain errors.

4) A Unifying Framework For Dynamic Multivariate Analysis Based on Dynamic Mixture Models, ***George Michailidis***, University of Michigan, 1440 Mason Hall, Ann Arbor, MI 48109, gmichail@umich.edu

We argue that many models for multivariate longitudinal and cross-sectional data analysis are based on the simple qualitative idea that knowledge of the actual state of nature leads to simple relations between the observed quantities. We show how this approach provides a convenient framework to look at such models and propose algorithms that estimate the unknown parameters.

MD34 Accounting

Contributed Session

Chair: Paul P. Hoppe, Golden Gate University, 536 Mission St., San Francisco, CA 94105, phoppe@ggu.edu

1) A New Concept to Measure the Success of Privatization: The Austrian Experience, ***Michaela M. Schaffhauser-Linzatti***, University of Vienna, Brunnerstrabe 72, Vienna, 1210, Austria, linzatti@finance2.bwl.univie.ac.at

First, an event study is introduced to measure potential changes in the performance of privatized firms. The results of the following ratio analysis are tested for significance by statistical methods. Finally, this new concept is applied to the privatization in Austria between 1985-1995 and shows unexpected results.

2) Estimating with Accidental Accounting Evidence, ***Paul P. Hoppe***, Golden Gate University, 536 Mission St., San Francisco, CA 94105, phoppe@ggu.edu

Accountants use sampling plans. Evidence bcome available outside their statistical sample. Literature suggests auditors minimize these errors as isolated or ignore due to materiality. The arrival of this data is modeled as a length biased process. The model assumes that the true value arrives as a length biased. I use the superpopulation models...

MD35 OR/MS in the Liberal Arts College

Sponsor: **Forum on Education**

Sponsored Session

Chair: Ronald J. Walker, Cedarville College, Box 601, Cedarville, OH 45314, walkerr@cedarville.edu

1) An Inventory Management Game, ***Thomas G. Groleau***, Bethel College, Business Division, 1001 West McKinley Ave., Mishawaka, IN 46545, groleat@bethel-in.edu

In Eli Goldratt's The Goal, protagonist Alex Rogo uses a simple game with matchsticks and dice to gain insight into his production problems. We describe how to use and extend that game in the classroom to help students understand the impact of variability on a "balanced" manufacturing system.

2) An Integrated Business Instruction System, ***David A. Jordan***, Geneva College, 3200 College Ave., Beaver Falls, PA 15010, dajordan@geneva.edu

As a result of analyzing student performance in our business program, it was apparent that students were having difficulty applying previously covered material. By using simulations and maintaining a familiar environment (case), students were able to integrate the effect of changes in the decision variables to the business operation.

3) Teaching Management Science at a Liberal Arts College, ***Ron Lucchesi***, Wittenberg University, Box 720, Springfield, OH 45501, rlucchesi@wittenberg.edu

We discuss the trials and tribulations of teaching quantitative management courses at a liberal arts college. We will also discuss how the development of sophisticated computer packages has created the perception that a fundamental understanding of mathematical techniques is unnecessary.

MD37 Software Demonstration III

Chair: To be announced

1) Software Demonstration: MPL for Windows 5.0 with the OptiMax 2000 Component Library, ***Bjarni Kristjansson***, Maximal Software Inc., 2111 Wilson Blvd., Ste. 700, Arlington, VA 22201, info@maximal-usa.com, www.maximal-usa.com

We will demonstrate the new release MPL for Windows 5.0 that will revolutionize how optimization modeling is applied to solve business problems. This new release includes, among other notable enhancements, a highly anticipated Component Library (API) that can be called seamless from both Visual Basic and C/C++ to create customized end-user applications to solve real-world optimization problems.

2) Software Demonstration: The New AIMMS 3.0 Modeling System, ***Johannes J. Bisschop***, Paragon Decision Tech. BV, PO Box 3277, Haarlem, 2001 DG, The Netherlands, http:///www.paragon.nl, ***Marcel Roelofs***

The new AIMMS 3.0 modeling system will be introduced both conceptually and through examples. Special emphasis will be placed on advanced GUI objects (Gantt chart, network object), advanced language topics (modeling of time, unit conventions), security issues (VAR licensing, user database) and advanced developments (API, code generation, matrix updates).

Tuesday 08:00-09:30

TA01 Panel: A Model Curriculum in MHT II

Cluster: **MHT as a Health Profession**
Invited Session
Chair: Ori Heller, MMT Institute, 530 South Second St., Philadelphia, PA 19147, mmtinstitute4@juno.com

1) Panel: A Model Curriculum in MHT II

TA03 Panel: Publishing Strategies for Research in Engineering & Technology Management

Sponsor: **Technology Management Section**
Sponsored Session
Chair: Dundar F. Kocaoglu, Portland State University, Engineering Mgmt. Program, Portland, OR 97207-0751, kocaoglu@emp.pdx.edu

1) Panel: Publishing Strategies for Research in Engineering & Technology Management, ***Dundar F. Kocaoglu***, Portland State University, Engineering Mgmt. Program, Portland, OR 97207-0751, kocaoglu@emp.pdx.edu, ***R. Balachandra***, Northeastern University, MS Dept., 314 Hayden Hall, Boston, MA 02115, balachand@neu.edu, ***Frederick Betz***, University of Maryland, Grad. Sch. of Mgmt. & Tech., University Blvd. at Adelphi, College Park, MD 20742-7043, fbetz@polaris.umuc.edu, ***Alok K. Chakrabarti***, NJIT, Sch. of Management, Unversity Heights, Newark, NJ 07102-1982, chakraba@megahertz.njit.edu, ***Burton V. Dean***, San Jose State University, Dept. of Org. & Mgmt., 1 Washington Square, San Jose, CA 95192-0070, bvdean@aol.com, ***George F. Farris***, Rutgers University, Grad. Sch. of Mgmt., 180 University Ave., Newark, NJ 07102-1897, gfarris@gsmack.rutgers.edu, ***Cheryl Gaimon***, Georgia Institute of Technology, DuPree Sch. of Mgmt., Atlanta, GA 30332-0520, cheryl.gaimon@mgt.gatech.edu, ***Jeffrey K. Liker***, University of Michigan, Dept. of IOE, 1520 McIntyre Dr., Ann Arbor, MI 48105, liker@engin.umich.edu, ***Ilze Zigurs***, University of Colorado, College of Business Admin., CB 419, Boulder, CO 80309-0419, zigurs@colorado.edu

The Editor-in-Chief and department editors of IEEE Transactions on Engineering Management will discuss the journal's philosophy and strategies in this panel discussion. A Q&A period will follow the brief presentations.

TA04 Recent Advances in Global Optimization

Cluster: **Global Optimization**
Sponsor: **Optimization Section**
Sponsored Session
Chair: Hong Seo Ryoo, Towson University, Math Dept., Towson, MD 21252, hryoo@towson.edu

1) Linear & Quadratic Surgical Separation of Sets, ***James E. Falk***, George Washington University, Dept. of OR, Washington, DC 20052, falk@seas.gwu.edu

Given a pair of non-empty, disjoint finite sets A and B, a fundamental problem with applications in pattern recognition is to determine if there is a 'simple' (e.g., linear or quadratic) function f which separates the sets in the sense that $f(a) > 0$ for all a in A, and $f(b) < 0$ for all b in B.

2) A Parameter-Space Conical Algorithm for Multiplicative Programming, ***Takahito Kuno***, University of Tsukuba, Inst. of Electronics & IS, Tsukuba, Ibaraki, 305-8573, Japan, takahito@is.tsukuba.ac.jp

We present a new deterministic approach to minimization of a product of several convex functions. We introduce a set of parameters and embed the problem in the parameter space. We then show that a conical branch-and-bound algorithm works well on the resulting problem due to its special structure.

3) Generalized Linear Multiplicative Programs & their Applications, ***Hong Seo Ryoo***, Towson University, Math Dept., Towson, MD 21252, hryoo@towson.edu, ***Nick Sahinidis***

Generalized linear multiplicative programs abound in practical applications. We present our branch-and-reduce global optimization algorithm for solving problems in this class. We summarize several important models of generalized multiplicative programs in various fields and present computational results with our algorithm on some of these models.

TA05 Neural Networks

Contributed Session
Chair: Susan W. Palocsay, James Madison University, CIS/OM Program, MSC 0202, Harrisonburg, VA 22807, palocssw@jmu.edu, http://cob.jmu.edu/palocssw

1) NP-Hard Optimization using a Genetic Algorithm with Neural Memory, ***Richard T. La Salle***, University of Oregon, 2287 McMillan St., Eugene, OR 97405, lasalle@oregon.uoregon.edu

A GA using a neural-based memory is presented. The neural memory operates in a similar fashion to that of the linear memory used in TS heuristics, but allows pre-filtering of parents before mating occurs, speeding convergence to the optimal solution. Sensitivity analysis of solutions is a bi-product.

2) withdrawn - author request of 3/22, ***Chien-Hung Wei***, New Jersey Institute of Technology, Inst. for Transport., Newark, NJ 07102, chwei@megahertz.njit.edu

3) Estimating Posterior Probabilities with Neural Networks, ***Susan W. Palocsay***, James Madison University, CIS/OM Program, MSC 0202, Harrisonburg, VA 22807, palocssw@jmu.edu, http://cob.jmu.edu/palocssw, ***Scott P. Stevens***, ***Robert G. Brookshire***

We consider the issue of evaluating the predictive capability of neural networks when the output values are to be treated as posterior probabilities. We demonstrate the use of a variant of a chi square statistic to measure the goodness-of-fit of neural network models for 2-group membership problems.

TA06 New Product Design & Development

Contributed Session
Chair: W. Steven Demmy, Wright State University, 21125 Crystal Marie Dr., Beavercreek, OH 45431-3313, steve.demmy@wright.edu

1) Partitioning Functional Requirements in New Product Design, ***Mohammed Arif***, University of Central Florida, Dept. of IE, PO Box 162450, Orlando, FL 32816-2450, am18928@pegasus.cc.ucf.edu, ***Michael A. Mullens***, ***Robert L. Armacost***, ***Robert Hoekstra***

We examine the new product design problem of partitioning functional requirements to create manageable subproblems. Multiple objective functions using group technology concepts are applied and used with size constraints to create partitions. A sequencing algorithm is proposed to schedule the order of work for the resulting partitions.

2) Optimizing the Schedule of New Product Development at Dow AgroSciences, ***Leslie Gardner***, University of Indianapolis, 1400 East Hanna Ave., Indianapolis, IN 46227, lgardner@uindy.edu, ***Matthew H. Bassett***, ***Kent Steele***

We describe the implementation of discrete event simulation with heuristic optimization to optimize the schedule of new product development at Dow AgroSciences. The optimization combines a GA with TS and other specialized searches. The application is innovative because it optimizes precedence relationships rather than parameters.

3) Manufacturing Integration in New Product Development, ***Morgan L. Swink***, Michigan State University, MSC Dept., Broad Coll. of Business, East Lansing, MI 48824, swinkm@pilot.msu.edu

We examine the effects of closely involving manufacturing personnel in NPD processes. Data from completed NPD projects are analyzed to detect potential benefits and detriments to project performance when manufacturing

representatives are intimately involved in product design decisions.

4) Improving Life Cycle Costs & System Performance using Front End Analysis, *W. Steven Demmy*, Wright State University, 21125 Crystal Marie Dr., Beavercreek, OH 45431-3313, steve.demmy@wright.edu, ***Charles O. Coogan***

Most life cycle costs and system performance characteristics are locked in during the concept development stage of a new system. Front end analysis (FEA) can dramatically improve those decisions. We describe FEA with examples involving both small components and major weapon systems.

TA07 Applications to Housing Location & Regional Planning

Sponsor: Public Programs & Processes Section
Sponsored Session

Chair: Michael P. Johnson, Carnegie Mellon University, Sch. of Pub. Policy & Mgmt., Hamburg Hall, Rm. 2108A, Pittsburgh, PA 15213-3890, johnson2@abdrew.cmu.edu

1) A Public Housing Relocation Decision Support Method, *Michael P. Johnson*, Carnegie Mellon University, Sch. of Pub. Policy & Mgmt., Hamburg Hall, Rm. 2108A, Pittsburgh, PA 15213-3890, johnson2@abdrew.cmu.edu

2) Operations Research & Public Housing: A Review of Some Early Models, *Edward H. Kaplan*, Yale University, Sch. of Organization & Mgmt., Box 208200, New Haven, CT 06520-8200, edward.kaplan@yale.edu

3) The Effect of Spatial Autocorrelation on a Hedonic Price Models of a Real Estate Market, *William M. Brown*, Cleveland State University, Levin Coll. of Urban Affairs, Cleveland, OH 44115, bowen@wolf.csuohio.edu

TA08 Business Applications

Contributed Session

Chair: Kamlesh Jain, Tiffin University, 155 Miami St., Tiffin, OH 44883, kjain@tiffin.edu

1) The Outlet Effectiveness Model: A Strategic Planning Tool for Bank Branch Design, *Charles R. Cash*, NCR Corporation, 5125 Abbotsbury Ct., New Albany, OH 43054, charles.cash@atlantaga.ncr.com

The outlet effectiveness model (OEM) is a strategic planning tool that assists banking executives in addressing complex business problems. It's a data-driven software application that uses simulation to predict the impact of process, design or technology changes on branch performance. NCR uses the OEM to provide business solutions to financial customers.

2) Strategy Simulators for Working Managers, *John Waldes*, Marketing Strategy & Planning, Inc., 1775 Broadway, Ste. 315, New York, NY 10019, jwaldes@msandp.com www.msandp.com

One of the barriers to managerial use of marketing strategy simulators is the delay between conceiving an idea and viewing the simulation results. We have developed a strategy simulator that displays predicted outcomes in real-time, enhancing managerial productivity. In our talk we will demonstrate this choice model-based system and describe its structure.

3) A Study of the Combination of Two Consumer Credit Scores, *Hui Zhu*, University of Virginia, Dept. of Systems Eng., Thornton Hall, Charlottesville, VA 22903, hz3f@virginia.edu, ***Peter A. Beling***, ***Yann Blanco***

We investigate several methodologies for the combination of bureau credit scores with application credit scores, then employ a profit-based utility measure to evaluate the performance of each approach. Our results show that a combined score has the potential to ourperform both of the scores upon which it's based.

4) Another Look at Performance Measurement, *Kamlesh Jain*, Tiffin University, 155 Miami St., Tiffin, OH 44883, kjain@tiffin.edu, ***Vinod K. Jain***

Global competition and increasingly demanding customers are making continuous performance improvement essential. A revolutionary tool, the balanced scorecard, has helped organizations transform themselves. We will discuss how the concepts of the balanced scorecard and DEA can be combined to better measure and manage organizational performance.

TA09 Metaheuristics & Applications

Cluster: Metaheuristics
Invited Session

Chair: Rex K. Kincaid, College of William & Mary, Dept. of Mathematics, 126 Jones Hall, Williamsburg, VA 23187-8795

1) Application of Scaled COSA to a Protein Folding Problem, *Mark Fleischer*, Old Dominion University, Dept. of Eng. Mgmt., Norfolk, VA 23529-0248, ***Rex K. Kincaid***

The scaled COSA algorithm, based on cybernetic optimization by SA, uses a configuration space as input and yields a much smaller configuration space as the output. Applying this algorithm recursively produces good solutions to continuous variable problems. A protein folding problem is used to experimentally demonstrate its efficacy.

2) Bell-Curve Based Evolutionary Optimization for Structural Optimization, *Keith Laba*, CarMax, 11090 West Broad St., Glen Allen, VA 23060, ***Jaroslaw Sobieszczanski-Sobieski***, ***Rex K. Kincaid***

A bell-curve based evolutionary algorithm is developed and tested to minimize weight in an I-beam hub structure design problem. A child is selecting uniformly on the surface of a hypersphere centered at a weighted point on the line connecting 2 parents with a normally distributed radius.

3) Tabu Search & the Polymer Straightening Problem, *Diane Evans*, College of William & Mary, Applied Science Dept., Williamsburg, VA 23187-8795, ***Jeffrey Hinkley***, ***Rex K. Kincaid***

Molecular conformations of polyimides exhibiting a straight line structure crystallize. Polyimides are used to build high-performance composites for structural components in aircraft and spacecraft. The composites must crystallize so they can be pressed into sheets. A TS is described that seeks to find these straight line conformations.

4) Actuator Placement for Gust & Turbulence Control of Aircraft, *Rex K. Kincaid*, College of William & Mary, Dept. of Mathematics, 126 Jones Hall, Williamsburg, VA 23187-8795, ***Sharon Padula***

We report on a TS algorithm to maximize the determinant of the Fisher information matrix. Applications include the placement of sensors on an aircraft wing and D-optimal designs.

TA10 Modeling & Assessment in Decision Analysis

Sponsor: Decision Analysis Society
Sponsored Session

Chair: Robert T. Clemen, Duke University, Fuqua Sch. of Bus., Durham, NC 27708, clemen@mail.duke.edu

1) Probabilistic Assessments in Practice, *Stephen Derby*, Strategic Decisions Groups, 2440 Sand Hill Rd., Menlo Park, CA 94025, sderby@sdg.com

The quality of an assessment of probability for decision analysis is limited by cognitive biases. In practice these biases are difficult to avoid and their identification and correction key to the quality of the assessment. We present what works in actual conversations with experts and what doesn't.

2) From Local Dependences to Model Structure: A Computer Aid for Building Influence Diagrams, *Marek Druzdzel*, University of Pittsburgh, Dec. Sys. Lab, 206 SIS Bldg., Pittsburgh, PA 15260, marek@sis.pitt.edu, ***Tsai-Ching Lu***

We describe an approach for building the structure of directed probabilistic graphs based on casual mechanisms - local, well understood interactions among relevant variables. We will demonstrate an implementation of this approach as a module of GeNIe, a development environment for influence diagrams developed at DSL and available at http://www2.sis.pitt.edu/~genie.

3) Correlations in Expert Probability Assessments due to Common Cause & Zero Sum Considerations, *Richard John*, University of Southern California, Dept. of Psychology, Los Angeles, CA 90089-1061, john@uscmvsa, ***Detlof von Winterfeldt***

We consider the case of eliciting a probability distribution over a continuous variable with multiple experts and correlated component variables. Using data from a major real-world elicitation, we demonstrate that it is important to capture individual experts' representations of correlations, by aggregating their component elicitations before aggregating across experts.

4) Assessing Dependence Measures for Decision & Risk Analysis Models, *Robert T. Clemen*, Duke University, Fuqua Sch. of Bus., Durham, NC 27708, clemen@mail.duke.edu, ***Gregory W. Fischer***, ***Robert L. Winkler***

Constructing decision- and risk-analysis probability models can in some cases require experts to subjectively assess measures of dependence among variables. We discuss 2 experimental studies that compare several ways to assess dependence measures. Our results suggest that simply asking experts to report a correlation is a reasonable approach.

TA11 Recent Advances in Military Modeling Applications

Sponsor: Military Applications Society
Sponsored Session

Chair: John A. Hosford, Boeing, Defense & Space Group, 1800 Satellite Blvd., Duluth, GA 30097-4099, john.hosford@west.boeing.com

1) The Modeling & Simulation on Remote Engagement Capability, ***Keiko Hoshino***, Mitsubishi Electric Corporation, 325 Kamimachiya, Kamakura, Kanagawa, 247-0065, Japan, khara@banana.kama.melco.co.jp, ***Hideaki Yoshikura***, ***Masayoshi Ito***

Based on the current military and commercial technology, the modeling and simulation on remote engagement capability of ship-based sensors is discussed. The main focus is the influence of data communication delay, which results in the degradation of target tracking quality.

2) A New Methodology for Receiver Operating Characteristic Curves, ***Stephen Alsing***, AFIT, AFIT/ENS, 2950 P St., Bldg. 640, Wright-Patterson AFB, OH 45433, salsing@afit.af.mil, ***Kenneth W. Bauer***

We develop a new methodology for ROC curves used to report and evaluate the performance of automatic target recognition algorithms. This methodology is applied to the Air Force's Moving and Stationary Target Acquisition and Recognition (MSTAR) program to improve testing and evaluation methods.

3) Optimizing Airborne Area Surveillance Asset Placement, ***Douglas Fuller***, AF/XOOC, ***James T. Moore***, ***Richard F. Deckro***

There is no automated planning tool for optimum positioning of USAF area surveillance assets for a theater-level campaign. Selection of orbit points is done by hand with little regard for optimum placement. This research explores the optimum placement of limited USAF airborne surveillance assets against a theater level target set.

4) Application of the New Sciences in Military Modeling, ***Raymond R. Hill***, AFIT/ENS, 2950 P St., Bldg. 640, WPAFB, OH 45433, rhill@afit.af.mil, ***Glenn Bailey***, ***Gregory A. McIntyre***

Current and projected military models, with their focus on prediction of warfare, often fail to capture the adaptive behavior of the battlefield. One technology emerging from recent theories of chaos and complexity is that of complex adaptive agent (CAA) simulation, which may better capture such emergent behavior. Two recent CAA projects completed at the Air Force Institute of Technology are presented as examples.

TA12 Cost/Performance Analysis

Contributed Session

Chair: Herbert F. Lewis, SUNY, Harriman Hall, Rm. 319, Stony Brook, NY 11794-3775, hlewis@notes.cc.sunysb.edu

1) Phase-Type Approximation of Stochastic Petri Nets for Analysis of Manufacturing Systems, ***Shang-Tae Yee***, Pennsylvania State University, 445 Waupelani Dr, G-5, State College, PA 16801, sxy120@psu.edu, ***Jose A. Ventura***

As customers demand shorter lead-times and greater ability to customize products, manufacturers must develop the capability to quickly evaluate different system options to meet these demands. Our research involves modeling and analysis of large non-Markovian stochastic Petri nets by approximating non-exponential transitions through phase type distributions..

2) The Role of Complexity on Tooling Cost & Time-to-Market of Injection Molded Parts, ***Adekunle A. Fagade***, University of Massachusetts, Mechanical & IE Dept., Amherst, MA 01002, afagade@ecs.umass.edu;http://www-unix.ecs.umass.edu/~afagade/, ***David O. Kazmer***

The effects of complexity on tooling costs and times-to-market of consolidated plastic parts has remained undetermined. A new method for evaluating part complexity by using the number of detailed design dimensions has been empirically found to correlate well with tooling cost and lead-time. New guidelines are proposed for part consolidation.

3) Optimizing Performance in Several Dimensions: A Model for Rotisserie League Baseball, ***Herbert F. Lewis***, SUNY, Harriman Hall, Rm. 319, Stony Brook, NY 11794-3775, hlewis@notes.cc.sunysb.edu, ***Thomas R. Sexton***

A specified number of elements must be selected from each set of a collection of disjoint sets. Each element is given a performance rating in several categories and a weight. The desired total rating for each category and total weight of the selected elements are given. We seek a selection that minimizes penalties for violating the ratings.

4) Policy Optimization for Dynamic Power Management, ***Giuseppe A. Paleologo***, Stanford University, EES & OR Dept., 101 San Mateo Dr., Menlo Park, CA 94025, gappy@stanford.edu, ***Luca Benini***, ***Alessandro Bogliolo***

Dynamic power management schemes can be used to control the power consumption levels of electronic systems by setting their components in different states, each characterized by a performance level and a power consumption. We describe power-managed systems using a finite-state stochastic model...

5) Key Quality Culture Attributes in World Class Organizations, ***Pui-Mun Lee***, Nanyang Technological University, Nanyang Ave., Singapore, 639798, Singapore, apmlee@ntu.edu.sg

We examine the common quality culture attributes in 4 world-class organizations that had all previously won the Singapore Quality Awards in different years. The research methodology included interviews with key managers and a questionnaire survey of lower level staff. Findings indicatd that a set of key attributes are reflected predominantly in all 4 organizations...

TA13 Panel: Supporting Teamwork in Higher Education

Sponsor: Group Decision & Negotiation Section
Sponsored Session

Chair: Laku Chidambaram, Indiana University, Bloomington, IN, laku@dscience.cba.hawaii.edu

1) Panel: Supporting Teamwork in Higher Education, ***Laku Chidambaram***, Indiana University, Bloomington, IN, laku@dscience.cba.hawaii.edu, ***Kelly Burke***, California State University, Chico, CA, ***Tim Hill***, San Jose State University, San Jose, CA, ***Chelly Vician***, University of Wisconsin, Whitewater, WI

TA14 Mathematical Programming Applications

Sponsor: Computing Society
Sponsored Session

Chair: Richard E. Rosenthal, Naval Postgraduate School, OR Dept., Monterey, CA 93943-5219, dell@monterey.nps.navy.mil, rosenthal@nps.navy.mil

1) Classifying Public Switched Telephone Networks Switching Stations, ***John F. Brandeau***, Naval Postgraduate School, OR Dept., Monterey, CA 93943-5219, ***Robert F. Dell***

We describe an algorithm to classify nodes in hierarchical public switched telephone networks (PSTNs) and motivate this unique optimization application. Using bounds, we develop for the minimum number of switching levels and classify 9 real-world PSTNs in under one second.

2) Two-Echelon Inventory Allocation & Facility Location Analysis in the Automobile Industry, ***Linda K. Nozick***, Cornell University, Sch. of Civil & Environ. Eng., Ithaca, NY 14853-3501, lkn3@cornell.edu, ***Mark A. Turnquist***

Lower demand products are often more effectively held in more centralized locations than higher demand products. We will discuss an automaker's analysis for optimizing the location of inventory for individual products in a multi-product 2-echelon inventory system and the integration of those decisions into the location analysis for distribution centers.

3) Optimizing Selection of Tomahawk Missiles, ***Scott Kuykendall***, Naval Postgraduate School, OR Dept., Monterey, CA 93943, ***Richard E. Rosenthal***

Tomahawk Land Attack Cruise Missiles, launched from the sea, have become the weapons of choice in many situations. We develop an integer programming approach to improved missile-to-mission matching, for a single ship or a battle group, which is currently being considered for shipboard implementation.

TA15 Economic Issues in Supply Chains

Cluster: Supply Chain Management
Invited Session

Chair: Martin Lariviere, Duke University, Fuqua Sch. of Business, Durham, NC 27708, larivier@mail.duke.edu

1) The Impact of Intrafirm Performance Incentives on Supply Chain Contracts, ***Narendra Agrawal***, Santa Clara University, Dept. of OMIS, Leavey Sch. of Bus., Santa Clara, CA 95053, ***Andy A. Tsay***

Consider a supply chain consisting of two independent profit-maximizing firms: a manufacturer, and a retailer facing a price-sensitive stochastic demand. The retailer's operational decisions are made by a manager with a different objective. We study how such goal incongruence impacts both parties, and the consequences for end customer welfare.

2) The Impact of Price vs. Quantity Competition on Capacity

Investment Decisions, ***Jan A. van Mieghem***, Northwestern University, Kellogg Sch. of Mgmt., MEDS Dept., 2001 Sheridan Rd., Evanston, IL 60208-2001, vanmieghem@nwu.edu, ***Maqbool Dada***

A firm's capacity investment decision crucially depends on the mode of market approach (price-setting vs. quantity-setting) and competition that follows investment. Because the operations literature typically takes prices as exogenous variables, this effect has been unnoticed. We show that quantity setting is significantly less sensitive to variability and more profitable than price-setting.

3) An Equilibrium Analysis of Linear & Proportional Allocation of Scarce Capacity, ***Gerard Cachon***, Duke University, Fuqua Sch. of Business, Box 90120, Durham, NC 27708-0120, gpc@mail.duke.edu, ***Martin Lariviere***

In many industries a supplier's total demand from the retailers she supplies frequently exceeds her capacity. In these situations, the supplier must allocate the capacity in some manner. We consider two allocation schemes: linear allocation and proportional allocation.

4) Contracting to See Demand, ***Martin Lariviere***, Duke University, Fuqua Sch. of Business, Durham, NC 27708, larivier@mail.duke.edu

Previous research has shown that a generous returns policy can both coordinate the channel and benefit the upstream supplier. However, in practice, many worry that easy returns destroy the ability of the upstream party to extract "good" information about demand from downstream channel members. We explore this tradeoff.

TA16 Tutorial: Genetic Algorithms & Their Application to Cellular Manufacturing

Cluster: Cellular Manufacturing
Invited Session
Chair: Jeffrey A. Joines, North Carolina State University, IE Dept., PO Box 7906, Raleigh, NC 27695-7906, jjoine@eos.ncsu.edu, http://www.ie.ncsu.edu/joines

1) Tutorial: Genetic Algorithms & their Application to Cellular Manufacturing, ***Jeffrey A. Joines***, North Carolina State University, IE Dept., PO Box 7906, Raleigh, NC 27695-7906, jjoine@eos.ncsu.edu, http://www.ie.ncsu.edu/joines, ***Russell E. King***, ***C. Thomas Culbreth***

As computers continue to get faster, methods such as GAs offer an effective approach for solving complex problems. This tutorial will introduce GAs, discuss their application to the cell formation problem and describe the use of hybrid-GAs, i.e., local heuristic search methods used in concert with GAs to form effective global optimization techniques.

TA17 New Models for Economic Lot Sizing

Cluster: Network Flows
Sponsor: Optimization Section
Sponsored Session
Chair: Janny M.Y. Leung, Chinese University of Hong Kong, Systems Eng. & Eng. Mgmt. Dept, Shatin NT, Hong Kong, janny@se.cuhk.edu.hk

1) withdrawn - session chair request of 3/29, ***Chun Hung Cheng***, Chinese University of Hong Kong, Dept. of SE/EM, Shatin NT, Hong Kong, PR China, chcheng@se.cuhk.edu.hk, ***M. S. Madan***

2) On Some New Economic Lot-Sizing Models & their Solutions, ***Jian Yang***, University of Texas, Dept of MSIS, Ctr. of Mgmt. of Oper. & Log., Austin, TX 78712, jiany@uts.cc.texas.edu, ***Gang Yu***

We introduce an economic lot-sizing problem that facilitates order acceptance decisions. We solve both deterministic and stochastic models of the problem. We also develop a mixed model which utilizes knowledge about both current information and future demand pattern. Simulation shows the mixed model's superiority to the stochastic model.

3) Dynamic Economic Lot Size Models With Period-Dependent Backorder Costs, ***Timothy J. Lowe***, University of Iowa, Dept. of MS, Coll. of Bus. Admin., Iowa City, IA 52242, timothy-lowe@uiowa.edu, ***Vernon Ning Hsu***

We consider the economic lot sizing problem, where backorder costs are modeled as concave functions which depend on both the period that the backorder occurred as well as the period from which the backorder is filled. Although the general problem is NP-hard, we provide polynomially solvable special cases.

4) Managing Inventories of Many Products Sharing One Facility with Batch Production, ***Yu-Sheng Zheng***, University of Pennsylvania, OPIM Dept., The Wharton Sch., 1300 SH-DH, Philadelphia, PA 19104-6366

In a production-inventory system where there are hundreds of items that share the same production facility, decentralized (R,Q) control is deemed to be more suitable than ELSP. We show how such a system should be designed and the hundreds of control parameters can be optimized.

TA18 Mixed Integer/Logical Programming

Cluster: Integer Programming
Sponsor: Optimization Section
Sponsored Session
Chair: Gabor Pataki, Columbia University, Dept. of IE/OR, Comp. Opt. Research Ctr., New York, NY 10027, gabor@ieor.columbia.edu http://www.ieor.columbia.edu/~gabor

1) A Declarative Modeling Framework, ***Hak-Jin Kim***, Carnegie Mellon University, Grad. Sch. of Ind. Admin., Pittsburgh, PA 15213, hak-jin.kim@andrew.cmu.edu, ***John Hooker***

While the conventional modeling framework in mathematical programming is generally restricted to numerical inequality and equality constraints, the recent success of constraint programming demonstrates the advantages of a more flexible framework. Our goal is to achieve this flexibility while preserving the declarative nature of mathematical programming.

2) Parallel Branch & Price, ***Jeff Linderoth***, Georgia Institute of Technology, Sch. of ISyE, 765 Ferst Dr., Atlanta, GA 30332-0205, jeff@akula.isye.gatech.edu http://akula.isye.gatech.edu/~jeff, ***Martin Savelsbergh***

B&P refers to the technique of combining LP-based B&B with column generation. We describe computational issues arising when parallelizing the B&P algorithm. As a case study, we consider the generalized assignment problem.

3) Building Superadditive Functions to Generate Valid Inequalities for Mixed Integer Sets, ***Hugues Marchand***, London School of Economics, Dept. of OR, Houghton St., London, WC2A 2AE, UK, hmarchand@core.ucl.ac.be, http://www.dash.co.uk/

Deriving "strong" valid inequalities for mixed integer sets is a crucial issue for the development of robust B&C algorithms to solve MIPs. We discuss the interest of using superadditive functions to obtain these "strong" valid inequalities. We show how to build superadditive functions using the concepts of mixed integer rounding and mixing...

4) The Multiple Knapsack Problem with Color Constraints, ***Milind Dawande***, IBM, TJ Watson Research Ctr. 01-133, PO Box 218, Yorktown Heights, NY 10598, ***Jayant Kalagnanam***

MKCP is motivated by a real application from the steel industry. It generalizes the multiple knapsack problem by adding a new attribute (known as "color") to items and "color" constraints that represent a general class of processing constraints in the application.

5) Computing with Lift & Project: A Progress Report, ***Gabor Pataki***, Columbia University, Dept. of IE/OR, Comp. Opt. Research Ctr., New York, NY 10027, gabor@ieor.columbia.edu http://www.ieor.columbia.edu/~gabor, ***Sebastian Ceria***

We present the current status of our work on using lift-and-project cuts to solve difficult mixed integer programs and other optimization problems with disjunctive constraints, notably linear complementarity problems.

TA19 Production & Scheduling I

Contributed Session
Chair: Richard C. Larson, MIT, 77 Massachusetts Ave., 9-215, Cambridge, MA 02139, rclarson@mit.edu

1) Vehicle Routing & Scheduling in a Multiproduct Distributed Manufacturing System, ***Ashok K. Mittal***, IIT Kanpur, IME Dept., Kanpur, 208016, India, mittal@iitk.ac.in, ***V. Sunil***

We consider a manufacturing system with distributed processing facilities or a system in which transportation times are significant in comparison with processing time. Each product has a prescribed sequence of operation. Total transportation and production times are required to be minimized for a limited number of transport vehicles.

2) An Integrated Production & Transportation Scheduling Problem on a Two-Echelon Manufacturing Network, ***Tan Miller***, 210 Tabor Rd., Morris Plains, NJ 07950, tan.miller@wl.com, ***Renato DeMatta***

We the most efficient use of production facilities of a supplier and

manufacturing plant by coordinating their production and shipping schedules. We formulate a MIP model to generate integrated production and transportation schedules.

3) Just-in-Time Production & Transportation Scheduling, ***Pan Chen***, Cornell University, Sch. of OR/IE, Ithaca, NY 14853, pc36@cornell.edu, ***Peter L. Jackson***

A company in the building products industry refuses to build a finished goods warehouse and instead, manufactures and ships all products to order. The production and shipping schedules are identical and transportation costs are substantial. We explore alternative combinations of production scheduling and vehicle routing algorithms to solve this problem.

4) Delivery of Optimal Product Amounts to Spatially Dispersed Customers using Stochastic Dynamic Programming, ***Richard C. Larson***, MIT, 77 Massachusetts Ave., 9-215, Cambridge, MA 02139, rclarson@mit.edu, ***Oded Berman***

Motivated by an implemented industrial gasses application, N customers are visted on a tour, with a possible N+1st customer added at the end. The amount of requested product at each customer is a known random process. The objective is to adjust dynamically the amount of product provided on scene to each customer so as to minimize the total expected cost, comprising costs of earliness, lateness, product shortfall and returning to the depot nonempty.

TA20 Constrained Optimization: Scheduling, Pricing & Dispatch in Deregulated Electricity Markets & Pricing in Deregulated Mar

Cluster: Energy
Sponsor: Section on Energy, Natural Resources & Environment Sponsored Session
Chair: Thomas Lekane, Tractebel Energy Engineering, Avenue Ariane 7, Brussels, B-1200, Belgium, thomas.lekane@tractebel.be

1) Constrained Optimization for Scheduling, Pricing & Dispatch in Deregulated Electricity Markets, ***David Sun***, Cegelec ESCA Corp., 11120 NE 33rd Pl., Bellevue, WA 98004

We describe mathematical modeling and implementation of the SPD application for the management of physical system operation in deregulated electricity markets. SPD analyzes bids for energy offers, reserve offers and energy demands and recognizes explicitly the effects on bid clearing due to transmission congestion, reserve requirements and other types of constraints...

2) Unit Commitment Method for Analyzing Power Generation & Trading in a Deregulated Market, ***Thomas Lekane***, Tractebel Energy Engineering, Av Ariane 7, Brussels, B-1200, Belgium, thomas.lekane@tractebel.be, ***J. Gheury***

We present the modeling and a new solution approach for optimizing the short-term power generation and trading over a period of up to 1 week. The generation system includes nuclear units, fossil-fired units and pumped storage plants. Several types of purchase and sale contracts are considered...

3) Modeling Framework of OMEGA: A Decision Support System for Open Market Energy Generation Allocation, ***Laureano F. Escudero***, Universidad Complutene de Madrid, Madrid, 28040, Spain, lf.escudero@iberduola.es, ***M. Aguilar***, ***J. Martinez***, ***J. Salmeron***

The main objective of the electricity market all over the world is to decrease the cost of electricity. So, electric utilities have been or are undergoing radical changes in their market and regulatory structure. The new framework replaces the centralized dispatch by market-oriented approaches. We present the modeling and algorithmic framework of OMEGA...

4) Bidding & Scheduling Electric Energy in an Electronic Network, ***Alva J. Svoboda***, Pacific Gas & Electric, 565 Bellevue #10001, Oakland, CA 94610, ajsh@pge.com

California's new electricity market requires participants to make decisions in a complex sequence of timed auctions and virtual markets. Depending on the participant, these decisions may include whether or not to take part in a given market, how to construct bids into a market and how to satisfy the resulting obligations...

TA21 Ring Network Design

Sponsor: Technical Section on Telecommunications Sponsored Session
Chair: Luis Gouveia, DEIO-CIO, Bloco C/2-Campo Grande, Cidade Universitaria, Lisboa, 1700, Portugal, lgouveia@fc.ul.pt

1) An Efficient Algorithm for the Ring Loading Problem with Integer Demand Splitting, ***Young-Soo Myung***, MIT, OR Ctr., E40-123, 77 Massachusetts Ave., Cambridge, MA 02139-4307, myung@ns.dankook.ac.kr

In the ring loading problem with integer demand splitting, traffic demands are given for each pair of nodes in an undirected ring network and a flow restricted to integers is routed in either of the 2 directions, clockwise and counter-clockwise. The load of a link is the sum of the flows routed through the link...

2) The Steiner Ring Network Design Problem with Revenues for MAN Design, ***Stefan Voss***, Technische Universitaet Braunschweig, Informationsmanagement, ABWL, Abt-Jerusalem-Str. 7, Braunschweig, D38106, Germany, stefan.voss@tu-bs.de, ***Gabriele Schneidereit***

3) Models for a Steiner Ring Network Design Problem with Revenue Costs, ***Luis Gouveia***, DEIO-CIO, Bloco C/2-Campo Grande, Cidade Universitaria, Lisboa, 1700, Portugal, lgouveia@fc.ul.pt, ***Jose Manuel Pires***

TA22 Applications of MS/OR in Forestry & the Forest Industries

Cluster: OR/MS in Forestry
Sponsor: Section on Energy, Natural Resources & Environment/IFORS Sponsored Session
Chair: Andres Weintraub, University of Chile, Dept. of IE, PO Box 2777, Santiago, Chile, aweintra@dii.uchile.cl

1) A Time Continuous Truck Scheduling System for the Forest Industry, ***Rafael Epstein***, University of Chile, Dept. of IE, PO Box 2777, Republica #701, Santiago, Chile, resptein@dii.uchile, ***Andres Weintraub***, ***Ezio Tadeu Lopez***, ***Enivanis De Abreu Vilela***

We present a truck scheduling system for the forest industry oriented to manage continuous time operations, that is, the trucks work 24 hours a day. The system is based on a simulation model with heuristic rules. This is an advanced version of ASICAM, a system already implemented in Chile, South Africa and Brazil.

2) A Tactical Planning Model for an Integrated Forest Industry, ***Andres Weintraub***, University of Chile, Dept. of IE, PO Box 2777, Santiago, Chile, aweintra@dii.uchile.cl, ***Rafael Epstein***, ***Fernando Cesar Pires Cabral***, ***Pablo Andalaft***

Aracruz is a large forest firm in Brazil which handles eucalyptus plantations and a cellulose plant. We developed a 6 year planning model to support decisions in harvesting areas and timber volumes, and use of machinery to satisfy demand. The model is an LP with integer variables to handle spatial characteristics.

3) Operational Research & Forest Fire Management Policy Analysis, ***David L. Martell***, University of Toronto, Fac. of Forestry, 33 Willcocks St., Toronto, Ontario, M5S 3B3, Canada, martell@smokey.forestry.utoronto.ca

Fire is natural component of many terrestrial ecosystems but it threatens public safety, property, and natural resources. As people exert more pressure on forests both the importance of natural processes and the potential impact of fire on human values increase. We explore the extent to which OR can help address social, economic, and ecological aspects of fire.

TA23 Information Technology Management within Operations

Sponsor: Technology Management Section Sponsored Session
Chair: Andrew McAfee, Harvard Business School, Morgan Hall T40, Soldiers Field, Boston, MA 02163, amcafee@hbs.edu

1) Measurement & Control of Knowledge Work Activities: Preliminary Results from a Field Study of IT Metrics Programs, ***Rob Austin***, Harvard Business School, Morgan Hall T91, Soldiers Field, Boston, MA 02163, raustin@hbs.edu

2) Enterprise Resource Planning Systems Adoption in Europe, ***Enver Yucesan***, INSEAD, Boulevard de Constance, Fontainebleau Cedex, 77305, France, ***Luk N. Van Wassenhove***

3) Determinants & Performance Implications of Electronic Coordination by Engineers in Buyer-Supplier Relationships: Test Contingency Hypothese, ***Ben M. Bensaou***, INSEAD, Boulevard de Constance, Fontainebleau Cedex, 77309, France

4) Coordination Requirements, Information Infrastructure & the Optimal Design of Organizations, ***Eric Clemons***, University of

Pennsylvania, The Wharton Sch., 1315 Locust Walk, SH-DH 6366, Philadelphia, PA 19104, clemons@wharton.upenn.edu

5) The Performance Impact of ERP: An Empirical Observation, ***Andrew McAfee***, Harvard Business School, Morgan Hall T40, Soldiers Field, Boston, MA 02163, amcafee@hbs.edu

Results are presented from a natural experiment which had as its treatment the adoption of an ERP information system within a high-tech manufacturing facility. System adoption occurred without significant contemporaneous business process changes. After an initial dip, operational performance improved along a classic learning curve.

TA24 Service Industry Scheduling

Contributed Session

Chair: Armann Ingolfsson, University of Alberta, Faculty of Business, Edmonton, Alberta, T6G 2R6, Canada, arman.ingolfsson@ualberta.ca, http://www.bus.ualberta.ca/aingolfsson/

1) Simultaneous Scheduling of Personnel & Customers in a Service Operation, ***Avi Dechter***, California State University, 3113 Greenfield Ave., Los Angeles, CA 90034, adechter@ucla.edu

In trying to balance their short-term capacity with uneven demand, service operations typically either schedule personnel to match a known demand pattern or schedule customers in accordance with their available capacity. We present a model that schedules both customers and personnel simultaneously and discuss its merits and applicability.

2) Optimal Scheduling of Customer Appointments for Telecommunication Service Activities, ***Dennis C. Dietz***, US West Advanced Technologies, Math. & Stats. Modeling, 4001 Discovery Dr., Boulder, CO 80303, dxdiet2@advtech.uswest.com, ***Peter M. Vanden Bosch***

An efficient algorithm is developed for determining the optimal appointment schedule for customers requiring telephone installation or repair. Service times are modeled as independent Coxian random variables and appointments are scheduled on a lattice. The algorithm minimizes the weighted costs of customer delay and technician overtime.

3) Progress on Marrying Labor Staffing & Scheduling with Queueing Theory, ***Armann Ingolfsson***, University of Alberta, Faculty of Business, Edmonton, Alberta, T6G 2R6, Canada, arman.ingolfsson@ualberta.ca, http://www.bus.ualberta.ca/aingolfsson/

Optimal labor staffing models and models of queues with time-varying arrival and service rates are concerned with the same physical situation but researchers do not usually combine the 2 approaches. We present progress on developing a heuristic algorithm for optimizing labor staffing while taking dynamic congestion effects into account.

4) A Cutting Plane-Based Algorithm for Police Scheduling Problems, ***Jin-Yuan Wang***, National Chiao Tung University, Dept. of Transportation, 1001 University Rd., Hsinchu, 30050, Taiwan, jinyuan@cc.nctu.edu.tw, ***Chih-Ping Lien***

A roster-based police scheduling problem is studied. A binary IP model is formulated, then we develop a cutting plane-based algorithm to solve this model for its optimal solution. Results also show that the model is appropriate and the solution technique is efficient.

TA25 Modeling & Optimization of Signalized Roadways

Sponsor: Transportation Science Section
Sponsored Session

Chair: Andrzej P. Tarko, Purdue University, 1284 Civil Engineering Bldg., W Lafayette, IN 47907, tarko@ecn.purdue.edu

1) Computational Performance of a Heuristic Signal Optimization Algorithm, ***Wu Sun***, NJIT, Inst. of Transportation, University Heights, Newark, NJ 07102, ***Kyriacos C. Mouskos***

Computational results of an algorithm developed using a heuristic based on a hybrid simulated annealing and tabu search strategies, to simultaneously optimize the signal timing and offsets of an urban network are presented.

2) A Discussion of Bandwidth Maximization in Arterial Traffic Signal Timing Optimization, ***Manoj K. Jha***, Maryland State Hwy Admin., 707 N Calvert St., Rm. C-122, Baltimore, MD 21202, mjha@sha.state.md.us, ***David J. Lovell***

Maximizing the width of the through traffic bands was proposed in the 1960's as an objective for optimizing coordinated traffic signal timing along an arterial, and is still in popular use today. We discuss the limitations of this objective and demonstrate conditions under which it yields inappropriate solutions.

3) Development of Dynamic Control Strategies for Managing Incident Traffic, ***Omar Sawaya***, Northwestern University, Dept. of Civil Eng., 2145 Sheridan Rd., Evanston, IL 60208, sawaya@nwu.edu, ***Alex Skabardounis***, ***Athanasis Ziliaskopoulos***

We present an approach that produces dynamic control strategies in the form of alternate routes around freeway incident, timing plans for traffic signals in the adjacent arterials and metering rates for the on-ramps. The system is implemented and tested computationally on a modest size network under various scenarios of incident severity and congestion levels...

TA26 Measurement & Productivity Improvement

Sponsor: Quality, Statistics & Reliability Section
Sponsored Session

Chair: David A. Nembhard, University of Wisconsin, Dept. of IE, 1513 University Ave., Madison, WI 53706-1572, nembhard@engr.wisc.edu

1) An Intelligent Hybrid Diagnostic System for the Machining Process, ***Nairong Zhou***, University of Michigan, Ann Arbor, MI 48109, nairong@engin.umich.edu, ***Jianjun Shi***

The intelligent hybrid diagnostic system for automated machinery monitoring and diagnostic systems employs a preprocessor that extracts information from sensor data and a rule-based expert system that processes that information to perform a diagnosis. The hybrid diagnostic system we discuss incorporates existing feature-extractor modelers for extracting features from the sensor data...

2) Space-Time Measurements in Manufacturing, ***Mustafa V. Uzumeri***, Auburn Univ., Dept. of Mgmt., 415 W Magnolia, Auburn University, AL 36849-5358, uzumeri@business.auburn.edu

The increased use of bar-code systems in manufacturing has produced a wealth of time located data. Visualization, aggregation and methods of measurement are discussed for spacio-temporal data. The methods have application in the areas of manufacturing, simulation and OM planning.

3) Effects of Learning & Forgetting in Production Processes, ***David A. Nembhard***, University of Wisconsin, Dept. of IE, 1513 University Ave., Madison, WI 53706-1572, nembhard@engr.wisc.edu

The effects of human learning have been shown to reduce manufacturing productivity from steady-state levels. When production breaks occur, the effects of forgetting can further reduce productivity. Models of learning and forgetting are examined in the context of a components manufacturing production line. We discuss the implications of these phenomena for workers and managers.

TA27 Applied Probability in Finance

Sponsor: Applied Probability Society
Sponsored Session

Chair: Steve Kou, Columbia University, Dept. of IE/OR, New York, NY 10027, kou@ieor.columbia.edu

1) Modeling Commodity Price Dynamics, ***James E. Smith***, Duke University, Fuqua Sch. of Bus., Box 90120, Durham, NC 27708-0120, ***Eduardo Schwartz***

We compare and contrast alternative models of commodity price movements, focusing on a new model that allows mean-reversion in short-term prices and uncertainty in the equilibrium level to which prices revert. We estimate these models from futures data and consider their use in valuing real options related to oil and gas investments.

2) Risk-Neutral Option Pricing in the Newsvendor Model, ***John R. Birge***, University of Michigan, 1877 IOE, 1205 Beal Ave., Ann Arbor, MI 48109-2117, jbirge@umich.edu, http://www-personal.engin.umich.edu/~jbirge

Both the capital-asset pricing model and option pricing models can be used to incorporate risk aversion into the news vendor model. Given an asset representing the full market for the product and a log-normal demand distribution, we show how to obtain a simple formula for the order quantity using risk-neutral option pricing.

3) Pricing Options in Incomplete Markets, ***Steve Kou***, Columbia University, Dept. of IE/OR, New York, NY 10027, kou@ieor.columbia.edu

We will present several approaches to option pricing in incomplete markets, where the perfect hedging is impossible, due to non-tradability, short-selling and borrowing constraints, or different interest rate for borrowing and lending. Applications to real options will also be discussed.

TA28 Logistics Heuristics

Contributed Session

Chair: Prasad Narasimhan, i2 Technologies, 565 Technology Sq., 9th Fl., Cambridge, MA 02139, prasad_narasimhan@i2.com

1) A Heuristic Approach for Solving the Truck & Trailer Routing Problem, ***I-Ming Chao***, Chinese Military Academy, PO Box 90602-6, Feng-Shan, 830, Taiwan ROC, iming@cc.cma.edu.tw, ***Jaw-Ji Li***

The truck and trailer routing problem constructs routes for a fleet with k trucks and m trailers to minimize the total distance. A route may contain a main tour for a truck pulling a trailer and 1 or more sub-tours for a truck alone. We present a heuristic for the truck and trailing routing problem and test it with 21 problems.

2) A Heuristic Approach for Crane Deployment in the Container Terminal, ***Chuqian Zhang***, HKUST, Dept. of IEEM, Clear Water Bay, Kowloon, Hong Kong, iezcq@ust.hk, http://home.ust.hk/~iezcq, ***Richard J. Linn***

A rubber tired Gantry crane is one type of yard crane used to handle containers in the container terminal. A heuristic algorithm is developed for dynamic crane allocation among blocks to minimize the workload left in each shift. This method is compared with our previous work based on the mixed integer programming.

3) Study of Outbound Logistics of a Tractor Company, ***G. Raghuram***, Indian Institute of Management, Public Systems Group, Ahmedabad, Gujarat, 380015, India, graghu@iimahd.ernet.in, http://www.iimahd.ernet.in/~graghu

We examine the strategic logistics choices made by a large, growing tractor manufacturer in India. The key drive was how to make outbound logistics flexible with a true service orientation to marketing, especially in a competitive environment. We examine dispatch planning and the associated business process and stockyard locations to service dealers...

4) An Insertion Heuristic for the Shuttle Company Problem, ***Prasad Narasimhan***, i2 Technologies, 565 Technology Sq., 9th Fl., Cambridge, MA 02139, prasad_narasimhan@i2.com, ***Robert Kohout***, ***Albert Baker***

Shuttle companies serve customers traveling to and from the airport. Unique to the shuttle company problem are 2 types of customers: "arriving customers," who have a "pickup-after" deadline and "departing customers," who have a "dropoff-before" deadline. We describe this problem and present an insertion heuristic to solve it.

TA29 Capacity & Technology Acquisition Models

Sponsor: Manufacturing & Service Operations Management Society

Sponsored Session

Chair: S. Rajagopalan, University of Southern California, Marshall Sch. of Bus., BRI 400D, Los Angeles, CA 90089-1421, srajagop@bus.usc.edu

1) Optimal Reconfigurable Capacity Portfolios for Dynamic Markets, ***Wichai Narongwanich***, University of Michigan, IOE Dept., 1205 Beal Ave., Ann Arbor, MI 48109-2117, wichai@engin.umich.edu, ***John R. Birge***, ***Izak Duenyas***

2) Selection of Suppliers Considering Learning Effect & Technology Improvement, ***Shanling Li***, McGill University, Fac. of Management, 1001 Sherbrooke St. W, Montreal, Quebec, H3A 1G5, Canada, li@management.mcgill.ca, ***Devanath Tirupati***, ***Wendy Huang***

3) Technology & Capacity Planning under Uncertainty, ***Zhi-Long Chen***, University of Pennsylvania, Dept. of Systems Eng., 220 S 33rd St., Philadelphia, PA 19104-6315, zlchen@seas.upenn.edu

4) Adoption Timing of New Equipment with Another Innovation Anticipated, ***S. Rajagopalan***, University of Southern California, Marshall Sch. of Bus., BRI 400D, Los Angeles, CA 90089-1421, srajagop@bus.usc.edu

TA30 Manufacturing Logistics Research I

Sponsor: Manufacturing & Service Operations Management Society

Sponsored Session

Chair: David Wu, Lehigh University, Mfg. Logistics Inst., Dept. of IMSE, Mohler Lab, Bethlehem, PA 18015, sdw1@lehigh.edu

1) Capacity-Driven Acceptance of Customer Orders for a Multi-Stage Batch Manufacturing System: Models & Algorithms, ***Robin Roundy***, Cornell University, Sch. of OR & IE, 203 Rhodes Hall, Ithaca, NY 14853, robin@orie.cornell.edu, ***Metin Cakanyildirim***, ***Didi Chen***, ***Pan Chen***, ***Michael Freimer***, ***Peter L. Jackson***, ***Vardges Melkonian***

A manufacturer must decide quickly whether it has the capacity required for a new customer order. We model this problem for a JIT manufacturer with setup times and general product routings. We derive an IP formulation and develop and test heuristic algorithms. The best algorithm is very efficient and very effective...

2) Control of a Deteriorating Machine, ***Seyed Iravani***, University of Michigan, Dept. of IOE, 1205 Beal Ave., Ann Arbor, MI 48109-2117, ***Izak Duenyas***

We consider the optimal control of a deteriorating machine producing items to stock. The options are to produce, repair or idle. We formulate the control problem as a dynamic program and present structural results as well as heuristics.

3) A Two-Stage Heuristic For Matching Lots to Orders, ***Kraig Knutson***, Arizona State University, PO Box 870204, Tempe, AZ 85287-0204, kraig.knutson@asu.edu, ***John W. Fowler***, ***Matt Carlyle***

We develop a method for deciding, on a given day, which orders to fill and the assignment of available lots to orders. This problem can be formulated as an integer program with a nonlinear objective and nonlinear constraints. Because of the complexity of this formulation, we decompose the problem into 2 integer LPs and solve them in sequence by heuristic methods.

4) Research Directions in Manufacturing Logistics - Results From the NSF Workshop, ***David Wu***, Lehigh University, Mfg. Logistics Inst., Dept. of IMSE, Mohler Lab, Bethlehem, PA 18015, sdw1@lehigh.edu, ***Robert H. Storer***, ***Louis A. Martin-Vega***, ***Robin Roundy***

An NSF workshop on Manufacturing Logistics was held at Lehigh University in 1997. More than 100 academic and industry researchers participated in the workshop to discuss a research agenda in this emerging area. Research directions suggested in the workshop will be summarized and taxonomy of manufacturing logistics research presented.

TA31 Inventory Models I

Contributed Session

Chair: Suresh K. Goyal, Concordia University, DS & MIS Dept., 1455 de Maisonneuve Blvd W, Montreal, Quebec, H3G 1M8, Canada

1) Inventory Models for Finite Horizon & Single Quantity Demands, ***Mohsen ElHafsi***, University of California, Anderson Grad. Sch. of Mgmt., Riverside, CA 92521-0203, mohsen.elhafsi@ucr.edu

We propose several models for short-lived demands. We deal with 2-level inventory systems in the presence of stochastic capacity. The latter is modeled through failures and repairs. The solution approach is simple and provides insights to the relationship between lot sizes and capacity shortages and lot sizes and due dates.

2) X-Y Band & Modified (s,S) Policy: The Infinite Time Horizon Case, ***Shaoxiang Chen***, Nanyang Technological University, B-2A-30 SAB NTU, Nanyang Ave., Singapore, 639798, Singapore, aschen@ntu.edu.sg

We show that the optimal policy for the infinite horizon stochastic, periodic review inventory system with a fixed set-up cost and finite capacity has an X-Y band structure but not of the modified (s,S) type in general. It proves that the limiting cost function as well as stationary optimal policy exist and satisfy the functional equation.

3) The Single Vendor Single Buyer Problem: Recent Developments, ***Suresh K. Goyal***, Concordia University, DS & MIS Dept., 1455 de Maisonneuve Blvd W, Montreal, Quebec, H3G 1M8, Canada

We present recently published approaches for determining the economic operating policy for a single product supplied by a vendor to a buyer. An example will be given to illustrate the approaches.

4) Capacitated Multi-Item Production Planning and Control when Item-Level Forecasts are not Possible for Most Items, ***James A. Rappold***, University of Wisconsin, 975 University Ave., Madison, WI 53706, jrappold@bus.wisc.eduinstruction.bus.wisc.edu/jrappold, ***John A. Muckstadt***, ***David H. Murray***

We consider a capacitated manufacturing resource, such as an assembly cell, which assembles several hundred items. Demand for a substantial portion of the

items is highly erratic and volatile, thus rendering moment estimation problematic, if not impossible. We control the system via a hybrid make-to-stock/maketo-order strategy in which MTO products receive production priority...

TA32 Data Envelopment Analysis I

Contributed Session

Chair: Jose H. Dula, University of Mississippi, Sch. of Bus., University, MS 38677, jdula@olemiss.edu

1) Assessing Robustness of DEA Models One Input/Output at a Time, ***Francisco J. Lopez***, University of Mississippi, Sch. of Bus., University, MS 38677, fjlopez@olemiss.edu, ***Jose H. Dula***

Once a DEA problem has been formulated and solved, the question often arises as to the impact of adding or omitting an input or an output. We explore efficient procedures to assess and bound this impact on the efficiency set.

2) Sensitivity Analysis for the Efficiency Classification in Data Envelopment Analysis, ***Akiko Takeda***, Tokyo Institute of Technology, Dept. of Math. & Comp. Sci., 2-12-1 Oh-Okayama, Meguro-ku, Tokyo, 152-8552, Japan, takeda@is.titech.ac.jp, www.is.titech.ac.jp/labs/kojimalab/takeda/, ***Hisakazu Nishino***

We present a technique for assessing the sensitivity of efficiency classifications in DEA. It is an extension of the technique Charnes et al proposed. For inefficient organization, ours is reduced to a nonconvex problem. We introduce transformations for solving the problem and show simple numerical results.

3) Price & Preference Information in DEA, ***Tarja Joro***, Helsinki School of Economics & Business Admin., PO Box 1210, Helsinki, 00101, Finland, joro@hkkk.fi, http:/www.hkkk.fi/methods/joro.html

Different approaches to incorporate preference and price information into DEA, i.e., different weights restriction schemes, value efficiency analysis, etc., are reviewed. Approaches are illustrated with an application to Finnish forestry data.

4) Accelerating DEA over Multiple Models & Forms with Frames, ***Jose H. Dula***, University of Mississippi, Sch. of Bus., University, MS 38677, jdula@olemiss.edu, ***Robert M. Thrall***

We extend our work on frames in DEA for accelerating computations when dealing with all 4 models and multiple orientations. Our investigations reveal that substantial savings are possible by careful sequencing and exploiting geometry.

TA33 Forecasting

Contributed Session

Chair: Terri Friel, Eastern Kentucky University, Coll. of Business, 215 Combs, Richmond, KY 40475, cbofriel@acs.eku.edu

1) Forecasting Product Sales using Multi-Source Data, ***XiaoYing Chen***, SOFTBANK Corp., 24-1 Nihonbashi-Hakozakicho, Chuo-ku, Tokyo, 103-8501, Japan, chenxy@cb.mbn.or.jp, http://plaza6.mbn.or.jp/~chenxy/

Demand forecasting is one of the most critical parts in supply chain management. We suggest an approach for sales forecasting by using multi-source data.

2) Evolution of Semiconductor Demand Forecasts, ***Metin Cakanyildirim***, Cornell University, School of OR, Rhodes Hall 294, Ithaca, NY 14853, metin@orie.cornell.edu http://www.orie.cornell.edu/~metin

In the semiconductor industry, many critical decisions are based on demand forecasts. However, these forecasts contain random errors. We present a scheme to understand such errors (without altering given forecasts) and model the evolution of forecasts. Our scheme allows correlations both across time and products. It also works in the case of nonstationary errors due to ramps (technology migrations)...

3) Forecasting Freight Flow at a County Level, ***Maria P. Boile***, Lafayette College, Dept. of Civil & Environ. Eng., AHE 315, Easton, PA 18042-1775, boilem@lafayette.edu, ***Jeremy Brodney***, ***Jakub P. Rowinski***

We present a methodology for the development of a commodity flow OD trip matrix. The matrix is used as input in the traffic assignment process to forecast freight movement over interstate, state and county roads. An application to the State of Pennsylvania is given.

4) Forecasting Catastrophic Demand Events in the Product Life Cycle, ***Terri Friel***, Eastern Kentucky University, Coll. of Business, 215 Combs, Richmond, KY 40475, cbofriel@acs.eku.edu

Forecasting events in the long-term using mathematical applications requires more development. Predicting when substitute products will arrive is, at best, based upon expert opinion. We present some of the mathematical concepts that could be used to forecast unique events such as obsolescences that affect the product life cycle.

TA34 Analysis Forecast Research

Sponsor: Accounting, Auditing & Tax Section

Sponsored Session

Chair: Susan Lightle, Wright State University, Dept. of Acct., Coll. of Bus. Admin., Dayton, OH 45435-0001

1) A Reexamination of Analysts' Earnings Forecasts of Quarterly Earnings, ***Somnath Das***, University of Illinois at Chicago, Coll. of Bus. M/Co75, Chicago, IL 60607-7123, sdas@uic.edu

Several papers have documented that analysts earnings forecasts have larger errors for 4th quarter earnings relative to interim quarters, e.g., Salamon & Stober 1994, Basu, Hwang & Jan 1997, etc. It has also been shown that analysts forecasts for loss firms are generally poorer than those of profitable firms, e.g., Hwang, Jan & Basu 1996, Das 1998...

2) Capturing Informational Uncertainties through Analysts' Forecasts, ***Praveen Sinha***, University of Cincinnati, 310 Lidner Hall, Coll. of Bus. Admin., Cincinnati, OH 45221-0020, sinhap@email.uc.edu, ***Pradyot K. Sen***

Available empirical evidence indicates that information releases earlier than expected tend to carry good news while information releases later than expected tend to carry bad news about a firm. We examine whether the properties of the informational uncertainty are consistent with managers' strategically choosing the timing of releasing information about earnings...

3) Analysts' Pre-Annoucement Information Acquisition, ***Donal Byard***, University of Cincinnati, PO Box 210211, Cincinnati, OH 45221-0211, donol.byard@uc.edu

We adopt a new model analysts' information environment. Using this model, I show that the precisision of both the public and private information available to analysts' increases prior to earnings announcements. Surprisingly, consensus is found to decrease prior to earnings announcements.

4) Determinants of Analyst Forecast Accuracy: The Case of Tax Law Change, ***Margaret Reed***, University of Cincinnati, Lindner Hall, Coll. of Bus. Admin., Cincinnati, OH 45221

Existing research on the accuracy of analysts' forecasts documents the analysts' failure to incorporate all information in their forecasts of firms' earnings per share. We argue that there are contextual factors that explain individual analyst's forecasts accuracy. In developing a model of individual analyst forecast accuracy, we use the natural experiment of the 1986 Tax Reform act...

TA35 The Use of Linked Spreadsheets in Teaching Production Planning & Inventory Control: For a Little More Swing

Sponsor: Forum on Education

Sponsored Session

Chair: Salwa Ammar, Le Moyne College, Dept. of Bus. Admin., Syracuse, NY 13214, ammars@palm.lemoyne.edu

1) The Use of Linked Spreadsheets in Teaching Production Planning & Inventory Control: For a Little More Swing, ***Salwa Ammar***, Le Moyne College, Dept. of Bus. Admin., Syracuse, NY 13214, ammars@palm.lemoyne.edu, ***Ronald H. Wright***

We descrbe spreadsheets built to perform 3 linked levels of production planning. These spreadsheets allow students to understand the interaction among aggregate planning, scheduling and MRP. Students utilize these to play the in-class manufacturing game, a competitive team exercise designed using visual basic. Copies of the game will be provided.

TA37 Software Demonstration IV

Chair: To be announced

1) Software Demonstration: MPSIII Model Management Utilities, ***Joseph B. Creegan, Jr.***, Ketron Management Sciences, 1755 Jefferson Davis Hwy, Ste. 901, Arlington, VA 22202, jcreegan@ketronms.com

MPSII utilities MATEDIT (matrix editor) and TABEDIT (table editor) are demonstrated in a realistic application environment - a logistics optimization application supported by DATAFORM, C-WHIZ and MIPIII.

2) Software Demonstration: ALPHA/Sim, ***Kendra E. Moore***,

Alphatech Inc., 50 Mall Rd., Burlington, MA 01803-4537, alpha.sim@alphatech.com, ***Scott Hammer***

ALPHA/Sim is a general-purpose, discrete-event simulation tool based on petri nets. The graphical modeling environment provides a simple, yet powerful set of model building blocks, making it easy to learn and use productively. Single-user, site and educational licensing are available. Platforms include PCs (NT) and Sun Workstations (SunOS or Solaris). ALPHATECH offers training, consulting and technical support.

Tuesday 09:45-10:45

OP36 Omega Rho Distinguished Lecture Plenary

Plenary Session

Chair: David F. Rogers, University of Cincinnati, Dept. of QAOM, CBA, PO Box 210130, Cincinnati, OH 45221-0130, david.rogers@uc.edu

1) Omega Rho Distinguished Lecture: The Ethical OR/MS Professional, ***Ronald A. Howard***, Stanford University, Terman 324, Stanford, CA 94305-4025

As a professional, the practitioner of OR/MS requires considerable training and specialized study, but is he or she governed by a code of ethical conduct? The continual disclosure of ethical lapses of other professions challenges the ethical standards of our own. The most basic ethical principles concern initiating the use of force against people and property. Such potential actions can and do arise from the work of analysts, but far more common are issues that involve the ethical principles of truth-telling. Telling the whole truth requires going beyond not lying to a proactive concern with avoiding any deception. We shall examine the ethical dilemmas that can arise in our work and how we can help ourselves and our students to resolve or, better, avoid them.

Tuesday 11:00-12:00

TT04 Tutorial: EMOSL - A New Paradigm for solving Hard Optimization Problems

Tutorial Session

Chair: Sebastian Ceria, Columbia University, Sch. of Business, Computer OR Ctr., New York, NY 10027, sebas@cumparsita.gsb.columbia.edu http://www.columbia.edu/~sc244

1) Tutorial: EMOSL - A New Paradigm for Solving Hard Optimization Problems, ***Sebastian Ceria***, Columbia University, Sch. of Business, Computer OR Ctr., New York, NY 10027, sebas@cumparsita.gsb.columbia.edu http://www.columbia.edu/~sc244

EMOSL is a programming interface that allows the OR practitioner to implement tailored optimization algorithms by fully integrating an easy-to-use modeling language and state-of-the-art optimizer. EMOSL allows the programmer to manipulate the in-core representation of the problem using the notation used to specify the model, thus avoiding the traditional separation between modeler and optimizer...

TT05 Tutorial: Design & Analysis of Simulation Experiments

Tutorial Session

Chair: W. David Kelton, University of Cincinnati, Dept. QAOM, Cincinnati, OH 45221-0130

1) Tutorial: Design & Analysis in Simulation Experiments, ***W. David Kelton***, University of Cincinnati, Dept. QAOM, Cincinnati, OH 45221-0130

A computer-simulation project should involve much more than building and running the model. The model should be exercised appropriately to gain insight into system operation, improvement and stability. We will cover the essential topic areas of such design and analysis with emphasis on statistical issues.

TT08 Tutorial: The OPL Optimization Programming Language

Tutorial Session

Chair: Pascal Van Hentenryck, Universite Catholique de Louvain, Dept. of Comp. Science & Eng., 2 Place Sainte-Barbe, Louvain la Neuve, B-1348, Belgium, pvh@info.ucl.ac.be

1) Tutorial: The OPL Optimization Programming Language, ***Pascal Van Hentenryck***, Universite Catholique de Louvain, Dept. of Comp. Science & Eng., 2 Place Sainte-Barbe, Louvain la Neuve, B-1348, Belgium, pvh@info.ucl.ac.be

The OPL programming language is a new modeling and programming language that supports LP, IP, constraint programming and scheduling. The language is strongly typed, providing extra semantic checking during execution. The ability to use a common language to apply both linear optimization and constraint programming techniques provides the capability to investigate appropriate techniques for hard combinatorial problems...

TT09 Tutorial: Genetic Algorithms & their Applications to Manufacturing

Tutorial Session

Chair: Lawrence Davis, Manugistics, Inc.

1) Tutorial: Genetic Algorithms & their Applications to Manufacturing, ***Lawrence Davis***, Manugistics, Inc.

We will provide an overview of GAs and evolutionary computation and describe some of the many applications of these algorithms to manufacturing problems. The overview will be designed to give the listener a feel for the way that GAs work. The descriptions will be designed to give the listener a feel for the variety of problems and solution techniques that the GA approach supports.

TT10 Tutorial: Preference Function Modeling - A New Methodology for Preference Measurement

Tutorial Session

Chair: Jonathan Barzilai, Dalhousie University, Dept. of IE, PO Box 1000, Halifax, Nova Scotia, B3J 2X4, Canada, jonathan.barzilai@dal.ca

Co-Chair: Ernst Grundke, Dalhousie

University, Dept. of Ie, PO Box 1000, Halifax, Nova Scotia,

B3J 2X4, Canada

1) Tutorial: Preference Function Modeling - A New Methodology for Preference Measurement, ***Jonathan Barzilai***, Dalhousie University, Dept. of IE, PO Box 1000, Halifax, Nova Scotia, B3J 2X4, Canada, jonathan.barzilai@dal.ca, ***Ernst Grundke***

PFM is a new methodology for measurement of preferences on interval scales. PFM represents a new easy-to-use but powerful decision paradigm. It is based on a rigorous mathematical theory and advancements in the theory of measurement. Technically, PFM is a utility theory; however, in contrast to the "standard gamble" method of MAUT, PFM is intuitive, easy to use and has a built-in mechanism for reconciling inconsistent assessments...

TT13 Tutorial: Java - Introduction & OR Applications

Tutorial Session

Chair: Gordon H. Bradley, Naval Postgraduate School, OR Dept., Code OR/TW, Monterey, CA 93943, bradley@nps.navy.mil

1) Tutorial: Java - An Introduction & OR Applications, ***Gordon H. Bradley***, Naval Postgraduate School, OR Dept., Code OR/TW, Monterey, CA 93943, bradley@nps.navy.mil

Java is a powerful object-oriented programming language that compiles to code that efficiently executes without modification in a number of different computer environments, i.e., Windows, NT, Macintosh, various UNIX systems, JavaOS, etc. We will present an overview of Java and related technologies with special emphasis on the use of Java to construct dynamic and distributed OR applications...

TT14 Tutorial: Introduction of "Optimization" Modules in Simulation

Tutorial Session

Chair: Averill M. Law, Averill M. Law & Associates, PO Box 40996, Tucson, AZ 85717

1) Tutorial: Introduction of Optimization Modules in Simulation, ***Averill M. Law***, Averill M. Law & Associates, PO Box 40996, Tucson, AZ 85717

The hottest topic in simulation is probably the introduction of "optimization" modules into numerous simulation products, having been made possible by faster PCs and better search heuristics. We present the results of experiments for evaluating the quality and efficiency of the solutions produced by these "optimizers."

TT17 Tutorial: Model Validation & Scenario Generation for Stochastic Programming Models

Tutorial Session

Chair: Suvrajeet Sen, University of Arizona, Dept. of SIE, Tucson, AZ 85721, sen@sie.arizona.edu

1) Tutorial: Model Validation & Scenario Generation for Stochastic Programming Models, ***Suvrajeet Sen***, University of Arizona, Dept. of SIE, Tucson, AZ 85721, sen@sie.arizona.edu

Stochastic programming provides an effective methodology for modeling uncertainty in decision making models. We begin by describing a variety of applications network planning, yield management, financial planning, etc. These models result in large scale optimization problems that are approximated by problems containing fewer scenarios than the entire deterministic equivalent...

TT18 Tutorial: Fuzzy Dynamic Programming & its Variants

Tutorial Session

Chair: Augustine O. Esogbue, Georgia Institute of Technology, Sch. of ISyE, Intell. Systems & Controls Lab, Atlanta, GA 30332-0205, augustine.esogbue@osye.gatech.edu, http://www.isye.gatech.edu ~ aesogbue

1) Tutorial: Fuzzy Dynamic Programming & its Variants, ***Augustine O. Esogbue***, Georgia Institute of Technology, Sch. of ISyE, Intell. Systems & Controls Lab, Atlanta, GA 30332-0205, augustine.esogbue@osye.gatech.edu, http://www.isye.gatech.edu ~ aesogbue

Brief exposure to the problems and tools of optimization, mathmatical programming and modern control reveals the existence of a bewildering array of problems that can be well-posed in the parlance of dynamic programming. Incursions into disciplines such as mathematics, engineering, computer science, economics, medicine, etc., reveal the existence of the inescapable problem of decision making and control...

TT19 Tutorial: Exploiting Operations Research Algorithms in Constraint-Based Scheduling II - Search & Optimization

Tutorial Session

Chair: Claude M. Le Pape, Bouygues Telecom, R&D Dept., 51 avenue de l'Europe, Velizy Cedex, 78944, France, clepapeg@bouyguestelecom.fr

1) Tutorial: Exploiting Operations Research Algorithms in Constraint-Based Scheduling II: Search & Optimization, ***Claude M. Le Pape***, Bouygues Telecom, R&D Dept., 51 avenue de l'Europe, Velizy Cedex, 78944, France, clepapeg@bouyguestelecom.fr

Constraint programming enables the development (at low cost) of many variants of search and optimization algorithms based on OR techniques. Part II of this tutorial reviews the most significant case studies and applications from the literature, i.e., project scheduling, non-preemptive and preemptive job-shop scheduling, etc. Experimental results are presented and discussed.

TT30 Tutorial: Retail Operations

Sponsor: Manufacturing & Service Operations Management Society

Sponsored Session

Chair: Marshall Fisher, University of Pennsylvania, The Wharton School, OPIM Dept., Philadelphia, PA 19102, fisher@wharton.upenn.edu

Co-Chair: Ananth Raman, Harvard University, Grad. Sch. of Bus. Admin., Morgan Hall, Boston, MA 02136, araman@hbs.edu

1) Tutorial: Retail Operations, ***Marshall Fisher***, University of Pennsylvania, The Wharton School, OPIM Dept., Philadelphia, PA 19102, fisher@wharton.upenn.edu, ***Ananth Raman***

Retailing is an industry in which we see enormous differences in performance. At one extreme, we have Wal-mart, who from a standing start in 1962 has grown to become the largest retailer in the world, making Sam Walton the wealthiest man in the US along the way. At the other extreme, about 15% of the largest retailers in the US went bankrupt in the 1980s...

Tuesday 13:00-14:30

TC01 Perspectives on MHT Education I

Cluster: MHT as a Health Profession

Invited Session

Chair: Charles Austin, Medical University of South Carolina, Dept. Health Admin. & Policy, 34 Edgewood Dr., Hilton Head, SC 29926

1) Graduate Program in Health Care Technologies Management, ***William Hendee***, Medical College of Wisconsin, 8701 Watertown Plank Rd., Milwaukee, WI 53226

2) Education of Health Administration Graduate Students in the Management of Health Care Technology, ***Charles Austin***, Medical University of South Carolina, Dept. Health Admin. & Policy, 34 Edgewood Dr., Hilton Head, SC 29926

3) Breaking the Sound Barrier: Revolutionizing Health Care Management Education, ***Paula Bobrowski***, SUNY, Sch. of Business, Oswego, NY 13126, ***Lanny Karns***, ***Charles Spector***, ***Hugh Bonner***

TC03 Engineering Valuation & Cost Analysis for Strategic Decision Making

Cluster: Engineering Costing

Invited Session

Chair: Kim L. Needy, University of Pittsburgh, Dept. of IE, 1041 Benedum Hall, Pittsburgh, PA 15261, kneedy@engrng.pitt.edu

Co-Chair: Adrien Presley, Truman State University, Div. of Bus. & Accountancy, Kirksville, MO 63501, apresley@truman.edu

1) Kriging Aproach to Sensitivity Analysis of Capital Investments, ***Ravipim Chaveesuk***, University of Pittsburgh, Dept. of IE, Pittsburgh, PA 15261, ***Alice E. Smith***

A metamodel approach to sensitivity analysis of capital investment evaluation that uses experimental design and kriging is presented. Kriging originated in geostatistics. Development of a metamodel of the behavior of the investment can provide specific and useful understanding of the effect of various uncertain factors. The kriging methodology is explained and an example is given.

2) A Fuzzy-Set Approach to Evaluation of Used-System Life Cycle Costs, ***John S. Usher***, University of Louisville, Dept. of IE, Louisville, KY 40245, jsushe01@ulkyvm.louisville.edu

A model is presented for estimating the total life of each component in a used, multi-component system through the use of fuzzy set theory and linguistic variables. The resulting component life estimates yield times at which a cost for component replacement is incurred. A general cost model then gives the equivalent uniform annual cost of owning and operating the system.

3) Integrating Acivity & Strategic Benefits in Project Selection, ***Adrien Presley***, Truman State University, Div. of Bus. & Accountancy, Kirksville, MO 63501, apresley@truman.edu, ***Donald Liles***

A methodology is presented for project selection that assists in the design of validation experiments for determining a project's benefits. The methodology uses activity-based costing concepts to identify the financial benefits of the projects which are then integrated with strategic impacts using a multi-attribute decision-making technique.

4) An Integrated Activity-Based Costing & Economic Value Added System for Small Manufacturing Firms, ***Narcyz Roztocki***, University of Pittsburgh, Dept. of IE, Pittsburgh, PA 15261, ***Kim L. Needy***

A cost and performance measurement system integrating ABC with EVA is presented. Steps are described for the design and implementation of the ABC&EVA system in small manufacturing firms and a comparison is made to a traditional ABC system. Resultant changes to corporate strategies are discussed.

TC04 Optimization of Risk & Reliability

Cluster: Global Optimization

Sponsor: Optimization Section

Sponsored Session

Chair: Stanislav Uryasev, University of Florida, Dept. of ISE, 474 Weil Hall, Gainesville, FL 32611-6595, uryasev@ise.ufl.com

1) Sensitivity & Optimization of Probability Functions: Applications in Risk Analysis, ***Stanislav Uryasev***, University of Florida, Dept. of ISE, 474 Weil Hall, Gainesville, FL 32611-6595, uryasev@ise.ufl.com

We consider the following simulation models: the dynamic population model and the model for evaluating cancer risk. The approach is based on new analytical differentiation formulas for integral and probability functions. An efficient procedure calculates performance function and sensitivities during the one run, resulting in savings in time and effort.

2) Quantile (Value at Risk) Optimization, ***Georg Ch. Pflug***, University of Vienna, Dept. of Stats. & OR, Universitaetsstrasse 5, Wien, A-1010, Austria, pflug@smc.univie.ac.at

In insurance and risk management, the value at risk (quantile) is an important indicator. Optimization problems associated with quantiles of distributions are very difficult (nonsmoothness of quantiles requires some approximation and smoothing techniques). We report on properties and solution techniques of stochastic optimization problems with quantiles functions.

3) Value-At-Risk Minimization for Decision Rules, ***Riho Lepp***, Institute of Cybernetics, Akadeemia tee 21, Tallinn, EE-0026, Estonia, iprh@ioc.ee

In stochastic programming the value-at-risk problem means minimization of a quantile function with a fixed (high) probability level. In some quantile optimization models, e.g., correction of a satellite orbit, a solution - a decision rule - depends on a random parameter. We study an approximative-iterative method for solving such problems.

4) Generating Scenario Trees for Multistage Stochastic Programs, ***Nicole Growe-Kuska***, Humboldt-University Berlin, Institut of Applied Math., Unter den Linden 6, Berlin, 10099, Germany, nicole@mathematik.hu-berlin.de

Optimal values and solutions of multistage stochastic programs are stable w.r.t. certain metric distances of the probability distributions of the random data. We approximate the distribution of the underlying input data by scenario trees which minimize the Fortet-Mourier metrics. Approach is used for generating and deleting scenarios from scenario trees.

TC05 Neural Network Applications

Contributed Session

Chair: James J. Pomykalski, James Madison University, CISAT MSC 4102, Harrisonburg, VA 22807, pomykajj@jmu.edu, http://www.cs.jmu.edu/users/pomykajj/homepage/

1) A Neural Network Model for Estimating Pipeline Contents, ***Robert A. Russell***, University of Tulsa, 600 S. College Ave., Tulsa, OK 74104-3189, russellra@centum.utulsa.edu

Given information on previous pipeline contents and input readings on temperature, pressure, and density, a neural network model is developed to predict the percentage of each type of gas in the shipment. The neural network significantly improves the accuracy of the estimation.

2) Forecasting the Monthly Natural Gas Consumption in Ohio using Neural Networks, ***Hisham M. Choueiki***, PUCO, 180 E Broad St., 3rd Floor, Columbus, OH 43215, puco_choueik@pucvms.a1.ohio.gov

We apply the rules developed in our previously published research to construct a neural network model for forecasting the monthly natural gas consumption in the State of Ohio. The results are promising in terms of accuracy; especially given the sensitivity of customers to the Heating Degree Days during the winter season.

3) Neural Network Design & Development Classify Fecal Samples, ***James J. Pomykalski***, James Madison University, CISAT MSC 4102, Harrisonburg, VA 22807, pomykajj@jmu.edu, http://www.cs.jmu.edu/users/pomykajj/homepage/, ***Keith R. McGerald***

The design and development of a neural network is a complex task. Two key, yet often overlooked, aspects of neural network development are data analysis and algorithm selection. We focus on these issues with regard to using a neural network to classify biological samples.

TC06 Marketing I

Contributed Session

Chair: Subir Bandyopadhay, University of Ottawa, 136 Jean-Jacques Lussier St., PO Box 450, Stn. A, Ottawa, Ontario, K1N 8P5, Canada, bandyopa@admin.uottawa.ca

1) Software Agents, the Internet & Marketing, ***Amit Pazgal***, Washington University, Olin Sch. of Business, 1 Brookings Dr., CB 1133, St. Louis, MO 63130, pazgal@mail.olin.wustl.edu

We present a detailed description of intelligent software agents including both search and negotiation agents. We demonstrate the use of theoretical concepts previously exclusive to the economic theory of bargaining and auctions to immensely improve the agents' performance. We investigate implications and challenges of adopting this new technology to numerous Internet marketing practices.

2) The Competitive Reactions between Firms, ***Minna Mattila***, University of Jyvaskyla, Sch. of Bus. & Economics, PO Box 35, Finland, mimaja@tase.jyu.fi, ***Shawn P. Daly***

We want to give better insight into the competitive reaction behavior of the marketing manager by studying motives, goals, market structure and consumer response functions. The speed and type of competitive reaction is studied from the game theoretical perspective by using student samples.

3) How Consumer Attitude Mediates the Influence of Product Belief on Product Usage Patterns, ***Vijayan K. Pillai***, University of North Texas, PO Box 13675, Denton, TX 76203, fd91@vm.acs.unt.edu, ***Subir Bandyopadhay***

We show empirically how consumer attitude towards products mediates the influence of product belief on consumer product usage patterns. We demonstrate how heavy users tend to have stronger attitudes towards products than light users.

4) Measurement of Acculturation & Advertisement Perceptions, ***Zahid Y. Khairullah***, St. Bonaventure University, School of Bus., Drawer Z, Mecom Center, St. Bonaventure, NY 14778, zyk@sbu.edu, ***Durriya Z. Khairullah***

Scales for the measurement of degrees of acculturation and for the measurement of advertising perceptions are reviewed. The modification and use of the Sczapocznik et al scale for acculturation in a specific application to study advertisement perceptions using the Barban and the Mitchell & Olson scales are discussed.

TC07 Third OR/MS Knowledge Bowl

Invited Session

Chair: Saul I. Gass, University of Maryland, Smith School of Bus., College Park, MD 20742, sgass@mbs.umd.edu

1) Third OR/MS Knowledge Bowl, ***Richard C. Larson***, MIT, 77 Massachusetts Ave., 9-215, Cambridge, MA 02139, rclarson@mit.edu, ***Carl M. Harris***, ***John J. Jarvis***, ***Thomas L. Magnanti***, ***Stephen M. Pollock***, ***Judith S. Liebman***, ***William P. Pierskalla***, ***Richard E. Rosenthal***

Following the "long tradition" of the 1990 (Philadelphia) and 1996 (Washington, DC) OR/MS Knowledge Bowls, the Cincinnati INFORMS Local Committee presents the 3rd OR/MS Knowledge Bowl. As before, 2 expert teams, 1 from the East and 1 from the West, (more or less!) face off to to determine which team can answer the most questions about OR/MS knowledge and trivia. Come and cheer (or jeer) your favorite team!

TC08 Industry Applications I

Contributed Session

Chair: Gopala Govinda Rajan, Cochin Refineries Ltd., Ambalamugal.P.O., Ernakulam, Kerala, 682302, India, ggr@md3.vsnl.net.in http://www.techsoftin.com

1) A Multi-Period Linear Programming Model for Refinery Scheduling, ***Ibrahim Al-Hajri***, Kuwait University, Dept. of Chemical Eng., PO Box 5969, Safat, 13060, Kuwait, ***Ali Elkamel***

A refinery scheduling model is presented. The aim is to find a sequence of operationally feasible daily activity levels for the different units in the refinery and to determine oil and product movements such that the overall production targets are met. Individual unit processing steps are represented by various regression equations...

2) The Scrap Blending & Alloy Addition Problems in Integrated Steelmaking, ***Richard H. Edahl***, US Steel Technical Center, 4000 Tech. Center Dr, Monroeville, PA 15146, redahl@uss.com

In carbon and alloy steelmaking, scrap blending and alloy addition are critical for cost control and meeting grade specifications. Several deterministic and stochastic optimization models that account for differing material chemistry and elementary recovery are given for these problems along with plant experience

with their use.

3) Development of Linear Programming Models to Control Product Yields & Properties of the Fluid Catalytic Cracking Process, ***Khaled Al-Hajri***, Kuwait University, Dept. of Chemical Eng., PO Box 5969, Safat, 13060, Kuwait, ***Ali Elkamel***, ***Erdogen Alper***

Regression models for predicting product yields and properties for the FCC process are presented. Feedstock properties are used as the primary correlation parameters. Models are based on data collected from various sources from the literature on pilot and commercial plants. Predictions of these models are compared to previous models and to real data...

4) Improving Productivity of the Hydrocarbon Processing Industry by OR Models, ***Gopala Govinda Rajan***, Cochin Refineries Ltd., Ambalamugal.P.O., Ernakulam, Kerala, 682302, India, ggr@md3.vsnl.net.in http://www.techsoftin.com

We highlight the role of LP and NLP models that could be used by the hydrocarbon industry for profit maximization. Impact of constraints such as the feed cost, yield pattern, demand pattern, operational constraints, hardware limitations, energy efficiency etc. on profitability will be covered with appropriate examples.

5) An Exploration of the Tenets of Conducting a Web-Based Survey, ***Tyler Frank***, University of Toledo, ISOM Dept., Toledo, OH 43606, tfrank3@netscape.net, ***Jeen Lim***

A study into web-based surveying, soon to be the accepted method of data collection, is presented along with a comparison to more traditional methods. Our method is a unique type with e-mail directions to the web-based survey with electronic submission.

TC09 Metaheuristics with Nontraditional Coding

Cluster: Metaheuristics
Invited Session
Chair: Gerrit K. Janssens, University of Antwerp, Bus. Info Systems & Op. Mgmt., Middelheimlaan 1, Antwerp, B-2020, Belgium, gerritj@ruca.ua.ac.be, http://wcc.ruca.ua.ac.be/TEW/PHP/gerritj.htm

1) The Non-Traditional Evolutionary Framework of Path Relinking: Unexpected Consequences for Optimization, ***Balu Rangaswamy***, US WEST Advanced Technologies, Inc., 4001 Discovery Dr., Boulder, CO 80303, brangas@advtech.uswest.com, ***Fred W. Glover***

There are some surprising gaps and misconceptions in the literature of evolutionary algorithms. A primary source is the lack of recognition that "solution combination methods," as notably exemplified by GAs, can be based on a framework that is much richer than classic crossover models and much less amorphous than customary attempts to go beyond these models...

2) Non-Traditional Coding in Genetic Algorithms, ***Gerrit K. Janssens***, University of Antwerp, Bus. Info Systems & Op. Mgmt., Middelheimlaan 1, Antwerp, B-2020, Belgium, gerritj@ruca.ua.ac.be, http://wcc.ruca.ua.ac.be/TEW/PHP/gerritj.htm

One of the choices the designer of a GA has to make is how to assign a meaning to the chromosome code. A chromosome mostly is coded as a linear string of binary elements, characters or digits. The string mostly represents a solution. We look at other opportunities of coding chromosomes. In particular, we investigate the use of 3 alternatives.

TC10 Improving Resource Allocation & Capital Investment Decisions

Sponsor: Decision Analysis Society
Sponsored Session
Chair: Don N. Kleinmuntz, University of Illinois, Dept. of Bus. Admin., 1206 S. Sixth St., MC-706, Champaign, IL 61820, dnk@uiuc.edu

1) Allocating Resources after a Significant Reorganization, ***Daniel G. Brooks***, Arizona State University, Dept. of Mgmt., Tempe, AZ 85287, dan.brooks@asu.edu

A major manufacturing corporation reorganized, combining traditionally competitive divisions into a single new division, creating a need for a decision-aiding process to facilitate the allocation of resources to large strategic projects.

2) Using Learning Models to Improve Downstream Decision Making, ***Lawrence H. Gallant***, Applied Decision Analysis, 2710 Sand Hill Rd., Menlo Park, CA 94025, lgallant@adainc.com, ***Richard E. Chatwin***

Successfully extracting the maximum value from capital investments requires making a sequence of investment and asset management decisions--decisions that reflect the decision maker's evolving worldview. Modeling how decision makers learn about the world improves their decision making. We present examples of stochastic learning models used in evaluating real-life investment decisions.

3) StrataCap: Software to Support Optimal Multiobjective Resource Allocation in Corporate Settings, ***Catherine E. Kleinmuntz***, Strata Decision Technology, 907 W Marketview Dr., Ste. 10-393, Champaign, IL 61821, cek@decisiontechnology.com, ***Don N. Kleinmuntz***

In corporate settings, implementing a multiobjective approach for project evaluation requires collecting and synthesizing large quantities of information. We demonstrate distributed client-server software specifically designed to support effective and efficient multi-attribute evaluation of hundreds of projects, and describe its use in practice.

4) Decision Analysis without the Analyst: Practical Considerations in Integrating Financial Forecasting with Decision Analysis, ***Don N. Kleinmuntz***, University of Illinois, Dept. of Bus. Admin., 1206 S. Sixth St., MC-706, Champaign, IL 61820, dnk@uiuc.edu, ***Catherine E. Kleinmuntz***

Typical decision analysis approaches involve an expert analyst guiding a decision-maker through the modeling process. We propose adding basic decision analysis capabilities to the structure of spreadsheet-based financial modeling software. This enables relatively unsophisticated organizations to begin to include risk modeling in financial analyses.

TC11 No Title Supplied

Sponsor: Military Applications Society
Sponsored Session
Chair: Steve Collier

1) In Pursuit of Modeling & Simulation Standards, ***Lana E. McGlynn***, US Army Model & Simulation Office

Standards development within the Army's M&S processes is a vital step toward achieving the economies, efficiencies and technological potential M&S represents. Through standards, the Army's M&S community shares techniques, procedures, processes, and applications. It builds on the work of others and advances the art and science of M&S in tandem with technological advances...

2) Army Model & Simulation Master Planning, ***William H. Dunn***, Army Model & Simulation Office, 1805 Crystal Dr. #308, Arlington, VA 22702

We will explain the concepts in the recently completed Army M&S Master Plan. The Army's vision for M&S will be described as a lead-in to discussion of how the Army plans for M&S to support the future direction of military OR. Other topics include the Army M&S management structure and processes and the overall M&S strategy...

3) The Army M&S Technology Review, ***Richard T. Maruyama***, US Army Model & Simulation Office

Coordinating research into M&S technologies has not been actively pursued in the Army or elsewhere in the past. The initiative to be presented has been underway with top level Army involvement for several months. It has two principal objectives: to share information on M&S research and to determine M&S technology needs...

4) Management & Use of Models & Simulations in the US Army, ***David E. Hardin***, US Army Model & Simulation Office

We acquaint the simulation professional with the philosophy behind the use of simulation technologies across all missions of today's Army. We also introduce management techniques and programs employed at the corporate level. This presentation is the capstone for all which will be presented in this season...

TC12 Business Process Reengineering

Contributed Session
Chair: Jack S. Cook, SUNY, Sch. of Business, 1 College Circle, Geneseo, NY 14454-1401, cook@geneseo.edu http://www.frontiernet.net/~cook/informs.htm

1) Methodology for Business Process Reengineering, ***T. Ravikumar***, Indian Statistical Institute, SQC-OR (T&P) Unit, 203 BT Rd., Calcutta, W. Bengal, 700 035, India, travi@ww.isical.ac.in

We give a simplified framework for a holisticapproach for Strategy Development (SD) in Business Process Reengineering (BPR). House of Quality and Radar chart mapping were the tools discussed in association with the

framework for structuring and analyzing the issues related to SD and BP designing. It concludes with the reasons for the failure of prescriptive solutions in BPR.

2) Reengineering: Radical Change for Turbulent Times, ***Alyson E. Becker***, SUNY, 44 Glen Cove Dr., Oswego, NY 13126, aeb99@geneseo.edu, ***Meghan S. Schneible***, ***Jack S. Cook***

Both large and small firms are reengineering with varying degrees of success. We examine how to successfully reengineer using examples from both large and small organizations. Misconceptions and difficulties encountered are explored.

3) Revisiting Reengineering, ***Jack S. Cook***, SUNY, Sch. of Business, 1 College Circle, Geneseo, NY 14454-1401, cook@geneseo.edu http://www.frontiernet.net/~cook/informs.htm

Corporations reengineer for a variety of reasons. Based on case studies of both successful and unsuccessful reengineering efforts, lessons learned will be presented. Various implementation strategies and their resulting organizational implications will be explored.

TC13 Panel: GDN Research in Context - Human & Artificial Agents I

Sponsor: Group Decision & Negotiation Section
Sponsored Session

Chair: Melvin F. Shakun, NYU, Stern Sch. of Bus., 44 W. 4 St., New York, NY 0012-1126, mshakun@stern.nyu.edu

Co-Chair: Gregory Kersten, Carleton University, Sch. of Bus., Dunton Tower, 1125 Colonel, Ottawa, On K1S 5B6, Canada, gregory@business.carleton.ca

1) Panel: Group Decision Negotiation Research in Context - Human & Artificial Agents, ***Gregory Kersten***, Carleton University, Sch. of Bus., Dunton Tower, 1125 Colonel, Ottawa, ON K1S 5B6, Canada, gregory@business.carleton.ca, ***Kalyan Chatterjee***, Pennsylvania State University, Smeal Coll. of Bus., 310 Beam BAB, University Park, PA 16802, chatterjee@psu.edu, ***Melvin F. Shakun***, NYU, Stern Sch. of Bus., 44 W. 4 St., New York, NY 0012-1126, mshakun@stern.nyu.edu, ***RachelCroson***, University of Pennsylvania, Wharton Sch. of Bus., Dept. of OPIM, 1322 SH-DH, Philadelphia, PA 19104-6366, crosonr@opim.wharton.upenn.edu

Classically, group decision and negotiation support systems support groups with human agents. Multiagent systems in AI involve artificial agents. Hybrid systems with both human and artificial agents are developing. Panelists will make opening remarks on these subjects followed by panel discussion with audience participation.

TC14 Computer Science/Applications

Contributed Session

Chair: Yosef S. Sherif, California State University, Dept. of MSIS/SBAE, Fullerton, CA 92834, jsherif@fullerton.edu

1) Sensitivity Analysis for Computer-Based Systems, ***Leila Meshkat***, University of Virginia, Dept. of Systems Eng., Charlottesville, VA 22903, leila@virginia.edu, ***Joanne B. Dugan***, ***Yacov Haimes***

An importance analysis is a sensitivity analysis, which identifies the weak areas of a system and which can be very valuable for making decisions at the design stage of a system. We have extended this sensitivity analysis to address the sensitivity of both the reliability and safety of a computer-based system with respect to the probability of failure and coverage parameter of the various components.

2) Approximately Optimal Elimination Orderings for Sparse Matrices, ***Wee-Liang Heng***, Environmental Systems Research Institute, 380 New York St., Redlands, CA 92373, wheng@esri.com

We consider the problem of reordering the rows and columns of a sparse matrix to minimize fill-in during factorization. This NP-complete problem can be approximately solved via recursion with suitable vertex separators. We present a novel extension of the recursive approach that is existentially optimal and empirically superior.

3) Metrics for Software Risk Management, ***Yosef S. Sherif***, California State University, Dept. of MSIS/SBAE, Fullerton, CA 92834, jsherif@fullerton.edu

We propose 2 metrics for software risk management. The first deals with the stability of requirements throughout software development and is known as the mission critical requirements stability risk metric. The second, the validation risk metric, deals with the incremental validation of requirements as the project progresses through the phase.

4) A New & Enhanced Interface Between Modeling Languages, ***Bjarni Kristjansson***, Maximal Software Inc., 2111 Wilson Blvd., Ste. 700, Arlington, VA 22201, info@maximal-usa.com, www.maximal-usa.com, ***Bjarni V. Halldorsson***

We are introducing a new standard format that can represent, in a single file, LP/MIPs, QPs and closed form NLPs. It has built-in function evaluators allowing for easy computation of derivatives in the optimzer, previously the bottleneck in NLP optimization interfacing. Thus, NLPs can now be stored and distributed in a standardized way just as easily as LPs.

TC15 Enabling Distribution Technologies in Supply Chain Management

Cluster: Supply Chain Management
Invited Session

Chair: M. Eric Johnson, Vanderbilt University, Owen Grad. Sch. of Mgmt., Nashville, TN 37203, eric.johnson@owen.vanderbilt.edu

1) The Future Meets the Past & the Challenge Ahead, ***Art St. Onge***, St. Onge & Co., 617 W Market St., York, PA 17404

The traditional supply chain delivers a mind boggling array of products to retail stores and manufacturers and retailers use broadcast marketing to attract customers. New business models are emerging, characterized by personalized service and products delivered to the consumer, bypassing traditional supply chains. We will describe the challenges and opportunities for research in this area.

2) Improving Crossdocking Operations in the LTL Trucking Industry: A Case Study, ***Kevin R. Gue***, Naval Postgraduate School, Dept. of Systems Mgmt., Monterey, CA 93943, krgue@nps.navy.mil, ***John Bartholdi, III***

We describe the use of material flow and congestion models to construct layouts for multi-purpose crossdocking operations in a freight terminal. We report our experiences from a recent implementation in Stockton, California, in which measured performance improved by 13%.

3) Design of a Fast-Pick Area for a Wholesale Distribution Warehouse, ***John Bartholdi, III***, Georgia Institute of Technology, Sch. of ISyE, Atlanta, GA 30332-0205, ***Steven T. Hackman***

To improve throughput a large distribution center we concentrated order-picking activity in one-fourth the space previously required and restocked this fast-pick area from reserve storage. The key problem: Which items to store in the fast-pick area and in what amounts?

4) Operation & Design of Split-Case Batch-Picking Systems, ***Russell D. Meller***, Auburn University, 308 Dunstan Hall, Dept. of ISE, Auburn, AL 36849, rmeller@eng.auburn, ***M. Eric Johnson***

To support continuous replenishment, retailers must make frequent small shipments to replenish small store inventories. Split-case batch-picking systems form the backbone of economical demand-pull replenishment. We develop an integrated model of the sorting and picking processes. Using our model, we examine the impact of order profile and system operation on system design.

TC16 Cellular Manufacturing: Material Flow Considerations

Cluster: Cellular Manufacturing
Invited Session

Chair: Sunderesh S. Heragu, RPI, DSES Dept., 110 8th St., Troy, NY 12180-3590, herags@rpi.edu

1) Algorithms for Production Flow Analysis, ***Shahrukh A. Irani***, Ohio State University, Dept. of IWSE, 210 Baker Systems Eng. Bldg., Columbus, OH 43210-1271, irani4@osu.edu

A traditional facility layout project accepts as-is the structure of the material flow network in the facility. However, use of production flow analysis, originally designed as a manual method for cellular layout design, could simplify the material flow network prior to facility layout...

2) Design of Distributed Layouts for Stochastic Environments, ***Saifallah Benjaafar***, University of Minnesota, Dept. of Mech. Eng., Minneapolis, MN 55455, saif@tc.umn.edu

We present a methodology for design of factory layouts with duplicate resources under variable demand and multiple products. We introduce procedures for simultaneous layout and flow allocation. We show that disaggregating functional departments and distributing them strategically throughout the plant floor can signficantly improve layout flexibility and performance in stochastic

environments.

3) A New Robustness Metric for Evaluating Alternative Layouts under Forecast Uncertainty, ***Bryan A. Norman***, University of Pittsburgh, 1048 Benedum Hall, Dept. of IE, Pittsburgh, PA 15261, banorman@pitt.edu, ***Alice E. Smith***

When forecasts of material handling costs are uncertain, optimizing facility layout depends on the attitude towards risk and the range of uncertainty considered. Given a forecast expected value and variance, the cost performance of a proposed layout can be calculated at each percentile of a Normal distribution. Integrating this yields a closed form metric that can be used in the optimization process or a posteriori to compare alternative layouts.

4) Flow Path Design in Cellular Manufacturing Systems, ***Srinivasan Rajagopalan***, RPI, Dept. of SDES, CII 5015, 110 8th St., Troy, NY 12180, rajags@rpi.edu, ***Sunderesh S. Heragu***

We discuss solving the cell layout and material flow network design problem jointly using the Lagrangian relaxation technique. It assumes that a discrete material handling device such as an AGV is used for material transportation.

TC17 New Bounding Techniques for the Traveling Salesman Problem

Cluster: Network Flows
Sponsor: Optimization Section
Sponsored Session
Chair: Dong X. Shaw, Purdue University, Sch of IE, West Lafayette, IN 47907, shawdx@ecn.purdue.edu

1) Primal-Dual Column Generation Approach for the Traveling Salesman Problem, ***Dong X. Shaw***, Purdue University, Sch of IE, West Lafayette, IN 47907, shawdx@ecn.purdue.edu

We present a columnwise formulation for the TSP, then we develop a new primal-dual column generation method to solve a linear program with an exponential number of columns. To the TSP, this linear program provides a lower bound equivalent to the 1-tree and 2-matching relaxation.

2) Computational Results for the Traveling Salesman Problem through Primal-Dual Column Generation, ***Hsuliang Chang***, Purdue University, Sch. of IE, W Lafayette, IN 47907, hsuliang@ecn.purdue.edu, ***Dong X. Shaw***

We present our computational results for the TSP based on a B&B method, where the lower bounds are obtained through the primal-dual column generation. Thus, we develop a branch-and-generate scheme to solve the TSP optimally. Many implementation details are provided and computational test data are presented.

3) The Asymmetric TSP: Using Generalizations of Disaggregated Miller- Tucker-Zemlin Constraints for Tightening a Multicommodity Flow Model, ***Luis Gouveia***, DEIO-CIO, Bloco C/2-Campo Grande, Cidade Universitaria, Lisboa, 1700, Portugal, lgouveia@fc.ul.pt, ***Jose Manuel Pires***

We show that a multicommodity flow (MCF) model can be aggregated into a node oriented model which is a disaggregation of the well-known Miller-Tucker-Zemlin model. This aggregation suggests an "augmented" MCF model with a tighter LP relaxation which implies an exponentially sized set of lifted circuit inequalities, some of which are known to be facet defining for the ATS polytope.

TC18 Cutting Plane & Column Generation Methods

Cluster: Integer Programming
Sponsor: Optimization Section
Sponsored Session
Chair: Wilbert E. Wilhelm, Texas A&M University, Dept. of IE, College Station, TX 77843-3131, wilhelm@tamu.edu

1) A Parallel Cutting Plane Solver, ***Eva K. Lee***, Georgia Institute of Technology, Sch. of ISyE, Atlanta, GA 30332-0205, evakylee@isye.gatech.edu

We describe a parallel implementation of a cutting plan solver which generates general knapsack cuts, clique inequalities and disjunctive cuts. Management of cuts on shared and distributed platforms will be highlighted. Computational results on difficult MIPLIB instances as well as instances arising from brain tumor treatment planning will be presented.

2) A Branch & Cut Algorithm for Solving an Intra-Ring Synchronous Optical Networks Design Problem, ***Youngho Lee***, Korea University, Dept. of IE, Sung-Buk Ku Anam Dong 5-1, Seoul, Korea, ***Hanif D. Sherali***

We consider an intra-ring design problem of synchronous optical networks (SONET). The problem is to find an optimal clustering of traffic demands such that the total number of nodes is minimized while satisfying the capacity and the node cardinality constraints. We develop a new B&C method along with preprocessing routines.

3) Column Generation for Crew Pairing using Compact Storage Schemes, ***Tina L. Shaw***, Georgia Institute of Technology, School of ISyE, 765 Ferst Dr., Atlanta, GA 30332, tshaw@isye.gatech.edu, ***Ellis L. Johnson***

In a previous work, column generation was performed as part of a primal-dual subproblem simplex method over a compact storage scheme. Here, we expand the compact storage scheme for the crew pairing problem by incorporating the notion of hub-to-hub strings, i.e. sequences of legs between busy stations, and by working with the weekly crew pairing problem to include frequency...

4) An Application of Branch & Price to Upgrade High-Tech Products Optimally, Maintaining Competitiveness over the Life Cycle, ***Narameth Nananukul***, Texas A&M University, Dept. of IE, College Station, TX 77843-3131, ***Purush Damodaran***, ***Wilbert E. Wilhelm***

As technology evolves, high-tech products must be upgraded to maintain competitiveness and, thus, profit margins. We address the problem of prescribing when to upgrade and what new features to incorporate in each upgrade. A solution method based on B&P is devised and computational experience is reported.

TC19 Production & Scheduling II

Contributed Session
Chair: Hossein H. Soroush, Kuwait University, Dept. of Stats. & OR, PO Box 5969, Safat, 13060, Kuwait, hsoroush@kuc01.kuniv.edu.kw

1) Developing Pouring & Molding Schedules that Reduce WIP in Steel Foundries, ***Timothy P. Van Voorhis***, Iowa State University, IMSE Dept., 205 Engineering Annex, Ames, IA 50010, tvanvoor@iastate.edu, http://www.public.iastate.edu/~tvanvoor

An integer programming formulation is developed for scheduling the molding and pouring operations in steel foundries. The goal of this approach is to reduce WIP and alleviate bottlenecks by considering the impact of the molding and pouring schedule on downstream operations.

2) In-Line Equipment & Yield Information for Maintenance Scheduling/ Dispatching in a Multi-Product/Multi-Machine Production System, ***Thomas W. Sloan***, University of Miami, Sch. of Bus. Admin., Dept. of Mgmt., Coral Gables, FL 33124-9145, tsloan@sba.miami.edu, ***J. George Shanthikumar***

We develop a model to schedule production and equipment maintenance of a multi-product, multi-station system in which equipment conditions affect yield. Using a simulation model, we show that policies which are optimal for the analogous single-machine problem provide substantial improvements over policies that ignore equipment condition, i.e., FCFS.

3) A Scheduling System for a Lubricant Production Plant, ***Joseph R. Litko***, Profit Point, Inc., 713 Dover Rd., Wynnewood, PA 19096, jlitko@worldnet.att.net, ***Alan J. Kosansky***

We present a model which supports decisions in a lubricants production business. It interfaces with existing information systems, schedules daily bulk loading, an provides the blend scheduler with information on all future package and bulk requirements, raw materials availablity, and inventory costs to support production lot-sizing decisions.

4) Single Machine Scheduling with Bivariate Cost Functions, ***Hossein H. Soroush***, Kuwait University, Dept. of Stats. & OR, PO Box 5969, Safat, 13060, Kuwait, hsoroush@kuc01.kuniv.edu.kw

We study the problem of sequencing jobs on a single machine where each job has 2 processing attributes. The objective is to find an optimal sequence which minimizes a bivariate cost function of sequence attributes. Exact solution approaches are developed for some special bivariate cost functions.

TC20 Scheduling & Pricing in Deregulated Markets

Cluster: Energy
Sponsor: Section on Energy, Natural Resources & Environment/Financial Services Section
Sponsored Session
Chair: John R. Birge, University of Michigan, 1877 IOE, 1205 Beal Ave., Ann Arbor, MI 48109-2117, jbirge@umich.edu, http://www-personal.engin.umich.edu/~jbirge

1) Modeling Electricity Markets, ***Alfredo Garcia***, Fundesarollo,

Via 40 #36-135 local 6, Barranquilla, Colombia, fundesarrollo@rednet.net.co

We study computational issues associated with a stochastic dynamic game model of hydrothermal electricity markets. An application to energy contracting evaluation is presented in the context of the Colombian market.

2) Auctioning Complementary Objects, ***Wedad Elmaghraby***, University of California, Energy Inst., 2539 Channing Wy #5180, Berkeley, CA 94720, wood@cimsim.berkeley.edu

Auctions are used widely for the sale of various objects. Often, the auctioned objects have complementary values, that is, the value of owning one object is dependent upon the ownership of another. An interested area where complementary valuation arises is in electricity auctions. I address the nature of this complementarity and possible auction designs to help attain an efficient allocation.

3) Building Conditional Distributions for Electricity Prices, ***Blake Johnson***, Stanford University, Terman Eng. Bldg., Office 327, Stanford, CA 94305-4023, blakej@stanford.edu

Since electricity is non-storable, its price is determined by prevailing supply and demand conditions. Thus, the forward price distribution for electricity cannot be derived with the cost-of-carry approach. Electricity forward price distributions should be conditioned on information about forward supply and demand conditions. We discuss methods for constructing conditional distribution.

4) Finding Equilibrium Values in a Sealed Bid Energy Market, ***Chonawee Supatgiat***, University of Michigan, Dept. of IOE, 1205 Beal Ave., Ann Arbor, MI 48105-2119, chonawee@engin.umich.edu, ***Rachel Zhang***, ***John R. Birge***

We consider an open energy market where each bidder does not know the other bidders' bids. All dispatched units are sold at the market-clearing price. Under the assumption of market stability, the equilibrium value is compared with the equilibrium value in a non-sealed bid market.

TC21 Numerical Applied Probability Methods Applied to Telecommunications

Sponsor: Technical Section on Telecommunications/Applied Probability Section
Sponsored Session

Chair: L. D. Servi, GTE Laboratories, 40 Sylvan Rd., Waltham, MA 02254, lds0@gte.com

1) withdrawn - author request of 4/3, ***Attahiru Sule Alfa***, University of Manitoba, Dept. of MIE, Winnipeg, Manitoba, R3T 2N2, Canada, alfa@cc.umanitoba.ca, ***Jungong Xue***, ***Qiang Ye***

2) Tandem Queues Solved by Eigenvalues, ***Winfried K. Grassmann***, University of Saskatchewan, Dept. of Comp. Sci., 57 Campus Dr., Saskatoon, SK, S7N 5A9, Canada, grassman@cs.usask.ca, ***Steve Drekic***

3) New Non-Iterative Methods to Solving Multi-Dimensional Birth-Death Equations Applied to Wireless Communication, ***L. D. Servi***, GTE Laboratories, 40 Sylvan Rd., Waltham, MA 02254, lds0@gte.com

TC22 OR/MS in Forestry: Wildlife Conservation

Cluster: OR/MS in Forestry
Sponsor: Section on Energy, Natural Resources & Environment
Sponsored Session

Chair: Robert G. Haight, USDA Forest Service, N. Central Res. Station, 1992 Folwell Ave., St. Paul, MN 55108, haigh003@tc.umn.edu

1) A Modeling Approach to Protect a Species: The Case of the San Joaquin Kit Fox, ***Richard Church***, University of California, Ntl Ctr for Ecol Anal & Synth., 735 State St., Ste. 300, Santa Barbara, CA 93101, church@geog.ucsb.edu, ***R.A. Gerrard***, ***M. Gilpin***, ***P. Stine***

We present a methodology that has been developed to focus protection efforts on specific targeted species. The process includes a special optimization model for designing habitat ranges to be protected. Results of this modeling approach applied to two Northern California counties will be discussed.

2) Testing Area-Based Forest Management Planning Constraints & Solutions, ***Marc McDill***, Pennsylvania State University, 214B Ferguson Bldg., Sch. of Forest Resources, University Park, IL 16802-4301, mem14@psu.edu, ***Janis Braze***

Many approaches have been proposed for formulating and solving large, mixed integer programming problems for area-based forest planning. To facilitate tests of algorithm performance, we developed MAKELAND, a program that randomly generates problems with varying numbers and shapes of stands.

3) Computer Simulation of Wolf Control Strategies in Minnesota, ***Robert G. Haight***, USDA Forest Service, N. Central Res. Station, 1992 Folwell Ave., St. Paul, MN 55108, haigh003@tc.umn.edu, ***Laurel E. Travis***

To balance conflicting public demands for wolf protection and control, state agencies needed information on the potential impacts of wolf management strategies. We used a stochastic model of wolf dynamics and dispersal to estimate wolf mortality and livestock depredation under preventive and reactive wolf control strategies.

TC23 Innovation Networks

Sponsor: Technology Management Section
Sponsored Session

Chair: Michael T. Pich, INSEAD, Boulevard de Constance, Fontainebleau Cedex, 77305, France, michael.pich@insead.fr

1) Collaborative Learning in Alliances: University Industry Interactions, ***Suzanne Stout***, INSEAD, Boulevard de Constance, Fontainebleau Cedex, 77305, France, skstout@ibm.net, ***David McKendrick***, ***Michael T. Pich***

2) Innovation Networks, ***Michael T. Pich***, INSEAD, Boulevard de Constance, Fontainebleau Cedex, 77305, France, michael.pich@insead.fr, ***Suzanne Stout***, ***David McKendrick***

3) Leveraging Supplier Innovation, ***Tim Laseter***, University of Virginia, Darden Grad. Sch. of Bus., PO Box 6550, Charlottesville, VA 22906, lasetertimothy@bah.com

TC24 Service Industry Applications I

Contributed Session

Chair: Sal R. Agnihothri, Binghamton University, School of Mgmt., Binghamton, NY 13902-6015, agni@binghamton.edu http://som.binghamton.edu/faculty.agnihothri.html

1) Assessing Employee Satisfaction in Service Firms: An Example in Higher Education, ***Dennis F. Mathaisel***, Babson College, Babson Hall, Babson Park, MA 02157, dfxm@mit.edu, ***Clare L. Comm***

We define employee satisfaction as the difference between perceptions of work and expectations of work. In the SERVQUAL model, quality is defined as "the difference between customer perceptions and expectations." We use these definitions and the SERVQUAL model to evaluate employee satisfaction in higher education.

2) Impact of Service Quality & Operating Efficiency on Financial Performance: A Longitudinal Analysis of Domestic US Airline Industry, ***Nikos Tsikriktsis***, Boston University, School of Mgmt., 595 Commonwealth Ave., Boston, MA 02215, tsiks@bu.edu, ***Michael A. Lapre***

How do service quality and operating efficiency impact financial performance? We investigate this question in the US domestic airline industry. The longitudinal, quarterly data concern all major airlines classified as such by DOT and dates back to the introduction of service data imposed by DOT.

3) Classifying Field Services to Gain Operational Insights, ***Sal R. Agnihothri***, Binghamton University, School of Mgmt., Binghamton, NY 13902-6015, agni@binghamton.edu http://som.binghamton.edu/faculty.agnihothri.html, ***Donald E. Simmons***

We define field service as being service provided at a customer's site. We explain the distinction between field service and facility-based service. We provide a framework to classify field service operations and explain implications of this for designing and managing field services.

TC25 Dynamic Traffic Assignment I

Sponsor: Transportation Science Section
Sponsored Session

Chair: Ismail Chabini, MIT, Civil & Environ. Eng., 77 Mass Ave., Rm. 126377, Cambridge, MA 02139, chabini@mit.edu

1) Analytical Properties of Dynamic Network Loading Operators, ***Ding Zhang***, SUNY, School of Bus., Oswego, NY 13126-2529, zhang@oswego.edu, ***Jiahao Wu***, ***Michael A. Florian***

We show that in a dynamic transportation network, the time-dependent arc traffic volumes, arc travel times, and path travel times continuously depend on the time-dependent path departure rates, under the arc FIFO assumption. These results serve for the purpose of sensitivity analysis of the network loading operator and for the study of the existence of dynamic traffic equilibrium.

2) Stability Issues for On-Line Traffic Assignment Update Heuristics in Networks with Advanced Information Systems, ***Srinivas Peeta***, Purdue University, Sch. of Civil Eng., West Lafayette, IN 47907-1284, ***Ta-Hui Yang***

The stability aspects of on-line adjustment methods for providing effective route guidance are investigated within a control framework. Some general perspectives of stability in the on-line context are discussed.

3) Solving a Nonadditive Traffic Equilibrium Problem with Multiple Value of Time Functions, ***Kelley Scott***, Princeton University, Dept. of Civil Eng. & OR, Princeton, NJ 08544, kscott@dragon.princeton.edu, ***David Bernstein***

A variety of formulations and related solution algorithms exist for finding the user equilibrium flow through a transportation network. However, when path costs are nonadditive, the standard solution approaches for this asymmetric TEP may not be sufficient. We present methods for solving a nonadditive TEP formulated as a variational inequality problem, along with initial numerical results...

4) The Dynamic Network Design Problem with Stochastic Demand, ***S. Travis Waller***, Northwestern University, Dept. of ISE, 2145 Sheridan Rd., Tech. Inst., Evanston, IL 60208, travis@transcivil.nwu.edu, ***Athanasis Ziliaskopoulos***

We discuss the continuous network design problem under the conditions of system optimum DTA where the origin-destination time-dependant demands are random variables with known probability distributions. The resulting problem is a 2-stage problem where the network modification takes place in the first stage, DTA in the second.

TC26 Simulation-Based Objectives for Optimal Experimental Design

Sponsor: Quality, Statistics & Reliability Section
Sponsored Session
Chair: Theodore T. Allen, Ohio State University, 210 Baker Systems, Dept. ISE, 1971 Neil Ave., Columbus, OH 43210-1271, allen.515@osu.edu, www-iwse.eng.ohio.state.edu/~facultyp/allen.htm

1) Multi-Model Expected Integrated Mean Squared Error Experimental Design, ***Liyang Yu***, Ohio State University, 210 Baker Systems, Dept. ISE, 1971 Neil Ave., Columbus, OH 43210, yu.149@osu.edu

The flexibility of using a simulation as the objective function for optimal experimental design permits relatively realistic prior assumptions and non-trivial decision-rules about which model(s) will be fit after the experiment. The resulting stochastically optimal methods achieve large reductions of the expected IMSE compared with Box Behnkin designs.

2) A Test Bed for Comparing Experimental Design Strategies, ***Bill McDaniel***, Northwestern University, 2225 N Campus Dr., MLSB 3057, Evanston, IL 60208-3119, bmcdaniel@nwu.edu

A response surface is the function corresponding to the true response of a dependent variable over given ranges of independent variables. We have created a test bed of response surfaces for testing experimental design methodologies, which takes user input and randomly generates response surfaces with characteristics desired by the user.

3) Maximum Profit Experimental Design for Engineering Design Decision-Making, ***Mikhail Bernshteyn***, Ohio State University, 210 Baker Systems, Dept. ISE, 1971 Neil Ave., Columbus, OH 43210, bernshteyn_1@hotmail.com

Decisions related to planned experiments have been largely based on the assumed properties of the attributes being modeled and not on profitability considerations. We describe how simulation-based objectives were used to derive experimental designs and modeling/optimization procedures that optimize expected engineering profits in general contexts.

4) Improving Taguchi Methods using Simulation-Based Optimal Experimental Design, ***Theodore T. Allen***, Ohio State University, 210 Baker Systems, Dept. ISE, 1971 Neil Ave., Columbus, OH 43210-1271, allen.515@osu.edu, www-iwse.eng.ohio.state.edu/~facultyp/allen.htm

Taguchi has developed static and dynamic Taguchi methods. Several methods are proposed that use simulation-based optimization methods to improve the ability of each type of Taguchi methods to achieve its stated goals, without altering the implied assumptions. The methods are compared with split plot and compound designs.

TC27 Stochastic Network Control I

Sponsor: Applied Probability Society
Sponsored Session
Chair: Kimberly Wasserman, University of Michigan, EECS Dept., 1301 Beal Ave., Ann Arbor, MI 48109-2122, wass@eecs.umich.edu

1) Traffic Engineering in Data Networks, ***Debasis Mitra***, Lucent Technology, AT&T Bell Labs., Room 2C-125, Murray Hill, NJ 07974

We address the resource allocation and routing problem faced by a service provider with service level agreements with customers to carry their multiserve traffic over its infrastructure. This problem arises in various scales and forms from the perspective of a carrier's carrier at one end of the spectrum to ISPs offering network management to outsourcing enterprises at the other end...

2) CDMA Mobile Networks Carrying High Speed Data, ***Philip Whiting***, Lucent Technology, PO Box 636, 600 Mountain Ave., Murray Hill, NJ 07974

Next generation CDMA wireless networks are expected to carry high speed data as well as voice. The usual statistical averaging approach then fails and a more carefully managed system must be constructed. If data users are delay tolerant then scheduling of data transmissions becomes an attractive approach. Using mathematical models we examine this alongside a number of alternatives.

3) Resource Allocation in CDMA Data Networks, ***Kimberly Wasserman***, University of Michigan, EECS Dept., 1301 Beal Ave., Ann Arbor, MI 48109-2122, wass@eecs.umich.edu

High spectral efficiency is a critically important objective in the design of CDMA data networks, but is difficult to achieve. We present various mechanisms to drastically improve the spectral efficiency of CDMA data networks.

TC28 Supply Chain Management I

Sponsor: Section on Logistics
Sponsored Session
Chair: Ton G. de Kok, Eindhoven University of Technology, Sch. of Tech. Mgmt., Paviljoen F4, PO Box 513, Eindhoven, 5600 MB, The Netherlands

1) Remanufacturing in a Make-to-Order Environment: Effect of Service Level on Production Mix & Profit, ***Gilvan C. Souza***, University of North Carolina, Kenan-Flagler Bus. Sch., Chapel Hill, NC 27599, ***Michael E. Ketzenberg***

Consider a firm operating in a make-to-order environment. The firm has the possibility of meeting demand with either remanufactured or new products. We derive the optimal production mix based on both products' production costs and gross margins such that the average order lead-time cannot exceed a specific value.

2) Inventory Rationining in an (s,Q) Inventory Model with Lost Sales & Two Demand Classes, ***Philip Melchiors***, University of Aarhus, Dept. of OR, Ny Munkegade Bldg., Aarhus, 8000 C, Denmark, philip@imf.au.dk, ***Rommert Dekker***, ***M. J. Kleijn***

We analyze a continuous review (s,Q) model with lost sales and 2 demand classes. A so-called critical level policy is applied to ration the inventory among the 2 demand classes. A simple optimization procedure is presented. We compare the optimal rationing policy with a standard (s,Q) policy.

3) On the Effect of a Break Quantity on the Demand Processes in Inventory Systems, ***M. J. Kleijn***, Erasmus University, Dept. of Econometrics & OR, PO Box 1728, Rotterdam, 3000 DR, The Netherlands, ***Hans B. Frenk***, ***Rommert Dekker***

A break quantity splits a demand stream into large and small orders. We consider the effect of the break quantity on the coefficient of variation of the truncated order size distribution. We indicate for which order distributions this coefficient is lowered and determine the optimal break quantity.

4) Cost Optimization under Internal Service Level Constraints: Supply Chain View vs. Supply Link View, ***Ton G. de Kok***, Eindhoven University of Technology, Sch. of Tech. Mgmt., Paviljoen F4, PO Box 513, Eindhoven, 5600 MB, The Netherlands

It is often assumed that a powerful link in the chain can enforce integrated control on its suppliers/customers. However, suppliers/customers usually have more customers/suppliers, respectively, than the powerful link. Quantitative analysis using multi-echelon models sheds light on this issue, yielding surprising

results.

TC29 The Use of Information in Managing Supply Chains

Sponsor: Manufacturing & Service Operations Management Society Sponsored Session

Chair: Leroy B. Schwarz, Purdue University, Krannert School, West Lafayette, IN 47907, lee@mgmt.purdue.edu

1) Assessing the Value of Customer-Order Information: An Information/Control/Buffer Portfolio Perspective, ***Leroy B. Schwarz***, Purdue University, Krannert School, West Lafayette, IN 47907, lee@mgmt.purdue.edu, ***Nicholas Petruzzi, Kwenang Wee***

We examine the value of customer-order information in managing inventories when customer orders are subject to possible cancellation. The analysis examines differences in the profit-maximizing inventory policy under 3 scenarios: "no-information", "cancellation" and "reservation" and compares their per-period expected profits.

2) Supply Contract Negotiations in a Capacity-Constrained Supplier Oligopoly, ***Elizabeth C. Junqueira***, University of California, Dept. of IE/OR, 4135 Etcheverry Hall, Berkeley, CA 94720-1777, junqueir@ieor.berkeley.edu, ***J. George Shanthikumar, Candace A. Yano***

We model the problem of supplier-capacity allocation among multiple buyers, when each contract specifies bounds of per-period purchase quantities. We characterize the structural properties of the optimal allocation scheme. We quantify the cost of offering more flexibility to buyers, which is then used in the supplier's contract negotiation decisions.

3) Supply Chain Inventory Management & the Value of Shared Information, ***Gerard Cachon***, Duke University, Fuqua Sch. of Business, Box 90120, Durham, NC 27708-0120, gpc@mail.duke.edu, ***Marshall Fisher***

In traditional supply chain inventory management orders are the only information firms exchange, but IT now allows firms to share demand and inventory data. We study the value of information sharing in a 1 supplier, N identical retailer model with stochastic consumer demand. Three inventory policies are developed, corresponding to 3 information sharing levels. A lower bound over all feasible policies is also developed.

4) Performance-Based Incentives in Decentralized Production Systems: The Markovian Principal-Agent Framework, ***Erica Plambeck***, Stanford University, Dept. of EES & OR, Stanford, CA 94305, elp@leland.stanford.edu, ***Stefanos Zenios***

We consider the following generalization of the repeated principal-agent problem: an agent controls a Markovian production technology and a principal receives state-dependent rewards from this technology. The principal cannot monitor the agent's controls and she has to determine an incentive compensation scheme that would reward the agent for his unobserved actions...

TC30 Manufacturing Logistics Research II

Sponsor: Manufacturing & Service Operations Management Society Sponsored Session

Chair: David Wu, Lehigh University, Mfg. Logistics Inst., Dept. of IMSE, Mohler Lab, Bethlehem, PA 18015, sdw1@lehigh.edu

1) Tool Capacity Planning for Semiconductor Fabrication Facilities under Demand Uncertainty, ***Jayashankar Swaminathan***, University of California, Haas Sch. of Bus., Berkeley, CA 94720, msj@haas.berkeley.edu

The rate of change in products and technology makes it difficult for manufacturers in the semiconductor industry to have a good estimate of future tool requirements. Further, manufacturers experience a long lead time while procuring these tools. We model the tool capacity planning problem under uncertainty in demand and provide heuristics to find efficient tool procurement.

2) Manufacturing Batch Size for a Supply Chain Model, ***Gyana Parija***, IBM Corporation, Optimization Group, 522 South Rd., Poughkeepsie, NY 12601, parija@us.ibm.com, ***Bhaba Sarker***

Both manufacturing companies and finished goods customers need to operate in a harmonic logistics in order to keep a production-inventory system operative at minimal cost. A model is devised to serve as a structural bridge to efficiently balance the operations between the manufacturing and customer organizations. The operational mechanics is illustrated with examples.

3) An Analytical Tool to Support the Selection of Partners from Organizational Webs in Agile Manufacturing, ***Rakesh Nagi***, SUNY, 342 Bell Hall, Box 602050, Buffalo, NY 14260, nagi@eng.buffalo.edu www.acsubuffalo.edu/~nagi, ***Ana Maria Sarmiento***

The problem of the organizational web's coordinator in Agile Manufacturing is to select the best combination of partners to form virtual enterprises. We formulate this problem as a mixed integer linear program with an objective to minimize the integrated operational costs. A heuristic solution is presented along with a numerical study.

4) Constructing Scenario Trees using Leading Indicators, ***Mary J. Meixell***, Lehigh University, Mfg. Logistics Inst., 200 W. Packer Ave., Bethlehem, PA 18015-1582, mjm2@lehigh.edu, ***David Wu***

A "leading indicator" often exists in demand analysis, which predicts the trend of a broader set. We develop a Bayesian method which defines a scenario tree using leading indicators. Using a case from semiconductor manufacturing we demonstrate the effectiveness of this modeling method in a stochastic program.

TC31 Inventory Models II

Contributed Session

Chair: Barry A. Pasternack, California State University, MSIS Dept., LH-540, 800 N State College Blvd., Fullerton, CA 92834, bpasternack@fullerton.edu

1) Echelon Inventory-Based Single Stage Cost for Inventory Control, ***Carlos F. Bispo***, Technical University of Lisbon, Inst. Superior Tecnico, Av. Rovisco Pais, Lisbon, 1049-001, Portugal, cfb@isr.ist.utl.pt www.isr.ist.utl.pt/~cfb, ***Jose A. Moreira***

We propose an alternative cost accounting function for inventory control on a make-to-stock setting. The results available for a 2-station tandem system, producing a single product, show that the optimal policies approach a multi-echelon base stock structure. Service levels and regeneration intervals are better when compared with those achieved with the traditional cost function.

2) Advance Order Information & Pull-Type Manufacturing Control Mechanisms, ***Fikri Karaesmen***, Universite Pierre et Marie Curie, LIP6-CNRS, 4 Place Jussieu, Paris, 75252, France, fikri.karaesmen@lip6.fr, ***John A. Buzacott, Yves P. Dallery***

We consider pull-type control mechanisms for multi-stage manufacturing systems. These mechanisms are usually defined to react to actual realizations of demand. We study how pull-type control mechanisms can utilize and benefit from advance information on demand.

3) withdrawn - author request of 4/7, ***Eylem Tekin***, Texas A&M University, IE Graduate Studies, College Station, TX 77843-3131, e0t9318@unix.tamu.edu, ***Emre Berk, Ulku Gurler***

4) The Capacitated Newsboy Problem, ***Barry A. Pasternack***, California State University, MSIS Dept., LH-540, 800 N State College Blvd., Fullerton, CA 92834, bpasternack@fullerton.edu

We consider a newsboy problem in which a vendor has limited funds and can either purchase the product being sold and/or act as a sales agent for the manufacturer. We determine optimal strategies and discuss implications to the video rental industry.

TC32 Data Envelopment Analysis II

Contributed Session

Chair: Moez Hababou, York University, Schulich Sch. of Bus., Rm. 344, 4700 Keele St., North York, Ontario, M6J 3P3, Canada, mhababou@bus.yorku.ca

1) DEA-Based Testimony in an Electric Rate Case using a New Technique to Adjust Inputs for Site Characteristics, ***Thomas R. Sexton***, SUNY, Harriman Sch. Mgmt. & Policy, Rm. 306, Stony Brook, NY 11794-3775, tsexton@notes.cc.sunysb.edu, ***Richard Silkman***

DEA is used to assess the efficiency of a large electric utility in preparation of testimony in a rate case. The inputs are adjusted independently to allow for variation across utilities in site characteristics, i.e., customer mix and customer density, that can influence efficiency but which are beyond management control.

2) Clastering Properties of DEA & their Applications, ***Alexander Y. Vaninsky***, Netanya Academic College, 16 Kibutz Galuyot St., Netanya, 42100, Israel, vaninsky@netanya.ac.il

It is shown that the ability of DEA to discriminate efficient objects from inefficient ones may be used for finding economic indicators that produce the same division. These indicators may be considered as factors of efficiency and used for its monitoring and managing. Examples from financial areas are revealed.

3) Measuring the Efficiency of Non-Volume Related Activities in Bank Branches, ***Moez Hababou***, York University, Schulich Sch. of Bus., Rm. 344, 4700 Keele St., North York, Ontario, M6J 3P3, Canada, mhababou@bus.yorku.ca, ***Wade D. Cook, Hans Tuenter***

Cook, Hababou & Tuenter (1998) proposed a model to assess both sales and service efficiencies of bank branches. A weakness of this model is that it does not account for unsuccessful attempts when assessing sales efficiency and considers only volume-related activities that take place after a successful sale of a financial product. We propose a modified model that also considers non-volume-related activities that occur before the actual sale...

4) withdrawn - author request of 3/30, ***Jae H. Min***, University of Cambridge, The Judge Inst. of Mgmt. Sci., Trumpington St., Cambridge, CB2 1AG, UK, jhm36@cam.ac.uk, ***Jin H. Kim***

TC33 Statistics: Goodness of Fit Tests

Contributed Session

Chair: John S. Crown, AFIT, AFIT/ENC, 2950 P St., WPAFB, OH 45433, jcrown@afit.af.mil

1) A New Sequential Goodness-of-Fit Test for the Weibull Based on Skewness & Kurtosis, ***J. O. Miller***, Air Force Institute of Technology, AFIT/ENS, 2950 P St., WPAFB, OH 45433, jmiller@afit.af.mil, ***Jonathan C. Clough***, ***John S. Crown***

We develop and evaluate a new sequential goodness-of-fit test for the 3-parameter Weibull distribution with a known shape that delivers power comparable to popular procedures while dramatically reducing computational requirements. The new procedure consists of 2 distinct tests, using only the sample skewness and sample kurtosis as test statistics...

2) A New Sequential Goodness-of-Fit Test for the Three-Parameter Gamma Distribution, ***Albert H. Moore***, Air Force Institute of Technology, ENC 2950 P St., WPAFB, OH 4543307765, ***Chil-ho Park***, ***John S. Crown***, ***J. O. Miller***

We develop and evaluate a new sequential goodness-of-fit test for the 3-parameter gamma distribution with a known shape that delivers power comparable to popular procedures while dramatically reducing computational requirements. The new procedure consists of 2 distinct tests, using only the sample skewness and sample kurtosis as test statistics...

3) Modified Goodness-of-Fit Tests for the Weibull Distribution using Normalized Spacings, ***John S. Crown***, AFIT, AFIT/ENC, 2950 P St., WPAFB, OH 45433, jcrown@afit.af.mil, ***Eric W. Frisco***, ***Dennis C. Dietz***

Two new goodness-of-fit tests are developed for the 3-parameter Weibull distribution with known shape parameters. These are easily adapted for censored data. This is accomplished by employing the Anderson-Darling and Cramer-von Mises statistics based on normalized spacings of the sample data. Critical values for the new test statistics are obtained by Monte Carlo simulations with up to 40% censoring from the left and/or right.

TC34 Managerial Accounting

Sponsor: **Accounting, Auditing & Tax Section**
Sponsored Session

Chair: Pradyot K. Sen, SUNY-Buffalo, 366 Jacobs Ctr., Buffalo, NY 14260-4000, pksen@buffalo.edu

1) The Impact of Targets on Performance: Archival Evidence from a Multi-Unit Firm, ***J. Daniel Daly***, Boston College, Carroll Sch. of Mgmt., Chestnut Hill, MA 02467, dalyjj@bc.edu

We investigate the relation between targets and manager performance using archival data from several facilities of a nursing home management firm. The results support the hypotheses that the relationship is non-monotonic and that the target that prompts the highest level of performance is one that is reached less than 50% of the time.

2) Relative Performance of Incentive Mechanisms in Delegated Investments: A Computational Study, ***T. S. Raghu***, Arizona State University, Sch. of Acct. & Info. Mgmt., Box 873606, Tempe, AZ 85287-3606, raghu@acsu.buffalo edu, ***H. R. Rao***, ***Pradyot K. Sen***

We investigate the relative performance of different incentive mechanisms for investment managers in a delegated investments scenario. Both behavior and outcome-based contracts are examined. A computational model of the scenario is simulated under different parametric settings. Parametric inputs to the model include extent of market uncertainty, risk aversion, salary and commission levels...

3) Accounting & Capacity Management in a Sequential Production Setting with Uncertain Demands, ***Bin Srinidhi***, Rutgers-State University of New Jersey, 11 Millman Dr., E. Brunswick, NJ 08816, srinidhi@andromeda.rutgers.edu, ***Suresh Radhakrishnan***

We examine capacity planning and input rate choice in a sequential 2-stage, 1-period and in a 2-period, 1-stage model with changing demand rates. The holding and opportunity costs of stock-outs are measured using conventional accounting systems. It is shown that the optimal capacity of downstream station is generally higher...

TC35 Panel: Re-Inventing the Management Science Curriculum

Sponsor: **Forum on Education**
Sponsored Session

Chair: Cliff T. Ragsdale, Virginia Polytech Institute, Dept. of MS & IT, Pamplin College of Bus., Blacksburg, VA 24061-0235, crags@vt.edu

1) Panel: Re-Inventing the Management Science Curriculum, ***Douglas J. Morrice***, University of Texas, MSIS Dept., CBA 5.202, Austin, TX 78712-1175, morrice@mail.utexas.edu, ***S. Christian Albright***, Indiana University, Dept. of Op. & Dec. Tech., Kelley Sch. of Bus., Bloomington, IN 47405, albright@indiana.edu, ***Richard H. McClure***, Miami University, Dept. of Dec. Sci. & MIS, Oxford, OH 45056, mcclurrh@miami.edu, ***Cliff T. Ragsdale***, Virginia Polytech Institute, Dept. of MS & IT, Pamplin College of Bus., Blacksburg, VA 24061-0235, crags@vt.edu

Management science education is in crisis at many schools while thriving at others. This session features panelists from a variety of schools where MS courses are growing in popularity and demand. Successful curriculum changes in these programs will be described along with promising strategies for future success.

TC37 Software Demonstration V

Chair: **To be announced**

1) Software Demonstration: Optimization Modeling with LINDO, LINGO and What'sBest!, ***Mark Wiley***, LINDO Systems, Inc., 1415 N Dayton St., Chicago, IL 60622, mwiley@lindo.com

LINDO Systems will highlight the recent speed enhancement to our LP solver and demonstrate our line of popular mathematical modeling packages including new releases of LINDO, our power linear and integer programming engine, LINGO, our integrated modeling language with linear/nonlinear solvers and What'sBest!, our large scale linear/nonlinear spreadsheet solver.

2) Software Demonstration: Dash Optimization, Inc., ***Sebastian Ceria***, Columbia University, Sch. of Business, Computer OR Ctr., New York, NY 10027, sebas@cumparsita.gsb.columbia.edu http://www.columbia.edu/~sc244

No abstract supplied.

Tuesday 14:45-16:15

TD01 Perspectives on MHT Education II

Cluster: **MHT as a Health Profession**
Invited Session

Chair: Tad Foster, Indiana State University, Sch. of Technology, 6th & Cherry St., Terre Haute, IN 47809

Co-Chair: Tom Harden, Eastern Michigan University, Coll. of Tech., Ypsilanti, MI 48197. Darryl Davis

1) Technology Education & Management of Health Care Technology, ***Tad Foster***, Indiana State University, Sch. of Technology, 6th & Cherry St., Terre Haute, IN 47809

2) PC-Based Simulator for Education & Testing, ***N. Ty Smith***, University of California, Dept. of Anesthesiology, 760 Armada Terrace, San Diego, CA 92106, ***Kenton Starko***, ***Terrence Davidson***

3) The Reintegration of a Surgery Residency using a Web-Based Intranet, ***Orlando Morejon***, University of Connecticut, Health Ctr., Farmington, CT 06030, ***Joseph Civetta***, ***Patricia Reilly***, ***Igor Serebriakov***

Our residency program developed a web-based intranet to provide interactive evaluation forms, a surgical procedure recorder, board-type review tests, rotation schedules, bulletin boards and links to other useful websites. The electronic system provides more efficient and effective ways of gathering and distributing information than traditional paper and conference methods marked by poor compliance and attendance.

TD04 Topics in Combinatorial Optimization

Cluster: **Global Optimization**
Sponsored Session

Chair: Dukwon Kim, University of Florida, Ctr. for Applied Optimization, 303 Weil Hall, ISE Dept., Gainesville, FL 32611, dkim@cao.ise.ufl.edu

1) Survivable Network Design Problem With Hop Limits, ***Byung Hyun Jun***, Kyung Hee University, Comp. Eng. Dept., Kee-Heung-Eup, Yong-In-Si, Kyung-Ki-Do, 449-701, Korea, ***Chi-Geun Han***

The SNDPH is defined: for a given G(V,E), survivability constraints, and hop limit constraints for each pair of nodes, find a set of edges E' that satisfy the constraints. In the telecommunications, each node on a path between 2 terminals increases time delay and, hence, for each pair of nodes, there must exist paths that satisfy the survivability constraints and hop limits.

2) On the Use of Variance in Complexity Measures for the Quadratic Assignment Problem, ***Paulo O. B. Netto***, COPPE/UFRJ, Progama de Engenharia, de Producao, Rio de Janeiro, Brazil, boaventu@pep.ufrj.br, ***Nair Maria M. de Abreu***, ***Tania Maia Querido***, ***Elisabeth F. Gouvea***

The general QAP is NP-hard from a theoretical point of view. However, in practice, there are polynomially solvable and provably hard cases of this problem. We present a cost variance function for instances that allows a discussion about perspectives of easy and hard versions for the QAP.

3) An Overview of Mean Field Theory from Statistical Physics in Combinatorial Optimization, ***Theodore B. Trafalis***, University of Oklahoma, Sch. of IE, 202 W. Boyd, Rm. 124, Norman, OK 73019, trafalis@mailhost.ecn.ou.edu.edu, ***Suat Kasap***

Mean field annealing based on the mean field theory of statistical physics combines many characteristics of simulated annealing and neural network and finds (near) global optimum solutions. Our main purpose is to give an overview of mean field theory from statistical physics in combinatorial optimization.

4) A Dynamic Slope Scaling Procedure for Concave Piecewise Linear Network Flow Problems, ***Dukwon Kim***, University of Florida, Ctr. for Applied Optimization, 303 Weil Hall, ISE Dept., Gainesville, FL 32611, dkim@cao.ise.ufl.edu, ***Panos M. Pardalos***

We discuss an efficient heuristic approach for solving concave PLNFP in which the cost function is separable and each arc cost is a concave piecewise linear function of the total flow along the arcs. The problem is well known to be NP-hard and can be solved efficiently using the DSSP in the string of global optimization.

TD05 Applications of Neural Nets & Genetic Algorithms

Cluster: Applications of Neural Nets & Genetic Algorithms
Invited Session

Chair: Radhika Santhanam, University of Cincinnati, Accounting & Info. Systems, Cincinnati, OH 45221, radhika.santhanam@uc.edu

1) The Iterated Prisoner's Dilemma Revisited: Early Experiences with a Learning Classifier System, ***Ram Pakath***, University of Kentucky, DSIS, Sch. of Mgmt., Gatton Coll. of Bus. & Econ., Lexington, KY 40506-0034, pakath@ukcc.uky.edu

We discuss the performances of different LCS agents playing simulated IPD games against opponents playing known strategies. Some games pit an adaptive agent against a single opponent while others involve several opponents. This work forms the foundation for a more extensive ongoing study.

2) Alternative Approaches to Data Mining, ***Atish P. Sinha***, University of Dayton, Dept. of MIS & Decision Sci., 300 College Park, Dayton, OH 45469-2130, sinha@udayton.edu, ***Barin Nag***

We examine 3 different data mining techniques namely, case-based reasoning, neural networks and logistic regression. We test the effectiveness of these techniques in a decision support environment for making indirect lending decisions. We also investigate how the performance using each of those techniques compares with that of a human expert.

3) An Investigation of the Performance of Genetic Algorithms in Decision Support Applications, ***Rathindra Sarathy***, Illinois State University, Dept. of Acct. & IS, 5520 College of Bus., Normal, IL 61790-5520, rsarathy@mail.ilstu.edu, ***Ravi Krovi***, ***Balaji Rajagopalan***

Classification problems involve categorizing entities based on a set of variables. Our objective is to investigate the performance of GAs for classification problems relating to products and markets. The implications of these results for decision support applications are discussed.

TD06 Marketing II

Contributed Session

Chair: Subir Bandyopadhay, University of Ottawa, 136 Jean-Jacques Lussier St., PO Box 450, Stn. A, Ottawa, Ontario, K1N 8P5, Canada, bandyopa@admin.uottawa.ca

1) Reverse Channel Choice & Coordination Issues, ***Canan R. Savaskan***, INSEAD, Boulevard de Constance, Fountainebleau, 77300, France, rezzan.canan.savaskan@insead.fr, ***Shantanu H. Bhattacharya***, ***Luk N. Van Wassenhove***

We explore the profitability of different reverse channel structures for a manufacturer who recovers used products in the production of new ones. We examine manufacturer's loss due to lack of coordination on reverse channel activities. We develop quantity discount schemes to achieve the coordinated channel performance.

2) Signaling Quality via Warranties in a Duopoly: The Impact of Brand Equity, ***Jinho Park***, University of Pittsburgh, Katz Grad. Sch. of Business, Mervis Hall, Pittsburgh, PA 15260, jinhop@vms.cis.pitt.edu, ***Rabikar Chatterjee***

Warranties may be employed as a device to signal a firm's product quality in markets where consumers are otherwise unable to differentiate between the quality levels of the competing brands. We examine how the need to signal quality distorts the extent of the warranty; in particular, we focus on how the warranty decision is influenced by the firm's brand equity and warranty delivery costs.

3) Marketing Consumer Products in China: Strategic Implications to Multinational Companies, ***Subir Bandyopadhay***, University of Ottawa, 136 Jean-Jacques Lussier St., PO Box 450, Stn. A, Ottawa, Ontario, K1N 8P5, Canada, bandyopa@admin.uottawa.ca, ***Rina Taraseiskey***

This study provides valuable information on the changing face of Chinese women. It uses a case-study approach to describe how Chinese women consumers should be segmented for a typical consumer product and how marketers should redesign their marketing strategies to sell their products in China.

4) Marketing Research as a Factor of Product Strategy for Passenger Railroads, ***Wojciech Soja***, 4 G Danska Str., Radom, 26-600, Poland, ***Tadeusz Dyr***

We present marketing research for creating a product strategy as well as conclusions of passenger transportation market research in Poland and the evaluation of recent changes in services and structure.

TD07 Internet Applications: Technology I

Contributed Session

Chair: Anthony J. Brigandi, AT&T Labs., 290 Davidson Ave., Rm. W4G081, Somerset, NJ 08875, brigandi@att.com

1) Multiple Technologies in the Information System of Academic Management, ***Nicolas Serrano Barcena***, Escuela de Ingenieros, Paseo Manuel de Lardizabal 13, San Sebastian, 20009, Spain, nserrano@ceit.es, ***Rafael Menendez Teillet***, ***Ismael Ciordia***, ***Pedro Agudo***

The solution for an IS can be created by the union of different technologies, i.e., desktop applications, Web servers, Java applets, CGIs, e-mail applications, database rules, etc. Dependent of the security of the information and how long is broaded, a rapid development, a cost internet application or other development is used.

2) Technological Alternatives to Develop Web OLAP Tools, ***Jose Mari Sarriegi Dominguez***, Escuela de Ingenieros, Paseo Manuel de Lardizabal 13, San Sebastian, 20009, Spain, jmsarriegui@ceit.es, ***Eva Galan Arratibel***, ***Nicolas Serrano Barcena***, ***Rafael Menendez Teillet***

OLAP tools have already been accepted by organization's managers. Nowadays, these tools must be integrated in the Internet environment. We examine some technological alternatives to develop Web OLAP tools which maintain a data warehouse that could be accessed by managers everywhere and expose the development of a preliminary version.

3) Performance Measurement & Modeling for Extranet Applications, ***Anthony J. Brigandi***, AT&T Labs., 290 Davidson Ave., Rm. W4G081, Somerset, NJ 08875, brigandi@att.com, ***Avinash G. Tilak***

We deal with the performance of an extranet application. AT&T's customers can access the application via the Internet. Service level agreements (SLAs) require that AT&T be able to monitor the performance of the application, identify causes of failure to meet SLAs and increase capacity to meet SLAs. These SLA-driven performance measures need to be linked to direct measures of quality (DMOQs)...

TD08 Industry Applications II

Contributed Session

Chair: Larry J. LeBlanc, Vanderbilt University, Owen Grad. Sch. of Mgmt., 401 21st Ave. South, Nashville, TN 37203, larry.leblance@owen.vanderbilt.edu

1) Generation Expansion Planning for Electric Utilities under Price Uncertainties, ***Chung-Hsiao Wang***, Iowa State University, 2717 Buchanan, Ames, IA 50013, wchrist@iastate.edu, ***Jo Min***

The electric power industry is changing from a regulated monopoly toward competition. This change affects the generation expansion planning with stochastic revenue. Under these circumstances, we design and analyze a stochastic generation expansion planning model based on the mean-variance methods. Various managerial insights and economic implications will be provided.

2) A Linear Programming-Based Model Developed for the Victorian Natural Gas Market, ***Grace S. Lo***, ICF Information Technology, Inc., 9300 Lee Hwy, Fairfax, VA 22031, glo@icfkaiser.com, ***William J. Pepper***

We present an application of using linear program to solve a dispatch model for the Victorian gas market. The formulation has both market and pipeline network constraints. Modeling issues include handling nonlinear pipe flow equations, modeling reversible pipes and using a successive iteration algorithm to improve flow approximation and performance.

3) withdrawn - author request of 3/29, ***Orfao M. Nuno***, Instituto Politecnico de Leiria, Portugal, Portugal, nmorfao2estg.iplei.pt, ***Carlos F. Bispo***

4) Heery International Assigns Managers to Construction Projects, ***Larry J. LeBlanc***, Vanderbilt University, Owen Grad. Sch. of Mgmt., 401 21st Ave. South, Nashville, TN 37203, larry.leblance@owen.vanderbilt.edu, ***Dale Randels, Jr., Ken Swann***

We describe an Excel spreadsheet optimization model for assigning managers to construction projects to minimize cost while maintaining balanced workloads. The problem involved 118 projects and 7 managers. Benefits from the model include reduced travel costs, improved morale because the assignments are generally perceived as fair, and better planning of time.

TD09 Tabu Search Applications

Cluster: Metaheuristics

Invited Session

Chair: Jean-Yves Potvin, Universite de Montreal, DIRO/CRT, CP 6128, Succ Centre-Ville, Montreal, Quebec, H3C 3J7, Canada, potvin@iro.umontreal.ca

1) Tabu Search for a Capacitated Multicommodity Location Problem with Balancing Requirements, ***Bernard Gendron***, Universite de Montreal, DIRO/CRT, CP 6128, Succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, bernard@crt.umontreal.ca, ***Jean-Yves Potvin, Patrick Soriano***

We study a class of discrete capacitated location problems on networks, which arises in freight transportation planning. We describe a solution methodology based on TS. Experimental results will be presented and analyzed.

2) Tabu Search for a Network Loading Problem with Multiple Facilities & Bifurcated Flows, ***Patrick Soriano***, Universite de Montreal, DIRO/CRT, CP 6128, succ. Centre-ville, Montreal, Quebec, H3C 3J7, Canada, patrick@crt.umontreal.ca, ***Bernard Gendron, Jean-Yves Potvin***

A TS heuristic optimizes the installation costs of fiber optic cables on a telecommunications network, when many types of cables with different capacities are available. During the search, network flow subproblems are solved thorugh column generation. Numerical results are reported on networks with up to 100 vertices.

3) Tabu Search for Resource Allocation & Scheduling on a Naval Platform, ***Jean-Yves Potvin***, Universite de Montreal, DIRO/CRT, CP 6128, Succ Centre-Ville, Montreal, Quebec, H3C 3J7, Canada, potvin@iro.umontreal.ca, ***Dale E. Blodgett, Michel Gendreau, Francois Guertin, Rene Seguin***

A TS heuristic produces defense plans to guide the allocation and scheduling of different types of weapons against anti-ship missiles. Improvements are obtained through the addition and deletion of defense actions in the plan. Numerical results are reported on scenarios with an increasing number of threats.

TD10 Decision Analysis Involving Outcomes over Time & Environmental Risks

Sponsor: Decision Analysis Society

Sponsored Session

Chair: L. Robin Keller, University of California, Grad. Sch. of Mgmt., 350 GSM, Irvine, CA 92697-3125, lrkeller@uci.edu

1) The Dynamic Implications of Diminishing Sensitivity, ***Luc Wathieu***, Harvard Business School, Morgan Hall, Boston, MA 02163, lwathieu@hbs.edu

A new model of habit formation is introduced that implies an interesting pattern of consumption under general conditions. An initial sequence of increasing consumption is followed by intermittent episodes of stopping and starting again. The model naturally applies to smoking behavior, but it also applies to issues of variety-seeking in consumer choice.

2) Assessing Preferences for Environmental Decisions with Long-Term Consequences, ***Thomas Eppel***, Decision Insights, Inc., 2062 Business Center Dr., Ste 110, Irvine, CA 92612, tomeppel@aol.com, ***Jeffery L. Guyse***

Many large-scale decision problems involve consequences that occur over a long time horizon. We will describe a series of experiments which systematically vary the factors that potentially influence how people form and express preferences for consequences that occur at different points in time.

3) Comparison of Expert Judgments in a Probabilistic Risk Assessment, ***Jeffery L. Guyse***, University of California, Grad. Sch. of Mgmt., 350 GSM, Irvine, CA 92697-3125, jlguyse@uci.edu, ***Thomas Eppel***

We present the results of analyzing expert judgments obtained in a probabilistic risk assessment. The presentation will emphasize consistencies and disagreements among experts as well as any systematic biases. The effect of such biases on the aggregated judgments and implications for future risk assessments are discussed.

TD11 TRAC-White Sands Military Operations Research

Sponsor: Military Applications Society

Sponsored Session

Chair: Richard R. Laferriere, USA TRAC - White Sands, Training Analysis, ATRC-WGA, WSMR, NM 88002-5502, Chair

1) A New Algorithm for the 1D Bin Packing Problem, ***Philipp A. Djang***, TRAC-White Sands, TRADOC Analysis Ctr., WSMR, NM 88002

We present the exact fit algorithm for solving one dimension bin packing problems. The computational performance of the algorithm is described and compared to other algorithms on a suite of test problems.

2) Lessons Learned from the US Army's Advanced Warfighting Experiment Process, ***Kenneth P. Dzierzanowski***, US Army TRADOC Analysis Ctr., Attn: ATRC-WBB White Sands, Missle Range, NM 88002-5502

We develop the process, models and lessons learned from the US Army's Training and Doctrine Command Analysis Center support of the Advanced Warfighting Experiments. One of TRAC's purposes was to assess the value gained by Information Age Technologies. We will provide insights into how modeling was used to evaluate this complex issue.

3) Mix Modeling for Combat Systems, ***Richard R. Laferriere***, USA TRAC - White Sands, Training Analysis, ATRC-WGA, WSMR, NM 88002-5502, Chair

The approach to integrating combat simulation results across several scenarios is presented. Statistical analyses, linear programming under uncertainty models, and spreadsheet analyses provide a robust set of approaches to help decision makers determine the best mix of systems for the future Army.

TD12 Reengineering Applications

Contributed Session

Chair: Alex Bangash, Bell Labs., Lucent Technologies, 101 Crawfords Corner Rd., Rm. 2L-518, Holmdel, NJ 07733, abangash@lucent.com

1) A Japanese Distribution System in the Daily Necessities Industry, ***Miho Nojima***, University of Tokyo, 2-10-303 Minamiyamabusi-Tsyou, Sinjuku-ku, Tokyo, 162-0854, Japan, cg4m-njm@asahi-net.or.jp

In Japan, a manufacturer of daily necessities has been successful because of

vertical integration strategy. But these days, supermarkets want manufacturers to deliver their goods as whole. Then, collaboration becomes a new strategy instead of vertical integration strategy. I introduce this new system in Japan in connection with supply chain management.

2) withdrawn - author request of 3/26, ***Ayako Takai***, University of Tokyo, Faculty of Econ., 4-26-12-301 Mejiro Toshima-ku, Toshima-ku, Tokyo, 171-0031, Japan, qg9a-tki@asahi-net.or.jp

3) Electronic Commerce Applications for Operations Research, ***Alex Bangash***, Bell Labs., Lucent Technologies, 101 Crawfords Corner Rd., Rm. 2L-518, Holmdel, NJ 07733, abangash@lucent.com

Demand planning, capacity planning, procurement and transportation logistics are changing rapidly through EC enabled partnering. We will describe how Web-based OR applications are being used to integrate supply chains, reduce cycle times, increase customer service and gain a competitive advantage.

TD13 GDN Research in Context: Human & Artificial Agents II

Sponsor: Group Decision & Negotiation Section
Sponsored Session

Chair: Melvin F. Shakun, NYU, Stern Sch. of Bus., 44 W. 4 St., New York, NY 0012-1126, mshakun@stern.nyu.edu

Co-Chair: Gregory Kersten, Carleton University, Sch. of Bus., Dunton Tower, 1125 Colonel, Ottawa, On K1S 5B6, Canada, gregory@business.carleton.ca

1) Panel: Group Decision Negotiation Research in Context - Human & Artificial Agents, ***Gregory Kersten***, Carleton University, Sch. of Bus., Dunton Tower, 1125 Colonel, Ottawa, ON K1S 5B6, Canada, gregory@business.carleton.ca, ***Kalyan Chatterjee***, Pennsylvania State University, Smeal Coll. of Bus., 310 Beam BAB, University Park, PA 16802, chatterjee@psu.edu, ***Melvin F. Shakun***, NYU, Stern Sch. of Bus., 44 W. 4 St., New York, NY 0012-1126, mshakun@stern.nyu.edu, ***Rachel Croson***, University of Pennsylvania, Wharton Sch. of Bus., Dept. of OPIM, 1322 SH-DH, Philadelphia, PA 19104-6366, crosonr@opim.wharton.upenn.edu

Classically, group decision and negotiation support systems support groups with human agents. Multiagent systems in AI involve artificial agents. Hybrid systems with both human and artificial agents are developing. Panelists will make opening remarks on these subjects followed by panel discussion with audience participation.

TD14 Sports Scheduling

Cluster: Sports & Games in OR/MS
Invited Session

Chair: Michael A. Trick, Carnegie Mellon University, GSIA, Pittsburgh, PA 15213, trick@cmu.edu, http://mat.gsia.cmu.edu/

1) Scheduling College Basketball, ***Kelly Easton***, Georgia Institute of Technology, Sch. of ISyE, Atlanta, GA 30332, kking@akula.ieye.gatech.edu, ***George L. Nemhauser***, ***Michael A. Trick***

We explore constraint programming and integer programming techniques for generating double round robin tournaments with and without mirroring restrictions. The Atlantic Coast Conference (ACC) men's basketball schedule is presented as an example.

2) ACC Scheduling with OPL & Constraint Programming, ***Irvin J. Lustig***, ILOG, CPLEX Division, 889 Alder Ave., Ste. 200, Incline Village, NV 89451, irv@cplex.com

Nemhauser & Trick demonstrated how the ACC basketball conference could be scheduled by using a combination of integer programming and enumeration. We demonstrate how the OPL Optimization Programming Language can be used to model the problem, using the techniques of constraint programming based on the work of Henz.

3) Constraint Programming & Sports Scheduling Problems, ***Jean-Charles Regin***, ILOG SA, Les Taissounieres HB2, 1681 Route des Dolines, Paris, France, regin@ilog.fr, http://www.ilog.com/

Recent research has shown that constraint programming is currently one of the best techniques for solving sports scheduling problems. We will identify several global constraints involved in sports scheduling problems. It is shown that developing efficient filtering algorithms for these global constraints, such as arc consistency for n-ary constraints, is crucial in the success of the solution methods...

4) Further Adventures in Baseball Scheduling, ***Michael A. Trick***, Carnegie Mellon University, GSIA, Pittsburgh, PA 15213, trick@cmu.edu, http://mat.gsia.cmu.edu/

The last few years have seen a variety of proposed and enacted schedule formats for Major League baseball. A combination of integer programming and constraint programming has proved a robust and flexible method for quickly generating reasonable schedules. I outline these techniques and talk about some barriers to implementation.

TD15 New Teaching Cases in Supply Chain Management

Cluster: Supply Chain Management
Invited Session

Chair: M. Eric Johnson, Vanderbilt University, Owen Grad. Sch. of Mgmt., Nashville, TN 37203, eric.johnson@owen.vanderbilt.edu

1) Mad River Canoe, ***David F. Pyke***, Dartmouth College, Tuck Sch. of Bus., Hanover, NH 03755-1798, david.f.pyke@dartmouth.edu

This case examines the production and distribution issues associated with a mix of make-to-order and make-to-stock premium canoes. One complicating factor is transportation cost, which is extremely high. Therefore, Mad River needs to ship in full truck loads which can extend lead times to the customer.

2) Stanford Supply Chain Management Teaching Cases, ***Laura Rock Kopczak***, Stanford University, IE/EM Dept., Terman 371, Stanford, CA 94305-4024, kopczak@leland.stanford.edu

Stanford University business and engineering school professors have developed several teaching cases which delve into supply chain management topics. The cases are used in the core Operations course, in a Supply Chain Management elective and in a new elective on Supply Chain Management and IT. This session presents the list of cases which are available and describes one or two cases in detail.

3) Mattel: Vendor Operations in Asia, ***M. Eric Johnson***, Vanderbilt University, Owen Grad. Sch. of Mgmt., Nashville, TN 37203, eric.johnson@owen.vanderbilt.edu

In March of 1998, Mattel was preparing to build a new plant in Southern China to augment its die-cast car capacity. However, with the deepening regional financial crisis, Mattel paused to rethink its decision. With both Hot Wheels and Matchbox toy car sales booming, capacity was sorely needed to support Mattel's distribution strategy. Should Mattel build a new plant in China or should they outsource the production?

TD16 Cellular Manufacturing: AGV & Robotic Considerations

Cluster: Cellular Manufacturing
Invited Session

Chair: Bryan A. Norman, University of Pittsburgh, 1048 Benedum Hall, Dept. of IE, Pittsburgh, PA 15261, banorman@pitt.edu

1) Optimal Location of Dwell Points in Single-Loop & Tandem-Loop Automated Guided Vehicle Systems, ***Jose A. Ventura***, Pennsylvania State University, 207 Hammond Bldg., Dept. of IME, University Park, PA 16802, jav1@psu.edu, ***Chulung Lee***

We investigate the dwell point decision problem in single-loop and tandem-loop multiple-vehicle AGV systems where the objective is to minimize the maximum response time and the mean response time. Exact algorithms using dynamic programming, bisection search and sub-gradient search are presented. Computational results are also provided.

2) Estimating the Number of Automated Guided Vehicles, ***F. Fred Choobineh***, University of Nebraska, Dept. of IMSE, 175 Nebraska Hall, Lincoln, NE 68588-0518, ffc@unl.edu, ***Sarah M. Ryan***

We model the AGV material handling system by a closed queueing network. A mathematical program is used to obtain performance characteristics of the network. Sensitivity analyses of the performance characteristics guide the identification of the most desirable number of AGVs.

3) A Statistical Approach for Determining Vehicle Requirements in an Automated Guided Vehicle System, ***Robert Arifin***, Ernst & Young, 1 KC Place, 1200 Main St., Kansas City, MO, ***Pius J. Egbelu***

One of the pieces of information required in the justification of an AGV system in manufacturing is the number of vehicles required. Simulation is often used for determining the required number of vehicles. A statistical approach for

determining vehicle requirement will be presented along with comparison data with simulation approach.

4) Planning Multiple Mobile Robots in Manufacturing Assembly, ***Behrokh Khoshnevis***, University of Southern California, ISE Dept., Los Angeles, CA 90089-0193, khoshnev@usc.edu

Use of multiple mobile robots overcomes a number of limitations of conventional robotics approaches in manufacturing. The technology to accomplish this needs research and development. A novel concept for design, planning, and control of a new breed of mobile robots used for manufacturing assembly is presented.

TD17 Stochastic Integer Programming

Cluster: Stochastic Programming
Sponsor: Optimization Section
Sponsored Session
Chair: Suvrajeet Sen, University of Arizona, Dept. of SIE, Tucson, AZ 85721, sen@sie.arizona.edu

1) On Probabilistic Discrete Programming, ***Darinka Dentcheva***, Rutgers University, RUTCOR, Piscataway, NJ 08854, ***Andras Prekopa, Andrzej Ruszczynski***

2) A Logic-Based Approach to Stochastic 0-1 Programming, ***Suvrajeet Sen***, University of Arizona, Dept. of SIE, Tucson, AZ 85721, sen@sie.arizona.edu

TD18 Solving Hard Combinatorial Optimization Problems

Cluster: Integer Programming
Sponsor: Optimization Section
Sponsored Session
Chair: Nick Sahinidis, University of Illinois, Dept. of Chem. Eng., 600 S. Mathews Ave., Urbana, IL 61801, nikos@uiuc.edu http://archimedes.scs.uiuc.edu

1) The Multi-Period Single-Sourcing Problem, ***H. Edwin Romeijn***, Erasmus University, Dept. of DIS, Sch. of Mgmt., F1-17, Rotterdam PO Box 1738, Rotterdam, 3000 DR, Netherlands, e. romeijn@fac.fbk.eur.nl http://www.fbk.eur.nl/FBK/VG1/HER, ***Dolores Romero Morales***

The multi-period single-sourcing problem finds an assignment of customers to warehouses, so that each customer is assigned to one warehouse in each period and demand and capacity constraints are satisfied. We derive a suitable stochastic model for generating feasible instances and a generalized greedy heuristic that is (probabilistically) asymptotically optimal.

2) Very Largescale Neighborhood Search, ***James B. Orlin***, MIT, E53-357, Cambridge, MA 02139, http://web.mit.edu/jorlin/www;, ***Ravindra K. Ahuja***

We will present neighborhood search algorithms for solving combinatorial optimization problems where the size of the neighborhood is very large (typically exponential in terms of the problem size) but an improved neighbor can often be identified efficiently using network flow techniques. We will illustrate this technique on several different problems.

3) Algorithm Portfolio Approach for Solving Hard Combinatorial Problems, ***Carla P. Gomes***, Cornell University, Dept. of Comp. Sci., 5133 Upson Hall, Ithaca, NY 14853, gomes@cs.cornell.edu

Randomized algorithms are among the best current algorithms for solving computationally hard problems. However, their run time performance can vary dramatically. We will discuss how one can take advantage of the high variance of randomized algorithms by combining them into a portfolio and running them on different processors or interleaving them on a single processor.

4) An Asymptotically Optimal Heuristic for a Multi-Period Integer Program, ***Shabbir Ahmed***, University of Illinois, Dept. of MIE, 40 MEB, MC-244, 1206 West Green St., Urbana, IL 61801, s-ahmed1@uiuc.edu http://www.cen.uiuc.edu/~s-ahmed1, ***Nick Sahinidis***

We present a multi-period integer programming formulation for chemical process capacity expansion and operation. We prove that the problem is NP-hard and develop an asymptotically optimal heuristic.

TD19 Flowshop Scheduling

Contributed Session
Chair: Ali Allahverdi, Kuwait University, Dept. of MIE, PO Box 5969, Safat, 13060, Kuwait, allahverdi@kuc01.kuniv.edu.kw

1) A Branch & Bound Algorithm for Minimizing Total Tardiness in a Flowshop with No Intermediate Buffer, ***Vinicius Armentano***, Universidade Estadual de Campinas, Fac. de Enhenharia Eletrica, CP 6101 Cidade Universitaria, Campinas Sao Paulo, 13083-970, Brazil, vinicius@densis.fee.unicamp.br, ***Debora P. Ronconi***

We address the scheduling of jobs in a flowshop without intermediate buffer storage between machines in order to minimize the total tardiness. Based on a graph representation of the problem, we develop a lower bound on the total tardiness which is used in a B&B algorithm. Computational tests are reported.

2) Connections between the @-Machine Flow Shop Problem & Factorizations of Matrix Functions, ***Rob A. Zuidwijk***, Erasmus University, Burgemeester Oudlaan 50, Rotterdam, 3000 DR, The Netherlands, rzuidwijk@fac.fbk.eur.nl

An instance of the 2-machine flow shop problem requires a certain time for completion, the makspan, which can be minimized. The corresponding optimal schedule can be computed using Johnson's rule. It turns out that the combinatorics involved here reappear in the factorization of certain matrix valued functions. Details of this surprising connection will be revealed.

3) A High Quality Solution Constructive Heuristic for Flow Shop Sequencing, ***Joao V. Moccellin***, Universidade de Sao Paulo, Escola de Engenharia, Av. Dr. Carlos Botelho 1465, Sao Carlos SP, 13560-250,Brazil,jvmoccel@sc.usp.brhttp://producao.prod.eesc.sc.usp.br/producao/docmoc, ***Marcelo S. Nagano***

We introduce a new constructive heuristic for the minimal makespan flow shop sequencing problem. In order to evaluate the performance of the proposed heuristic, we compare it with the NEH heuristic, that is the best constructive one known so far. The results from computational experience are discussed.

4) Three-Machine No-Wait Flowshop Scheduling, ***Ali Allahverdi***, Kuwait University, Dept. of MIE, PO Box 5969, Safat, 13060, Kuwait, allahverdi@kuc01.kuniv.edu.kw, ***Tariq Aldowaisan***

A 3-machine no-wait flowshop scheduling problem is addressed with respect to total completion time criterion. Optimal solutions are obtained for special cases and a lower bound is developed for the generic case. A B&B algorithm is developed for small numbers of jobs and heuristics are obtained for larger numbers of jobs.

TD20 Military Applications I

Contributed Session
Chair: Dean S. Hartley, III, Oak Ridge National Labs., 1099 Commerce Park, Oak Ridge, TN 37830, dhx@ornl.gov

1) Effects of Unmanned Aerial Vehicles on Information Gain for Army After Next, ***Ethan Dial***, US Military Academy, USCC, D-1, West Point, NY 10997, x96163@exmail.usma.army.mil, ***Nathan Garaas, Eugene P. Paulo***

This research is a Janus-based simulation effort that studies the army after next (ANN) and its utilization of unmanned aerial vehicles (UAVs). Design of experiments is used to study the effect of varying certain UAV capabilities and tactics as well as to determine the overall benefits of UAV utilization to the friendly fighting force.

2) The Land Warrior Arms Room, ***Michael A. Schneider***, US Military Academy, PO Box 1991, West Point, NY 10997, x96837@exmail.usma.edu, ***Barry Lingelbach, Dave Zickafoose***

Our design team has developed and analyzed 5 feasible alternatives for a facility capable of storing the US Army's new land warrior system. The team's focus during the creation and modeling of these alternatives was to enhance unit readiness and deployability by allowing for the rapid distribution of equipment while minimizing implementation costs.

3) Leontief Modeling of Military Strategic Effects, ***Anthony W. Snodgrass***, Air Force Institute of Technology, 2950 P St., Bldg. 640, WPAFB, OH 45433-7765, ***Mark A. Gallagher, Jack M. Kloeber, Jr.***

Military strategic effects encompass cumulative direct and indirect attack results on an adversary's warring capability. The Leontief input-output system, from macroeconomics, assesses each industry's capacity on other industries. We postulate modeling functional areas, i.e., combat forces, logistics, communication, intelligence, etc., as "industries" to determine targeting's strategic effects.

4) Defining Operations Other Than War Tools for Force Design, ***Dean S. Hartley, III***, Oak Ridge National Labs., 1099 Commerce Park, Oak Ridge, TN 37830, dhx@ornl.gov

A continuation of the work of determining the tool requirements for OOTW analysis, this presentation describes the definition of the tools required for the Force Design process.

5) Measuring Cost & Performance: A Military Case Study,

Diana I. Angelis, Naval Postgraduate School, 1522 Cummingham Rd., Monterey, CA 93943, diangeli@nps.navy.mil

We present a case study describing how one military organizaion is attempting to measure cost and performance. This effect is the result of leadership seeking to manage the organization in a business-like manner in order to increase accountability and manage costs instead of budgets.

TD21 Applied Probability & Telecommunications

Sponsor: Technical Section on Telecommunications/Applied Probability Section
Sponsored Session

Chair: L. D. Servi, GTE Laboratories, 40 Sylvan Rd., Waltham, MA 02254, lds0@gte.com

1) Time Varying Multiserver Queues with Abandonment & Retrials, *William A. Massey*, Bell Laboratories, 700 Mountain Ave., Rm. 2C-12, Murray Hill, NJ 07974-0636, will@research.bell-labs.com, *Avi Mandelbaum*, *Martin I. Reiman*, *Brian Rider*

2) Loss Probabilities of Hand-In Traffic under Different Protocols, *Daryl J. Daley*, Australian National University, Sch. of Math Sci., Canberra, 0200, Australia, daryl@maths.anu.edu.au, *L. D. Servi*

3) Allocation of Service Time in a Two-Server System, *Muhammad A. El-Taha*, University of Southern Maine, Dept. of Math. & Stats., 96 Falmouth St., Portland, ME 04104-9300, eltaha@usm.maine.edu

TD22 Wildlife Management & Conservation Biology

Cluster: OR/MS in Forestry

Sponsor: Section on Energy, Natural Resources & Environment
Sponsored Session

Chair: Michael Bevers, USDA Forest Service, Rocky Mountain Res. Station, 240 W. Prospect Rd., Fort Collins, CO 80526, mbevers/rmrs@fs.fed.us

1) Spatial Optimization for the Western Prairie Fringed Orchid, *John Hof*, USDA Forest Service, Rocky Mountain Res. Station, 3825 E. Mulberry, Fort Collins, CO 80524, jhof/rmrs@fs.fed.us

We will discuss a spatial optimization model for the Western Prairie Fringed Orchid. This endangered plant species has a complicated life history that is captured in a formulation which optimally places the areas to be protected as habitat. A case example located in the Sheyenne National Grassland is included.

2) An Optimization Model for Reserve Site Selection, *Robert G. Haight*, USDA Forest Service, N. Central Res. Station, 1992 Folwell Ave., St. Paul, MN 55108, haigh003@tc.umn.edu, *Charles ReVelle*, *Stephanie Snyder*

We developed a 0/1 optimization model for a reserve site selection problem in which information about the presence/absence of species in candidate sites was uncertain. The model maximized the number of species represented by the selected sites subject to a budget constraint and a reliability constraint requiring a minimum probability of occurrence for a species to be considered represented.

3) A GIS-Based Approach to Determining Migratory Patterns, *Denis Dean*, Colorado State University, Dept. of Forest Sciences, Ft. Collins, CO 80523, denis@cnr.colostate.edu

Migratory patterns of many terrestrial animals are disrupted by human activities. A prior knowledge of how these migratory paths might change, or knowledge of what alternative migratory paths are feasible, is immensely beneficial to wildlife managers. We evaluate the ability of a GIS-based spatial data analysis known as anisotropic cost spreading to accomplish these types of predictions.

4) An Analysis of Deterministic Optimization Methods of Habitat Selection, *Michael Bevers*, USDA Forest Service, Rocky Mountain Res. Station, 240 W. Prospect Rd., Fort Collins, CO 80526, mbevers/rmrs@fs.fed.us, *Curtis Flather*

Spatial population models that represent organism dispersal as aggregated random walks can be very sensitive to violations of the large-population assumptions necessary for deterministic analyses. We use rank-order correlations of numerous stochastic simulations applied to a broad range of landscapes to test whether deterministic optimization methods of habitat selection are suitable for small populations.

TD24 Service Industry Applications II

Contributed Session

Chair: Thomas A. Grossman, University of Calgary, Fac. of Mgmt., 2500 University Dr. NW, Calgary, Alberta, T2N 1N4, Canada, grossman@ucalgary.ca, http://www.ucalgary.ca/~grossman/

1) withdrawn - author request of 3/16, *Gerard M. Campbell*, University of Connecticut, Sch. of Bus. Admin., U-41 IM, Storrs, CT 06269, gcampbel@uconnvm.uconn.edu

2) Modeling ACD Data to Improve Computer Simulation of Call Centers, *Sherry L. Oh*, University of Calgary, Faculty of Mgmt., Calgary, Alberta, T2N 1N4, Canada, ohg@cadvision.com, soh@mgmt.ucalgary.ca, *Thomas A. Grossman*

Computer simulations of call centers are often hampered by insufficient data provided by automated call distributors. We use Bayesian statistical techniques to disaggregate essential talk time data and to provide better estimates of censored abandonment distributions.

3) A Survey of Management Science for Incoming Call Centers, *Thomas A. Grossman*, University of Calgary, Fac. of Mgmt., 2500 University Dr. NW, Calgary, Alberta, T2N 1N4, Canada, grossman@ucalgary.ca, http://www.ucalgary.ca/~grossman/, *Thomas Rohleder*, *Sherry L. Oh*

With 6.5 million employees and complex management challenges, call centers are fertile ground for research and application. We discuss call center management, operations, technology and data availability. We describe industry practice, survey the scant relevant research results and identify pracical problems that require additional research.

TD25 Dynamic Traffic Assignment II

Sponsor: Transportation Science Section
Sponsored Session

Chair: David Bernstein, Princeton University, Dept. of Stats. & OR, Princeton, NJ 08544, dhb@princeton.edu

1) Solution Algorithms for the Combined Dynamic Traffic Control-Assignment Problems, *Owen J. Chen*, i2 Technologies, Inc., 565 Technology Square, 9th Floor, Cambridge, MA 02139, owen_chen@i2.com, *Moshe E. Ben-Akiva*, *Ismail Chabini*, *Nathan H. Gartner*

Gradient-based solution algorithms are developed to solve 3 models of the combined control-assignment problems: Cournot, Stackelberg and Monopoly. The developed models and solution algorithms are applied to the Boston Back Bay network. Results from the application demonstrate the potential improvements in traffic performance by integrating control and assignment.

2) Linear Programming Formulation for Fixed Arrival Time DTA with Penalties on Scheduled Delays, *Irene Yue Li*, Northwestern University, Dept. of ISE, 2145 Sheridan Rd., Tech. Inst., Evanston, IL 60208, liyue@nwu.edu, *Athanasis Ziliaskopoulos*

We are concerned with the system optimum dynamic traffic assignment problem when drivers fix their arrival rather than their departure times. The model is formulated as an LP that simultaneously optimizes departure time and route choice. The model applies to multi-origin/multi-destination problems and the first-in-first-out condition is generally observed on the links and nodes of the network.

3) Dynamic Update Heuristics for Robust On-Line Dynamic Traffic Assignment, *Chao Zhou*, Purdue University, Sch. of Civil Eng., West Lafayette, IN 47907, *Srinivas Peeta*

Heuristics are proposed and evaluated for the efficient update of a robust initial solution for on-line dynamic traffic assignment as part of a hybrid solution framework. The effect of varying user class fractions is also investigated.

4) Hybrid Dynamic Network Traffic Assignment Strategies: Algorithmic Framework & Computational Experiments, *Yi-Chang Chiu*, University of Texas, Dept. of Civil Eng., ECJ 6.2, Austin, TX 78712, y-chiu@mail.utexas.edu, *Hani S. Mahmassani*

We present a hybrid dynamic traffic assignment framework that integrates centralized and decentralized strategies for optimal vehicular traffic routing. The cooperative scheme allows a central controller to collaborate with local controllers to achieve system objectives under various network conditions. Analytical and numerical results illustrate the performance of these strategies.

TD26 Modeling Manufacturing Systems for Quality Improvement

Sponsor: Quality, Statistics & Reliability Section
Sponsored Session

Chair: Theodore T. Allen, Ohio State University, 210 Baker Systems, Dept. ISE, 1971 Neil Ave., Columbus, OH 43210-1271, allen.515@osu.edu, www-iwse.eng.ohio.state.edu/~facultyp/allen.htm

1) Impact of Material Handling Systems on Dimensional Quality of Sheet Metal Stamped Parts, ***Huifang Li, Darek Ceglarek***

Recent studies show that material handling has significant impact on the dimensional quality of sheet metal parts and production cycle time. We present simulations and experimental results of methodology for optimization of material handling part holding end-effector layout. The constraints from press/die/handling devices are considered in the optimization.

2) Diagnostic Feature Extraction from a Stamping Tonnage Signal Based on Design of Experiment, ***Jionghua Jin***, University of Michigan, Dept. of IOE, IPQI Lab., Ann Arbor, MI 48109-2117, ***Jianjun Shi***

Stamping tonnage signal represents changes of process variables. A PCA analysis is performed for feature extraction and a DOE is conducted to identify key variables and to cluster the loading scores for process diagnosis. Hierarchical clustering is used to handle the interaction variables. The methodologies and real examples are presented.

3) Neural Network Metamodels of Manufacturing Systems, ***Mark Chambers***, Ohio State University, 210 Baker Systems, Dept. ISE, 1971 Neil Ave., Columbus, OH 43210, ***Clark A. Mount-Campbell***

A general purpose ANN metamodel of a single queue is developed. A network of queues are then modeled by networking multiple copies of the neural network model. Specific examples are discussed based on the manufacturing of PCBs along with training and tests of the model's performance.

4) Statistical Applications to the Management of Manufacturing Systems, ***Karl D. Majeski***, University of Michigan, Office for Auto Transport., 2901 Baxter Rd., Ann Arbor, MI 48109-2117, kdm@engin.umich.edu

We address various issues of the integration of statistical methods to inform the management of manufacturing systems. Examples will be taken from the literature and real examples from the speaker's experiences.

TD27 Stochastic Network Control II

Sponsor: Applied Probability Society
Sponsored Session

Chair: Kimberly Wasserman, University of Michigan, EECS Dept., 1301 Beal Ave., Ann Arbor, MI 48109-2122, wass@eecs.umich.edu

1) Routing in Multiclass Loss Networks, ***Abel Dasylva***, Nokia Research Center, ***R. Srikant***

We consider the performance of routing schemes in loss networks with multiple bandwidth classes, such in ATM networks or in reservation-based connections in the Internet. LP lower bounds on the lost revenue are obtained when the full stochastic description of the traffic is available. In the case where only partial information is available, we obtain bounds on the worst-case performance using competitive ratio techniques.

2) Performance Analysis of a Parallel Computing System, ***David D. Yao***, Columbia University, IEOR Dept., 302 Mudd Bldg., New York, NY 10027-6699, yao@ieor.columbia.edu, ***Mark S. Squillante***, ***Li Zhang***

We study a set of workload data from the 512-node IBM SP2 system at the Cornell Theory Center and reveal the underlying heavy-tailed distribution. We then investigate various partitioning schemes of the parallel processors and the resulting system performance.

3) An Adaptive Call Admission Control Approach for Circuit-Switched Networks, ***Christos G. Cassandras***, Boston University, Dept. of Mfg. Eng., 15 St. Mary's St., Boston, MA 02215, cgc@bu.edu, ***Kagan Gokbayrak***

In a threshold-based call admission control policy, threshold parameters are continously adjusted to yield optimal performance, i.e., minimal call blocking probabilities. Our approach is to solve the associated hard stochastic discrete optimization problem through a surrogate continuous optimization problem provably convergent to the optimum of the original problem.

TD28 Supply Chain Management II

Sponsor: Section on Logistics
Sponsored Session

Chair: Ton G. de Kok, Eindhoven University of Technology, Sch. of Tech. Mgmt., Paviljoen F4, PO Box 513, Eindhoven, 5600 MB, The Netherlands

1) The Value of Imperfect Advance Demand Information in a Project-Based Supply Chain, ***K. van Donselaar***, Eindhoven University of Technology, The Netherlands, ***Laura Rock Kopczak***, ***M. Wouters***

Several recent articles focus on the value of transferring demand information to suppliers in an early stage. Via analytical models and simulation, we study the value of imperfect ADI in these project-based supply chains. We will provide a simple heuristic to approximate the value of imperfect ADI.

2) Spare Parts Management at the Royal Netherlands Navy, ***Geert-Jan van Houtum***, University of Twente, Fac. of Mech. Eng., PO Box 217, Enschede, 7500 AE, The Netherlands, ***W. H. M. Zijm***, ***J. W. Rustenburg***

Methods such as VARI-METRIC maximize the up-time (availability) of complex technical systems, i.e., warships, for a given budget that may be invested in spare parts. These methods focus on initial supply. We apply VARI-METRIC to the resupply of spare parts in the exploitation period of warships, subject to limited budgets.

3) Evolutionary Optimization of Kanbans, ***Peter Koechel***, Technische Universitat Chemnitz, Dept. of Informatics, Chemnitz, 09107, Germany, pko@informatik.tu-chemnitz.de, ***Ulf Nielander***

Manufacturing stages with workflow controlled using kanbans are investigated. Usually, the assumption is made of identical lot sizes at all stages; however, from the economic point of view, variable lot sizes should be preferred. For reasons of analytical intractibility, we use simulation optimization combined with GAs.

4) Push & Pull Strategies in Multi-Stage Assembly Systems, ***Nico P. Dellaert***, Eindhoven University of Technology, Sch. of Tech. Mgmt., Breda, 4811 RA, The Netherlands, ***Ton G. de Kok***, ***Wayne Wang Wei***

In convergent multi-echelon systems, a pull strategy is usually assumed where demand at the end-stockpoint triggers demand at the preceding stockpoint; whereas in the push strategy, demand is triggered at the initial stockpoint. We will discuss the equivalence and differences between the 2 strategies for the 2-component assembly case.

TD29 Service Operations

Sponsor: Manufacturing & Service Operations Management Society
Sponsored Session

Chair: Sridhar Seshadri, NYU, Stern Sch. of Bus., 40 W 4th St., 700 Tisch, New York, NY 10012, sseshadr@stern.nyu.edu

1) Call Center Demand: Analysis of Marketing Drivers, ***Moshe B. Rosenwein***, AT&T, 101 Crawfords Corner Rd., Rm. 3J-327, Holmdel, NJ 07733

We describe regression models that may be used to predict the impact of marketing activities on call center volumes for different types of calls. For example, the models may be used to evaluate the impact of marketing programs on sales.

2) Transforming Delivery Systems in Retail Banking, ***Patrick T. Harker***, University of Pennsylvania, The Wharton Sch., OPIM, 3620 Locust Walk, 1300 SH-DH, Philadelphia, PA 19104, harker@opim.wharton.upenn.edu

We present the results of a detailed study of the transformation of sales and service delivery systems in retail banking, including traditional branches, call centers and electronic channels. The drivers of successful delivery systems are described along with the challenges these findings offer to the operations management community.

3) Netting vs. Real-Time Gross Settlement Clearing House Systems, ***Martin Shubik***, Yale University, Yale Sch. of Mgmt., Box 208200, New Haven, CT 06250-8200, martin.shubik@yale.edu, ***Matthew J. Sobel***

The principle large dollar payment automated clearing houses in the US are FedWire and CHIPS, which are grossing and netting systems, respectively. Their combined volume is roughly 300,000 transactions totaling $2 trillion daily. We contrast grossing and netting systems with respect to cost, efficiency, responsiveness and risk.

4) Channels for Insurance, ***Avi Giloni***, NYU, Stern Sch. of Bus., 44 W. 4th St., MEC 8-154, New York, NY 10012, agiloni@stern.nyu.edu, ***P.V. Kamesam***, ***Sridhar Seshadri***

Distribution Channel Design for Insurance Firms. The insurance industry is

going through a major transition. Regulatory changes and technological advances are leading to a rethinking of the channels of distribution. We will present a model for channel design that can lead to different channel selections depending on the strategies adopted.

TD30 Supply Chain Models

Sponsor: Manufacturing & Service Operations Management Society Sponsored Session

Chair: Paul Zipkin, Duke University, Fuqua Sch. of Bus. Admin., Durham, NC 27708-0120, paul.zipkin@duke.edu, zipkin@mail.duke.edu

1) Optimal & Near-Optimal Policies for an Assemble-to-Order Inventory System, ***Jing-Sheng Song***, University of California, Grad. Sch. of Mgmt., Irvine, CA 92697, jssong@uci.edu, ***Shaohui Zheng***

We examine a 2-item ATO inventory system, in which we replenish the stocks for the components from outside suppliers, but final products are assembled only when customer orders are realized. The focus point is the structure of optimal and near optimal component inventory control policies.

2) Selling to the Newsvendor, ***Martin Lariviere***, Duke University, Fuqua Sch. of Business, Durham, NC 27708, larivier@mail.duke.edu, ***Evan L. Porteus***

A manufacturer sells to a newsvendor and uses a price-only contract. Although failing to coordinate the system, such terms are common in practice. We present conditions for a unique optimal price, relate characteristics of the price to the demand distribution, and examine the extent of the coordination loss.

3) Analysis of a Production-Inventory System under a Stationary Demand Process & Forecast Updates, ***L. Beril Toktay***, INSEAD, Bld. de Constance, Fontainebleau, Cedex, 77305, France, beril.toktay@insead.fr, ***Lawrence M. Wein***

We compare the value of information use and quality in a capacitated production-inventory system using forecast update information to release orders. We demonstrate that the value of decisions regarding the usage of information, i.e., length of planning horizon, aggregation level, etc., is low compared to that of correct forecast model specification.

4) Supply Contract with a Single Opportunity to Adjust, ***Yehuda Bassok***, University of Washington, Sch. of Bus., Box 353200, Seattle, WA 98195, yehuda@u.washington.edu, ***Kamran Moinzadeh***

We consider a supply chain with a supplier and N retailers. In addition to periodic commitments, each retailer has the flexibility to purchase any quantity/adjust only in one period. Optimal timing of adjustment periodical commitments and conditions that justify such supply-contracts are presented.

TD31 Inventory Models III

Contributed Session

Chair: James O. Flynn, Cleveland State University, 1801 E 12th St., Ste. 1007, Cleveland, OH 44114, j.flynn@popmail.csuohio.edu

1) withdrawn - author request of 3/16, ***Emoke M. Bazsa***, Erasmus University, Econometric Inst., Rm. H11-30, PO Box 1738, Rotterdam, 3000DR, The Netherlands, bazsa@few.eur.nl, ***Hans B. Frenk, Peter W. den Iseger***

2) Inventory Placement in a Supply Chain for a Single Period, ***Chia-Shin Chung***, Cleveland State University, Dept. of Op. Mgmt. & Bus. Stat, 1860 E 18th St., Cleveland, OH 44114, c.chung@popmail.csuohio.edu, ***James O. Flynn, Piotr Z. Stalinski***

We investigate a single-period inventory placement problem for a serial supply chain where the objective is to maximize the probability of achieving a budgeted profit level. We characterize the properties of an optimal solution and provide an iterative procedure for its computation.

3) Order-Based Material Management in a Build-to-Order Environment, ***Turgut Aykin***, Bell Laboratories, MSE Dept., Eng. Research Ctr., PO Box 900, Princeton, NJ 08542, taykin@lucent.com

In manufacturing highly customized products, e.g., data/voice networks, the set of components and the number of each component needed to build a product change from one order to another. We present an order-based approach to determine the component inventory levels needed to achieve an order level service target in this type of manufacturing environment.

4) Selecting T for a Periodic Review Inventory Model with Staggered Deliveries, ***James O. Flynn***, Cleveland State University, 1801 E 12th St., Ste. 1007, Cleveland, OH 44114, j.flynn@popmail.csuohio.edu

Orders arrive in every period and the cost of receiving them is small, as in JIT. Every T periods, one audits the stocks and chooses delivieries for the next T periods, thus incurring fixed costs. We study the problem of finding a T that minimizes the expect average cost.

TD32 Advances in Enterprise Integration

Cluster: Advances in Enterprise Integration

Invited Session

Chair: Ping Yi Chao, National Sun Yat-Sen University, Dept. of Mech. Eng., Kaohsiung, Taiwan, ROC, chaopy@mail.nsysu.edu.tw

Co-Chair: Charles V. Trappey, George Mason University, Fairfax Ecrc, 10640 Page Ave., Ste. 400, Fairfax, VA 22030-4000, ctrappey@mason.gmu.edu

1) Electric Commerce for Shipbuilding Supply Chains, ***Tom Gulledge***, George Mason University, Policy Analysis Ctr., Fairfax, VA 22030-4444, gulledge@gmu.edu, ***Ronil Hira, John Liuzzi, Rainer Sommer***

We describe our experiences in implementing VAN-based EDI in a shipbuilding supply chain. Many SMEs accept the EDI mandate to preserve a business relationship. We also describe the utility of EDI and EC technologies and provides our experiences in trying to implement EDI in this supply chain.

2) CALS-Based Integrated Product Data & Document Management, ***Amy J. C. Trappey***, George Mason University, Fairfax ECRC, 10640 Page Ave., Ste. 400, Fairfax, VA 22030-4000, atrappey@mason.gmu.edu, ***Rong-Hui Lu***

Our research focuses on developing integrated data model using ISO data modeling standard (EXPRESS) to build database consisting of both product data and document for product research and development. Document is to be generated in SGML format and product data is to comply with ISO10303 AP203.

3) Electronic Commerce for Retail Transactions, ***Charles V. Trappey***, George Mason University, Fairfax ECRC, 10640 Page Ave., Ste. 400, Fairfax, VA 22030-4000, ctrappey@mason.gmu.edu

We address the functional structure of electronic retail market places, associated pricing mechanisms and links between suppliers and manufacturers. The transaction costs for internet-based retailing are compared to costs for traditional retailing. The process and data modeling issues are addressed, as are issues concerning the impact on distribution intermediaries and consumers.

4) A Data Exchange Framework for Networked CAD/CAM, ***Ping Yi Chao***, National Sun Yat-Sen University, Dept. of Mech. Eng., Kaohsiung, Taiwan, ROC, chaopy@mail.nsysu.edu.tw, ***Yu-chou Wang***

We propose an architecture for networked CAD/CAM. Users on different sites of the network can share their product information with each other. The STEP representation is used for information sharing. The architecture uses current communication tools to transfer files. With the proposed architecture, concurrent engineering is made easier and product development will be more efficient.

5) Personal Computer Configuration Management Using STEP Compatible Data Model for Global Manugustics, ***Yin-Ho Yao***, National Tsing Hua University, Dept. of IE, Hsinchu, Taiwan, ROC, d867809@oz.nthu.edu.tw, ***Amy J. C. Trappey***

Our research focuses on developing a PC configuration management system using ISO product data modeling standards to support the industry's global manugistic realization. Through the application of ISO10303 and ISO10007-based CM procedure, the CM-related data can be exchanged between PDM systems for data sharing and enterprise integration.

TD33 Reliability

Contributed Session

Chair: William S. Griffith, University of Kentucky, Dept. of Statistics, Lexington, KY 40506-0027, griffith@ms.uky.edu, http://www.ms.uky.edu/~griffith

1) Optimal Network Reliability Allocation with Generalized Redundancies for Components, ***Yash P. Aneja***, University of Windsor, Fac. of Business, 401 Sunset Ave., Windsor, Ontario, N9B 3P4, Canada, aneja@uwindsor.ca, ***K. P. K. Nair, R. Chandrasekaran***

For an s-t network, for each edge, we have a finite choice set of components,

each with different cost and reliability. For a desired system reliability, we need to determine the choice for each component with the objective of minimizing total costs. We provide fully polynomial approximation schemes for series-parallel reducible graphs.

2) A Warranty Model with Shelf Life, ***Hakan Polatoglu***, Protek Computer Systems, Inc., Perpa Elektrokent, No. 1981 Okmeydani, Istanbul, 80270, Turkey, hpolatog@protek.com.tr

We introduce a warranty model with shelf life which should lead to lower warranty administration, claim processing and dispute resolution costs. We analyze the cost structure of the model, discuss policy issues and provide some numerical examples to demonstrate the managerial implications.

3) Efficient Solution Schemes in Optimal Redundant Assignment for Series-Parallel Reliability Networks, ***Ngok Lam***, Chinese University of Hong Kong, SE/EM Dept., Shatin, Hong Kong, China, nlam@se.cuhk.edu.hk, ***Duan Li***, ***Xiao-Ling Sun***

Optimum resource allocation of series-parallel reliability network bears a characteristic that redundant components should be placed to the subsystems in descending order of their reliabilities. Further research identifies an upper bound for the difference between component redundancy levels. An efficient solution algorithm has been developed for this nonlinear integer programming problem.

4) Component Importance in Multistate Systems & Voter Power, ***William S. Griffith***, University of Kentucky, Dept. of Statistics, Lexington, KY 40506-0027, griffith@ms.uky.edu, http://www.ms.uky.edu/~griffith

Various connections have been made between the modeling of component importance in binary systems reliability theory and the modeling of voter power in 2 candidate elections. The connections between multistate systems reliability theory and multicandidate elections involve some issues which do not arise in the binary case.

5) Distribution-Free Confidence Interval Estimation for Multivariate Functions: Applications to System Availability, ***Jeffrey D. Havlicek***, US Air Force, 5487A Pine St., Fairchild AFB, WA 99011-2211, havlicej@afotec.af.mil

Distribution-free statistics and conditioning are used to develop a CI for a parameter estimated by a function of n independent random variables. The technique is applied to a reliability test scenario where a CI for the availability of a repairable system must be developed using limited information.

TD34 FMS Performance Issues I

Cluster: Flexible Manufacturing Systems
Sponsor: IFORS
Invite/Sponsor Session
Chair: Ashok Kumar, Grand Valley State University, 301 W Fulton, Grand Rapids, MI 49504, kumara@gvsu.edu

Co-Chair: Kathryn E. Stecke, University of Michigan, Sch. of Business Admin., 701 Tappan Rm. 5206, Ann Arbor, MI 48109-1234, kstecke@umich.edu

1) A Model for Using Activity-Based Costing in Flexible Manufacturing Systems, ***Tamas Koltai***, Technical University of Budapest, Dept. of Ind. Mgmt., Huegyetem RT 9 Bld., Budapest, 1111, Hungary, koltai@wg.bwe.hu, ***Sebastian Lozano***, ***Fernando Guerrero***

FMSs are designed to integrate the flexibility of job shops and the efficiency of mass production systems. Product costing methods have to adapt to this new technological environment. We introduce the concept of flexible costing in FMSs and propose a method that modifies the overhead allocation based on the results of the production plan and on the simulated performance of the process.

2) An Activity-Based Throughput Management Model for Flexible Manufacturing Systems, ***Mahesh Gupta***, University of Louisville, School of Bus., Louisville, KY 40292, mcguptol@homen.louisville.edu, ***Chun Hung Cheng***

We study an activity-based throughput management model for a company operating in a flexible manufacturing environment. We identify and analyze activities and their associated cost drivers used to trace costs to products. The proposed model helps manufacturing managers exploit bottleneck activities by efficiently using the expensive resources in a flexible manufacturing environment...

3) Impact of Uncertainty in Information Delays on Scheduling Semi-Automated Flexible Systems, ***Ashok Kumar***, Grand Valley State University, 301 W Fulton, Grand Rapids, MI 49504, kumara@gvsu.edu, ***Rahul Caprihan***, ***Kathryn E. Stecke***

We investigate the impact of incorporating stochasticity into the duration of information delays on the makespan achieved by an FMS under various system parameterizations. A system parameterization is characterized by the level of its routing flexibility, number of pallets and types of sequencing and dispatching rules used.

TD35 Education Issues

Contributed Session
Chair: Cerry M. Klein, University of Missouri, E3437 Eng. Bldg. East, Dept. of IMSE, Columbia, MO 65211, klein@ecn.missouri.edu

1) Using Hypermedia Resources for Teaching Operations Research, ***Stephan Kassanke***, University of Paderborn, DS & OR Lab., Warburger Str. 100, Paderborn, 33098, Germany, kass@uni-paderborn.de, http://dsor.uni-paderborn.de/, ***Leena Suhl***

We discuss the hypermedia learning environment, ORWelt (OR-World). ORWelt covers topics such as LP/MIP, network optimization and simulation as well as applications and case studies. Additionally, we present ClipMOPS, a spreadsheet-based, interactive solver. ClipMOPS offers an intuitive model representation and is able to solve LP and MIP models.

2) Casting Program Introduction along Product Innovation Models, ***Rachna Kumar***, US International University, 10455 Pomerado Rd., San Diego, CA 92131, rkumar@usiu.edu

The introduction of new degree programs has several design and implementation issues fraught with risks and uncertainties. Curriculum design, customization for existing resources and faculty environments are examples. We present a comprehensive framework based on product innovation and new product introduction models in management literature to aid new program design.

3) Integrated Curriculums through OR Methods, ***Cerry M. Klein***, University of Missouri, E3437 Eng. Bldg. East, Dept. of IMSE, Columbia, MO 65211, klein@ecn.missouri.edu

The integration of curriculum is a method to enhance the learning environment of students. OR models can be used to aid the integration of material. Examples from an experimental course are given and outcomes are discussed.

4) Relation Between Attitude & Performance: A Study in Web-Based Instruction, ***Siva R. Sankaran***, California State University, Dept. of Acct. & MIS, 18111 Nordhoff St., Northridge, CA 91330-8372, siva@pacbell.net

University students were studied regarding their attitude toward lecture vs. web-based instruction. Significant results indicated that students with perceived computer expertise preferred the Web format. They believed Web courses offer more convenience and will increase interest in school. In terms of performance, GPA was the best predictor, not attitude to Web.

5) Trials & Triumphs Teaching Team-Based Business Statistics, ***Susan Sanchez***, University of Missouri, Sch. of Bus. Admin., 8001 Natural Bridge Rd., St. Louis, MO 63121-4499, susan_sanchez@umsl.edu

We describe what worked well (and what didn't) in a non-traditional format for a junior-level business statistics course. An active learning approach fostered student teamwork for exam preparation and class participation. Our responses to special challenges faced by incoming community college transfer students may provide lessons for other urban institutions.

TD37 Software Demonstration VI

Chair: To be announced

1) Software Demonstration: eSocrates Web Learning Environment, ***Paul Shrivastava***, eSocrates, 425 Pheasant Ridge Rd., Lewisburg, PA 17837, socrates@esocrates.com

This unique software and Web hosting service allows instructors to create and launch their own courses on the Internet in a few hours without learning any programming or Web server maintenance. We will demonstrate how you can create your course Web sites with a Bulletin Board, Quizzer with Automatic Grading, Chatroom, Class email, Grade Tracker and 800 links to WWW teaching resources...

2) Software Demonstration: CB Predictor, ***Ben Bouillion***, Decisioneering Inc., 1515 Arapahoe St., Ste. 1330, Denver, CO 80202, bbouillion@decisioneering.com

Decisioneering is proud to introduce CB Predictor to its arsenal of risk analysis products. CB Predictor incorporates the most advanced methods of Time-Series-Forecasting (TSF) into an easy-to-use microsoft Excel add-in. TSF techniques analyze historical data to predict future performance. Decisioneering's other risk analysis produces include Crystal ball, Crystal Ball

Pro and CB Turbo.

Tuesday 16:30-18:00

TE01 Research Perspectives in MHT I

Cluster: MHT as a Health Profession
Invited Session

Chair: Thomas R. Prince, Northwestern University, Kellogg Grad. Sch. of Mgmt., 2001 Sheridan Rd., Evanston, IL 60208

1) Assessing Medical Technology Investments in Community Hospitals for Financial Viability, ***Thomas R. Prince***, Northwestern University, Kellogg Grad. Sch. of Mgmt., 2001 Sheridan Rd., Evanston, IL 60208

2) Measuring the Impact of New Technology in the Clinical Laboratory, ***David Wilkinson***, Virginia Commonwealth University, Dept. of Pathology, PO Box 980662, Richmond, VA 23298-0662

3) Conforming Medicine in Principals of Management: A Thankless Task?, ***Ann L. Greer***, University of Wisconsin, Dept. of Sociology, Milwaukee, WI 53201-0413

4) The Research Services Organization: A Program to Attract Industry-Sponsored Research & Enhance Quality & Productivity, ***Mark S. Paller***, University of Minnesota, Academic Health Ctr., Box 406, 420 Delaware St. SE, Minneapolis, MN 55455, ***Debra A. Dykhius***, ***Frank B. Cerra***

TE04 Global Optimization in Stochastic Programming

Cluster: Global Optimization
Sponsored Session

Chair: Shabbir Ahmed, University of Illinois, Dept. of MIE, 40 MEB, MC-244, 1206 West Green St., Urbana, IL 61801, s-ahmed1@uiuc.edu
http://www.cen.uiuc.edu/~s-ahmed1

1) Two-Stage Stochastic Integer Programs From Global-Optimization Viewpoint, ***Ruediger Schultz***, Gerhard-Mercator University Duisburg, Dept. of Math, Lotharstr. 65, Duisburg, D-47048, Germany, schultz@zib.de

When introducing integer requirements into traditional 2-stage linear stochastic programs, the latter become non-convex and, thus, challenge for global optimization. We elaborate the structure of two-stage stochastic integer programs, discuss algorithmic approaches and demonstrate that a method combining dual decomposition with B&B is able to solve quite substantial problem instances.

2) Solution Methods for Nonconvex Recourse Problems in Stochastic Airline Crew Scheduling, ***Joyce Yen***, University of Michigan, Dept. of IOE, Ann Arbor, MI 48129, jyen@engin.umich.edu, ***John R. Birge***

We model the airline crew scheduling with random delays problem as a stochastic program. This model has non-convex decision variables. We use B&B to find optimal solutions. We have data from 2 airlines, one large domestic and one small international airline and will report on latest results.

3) A Finite Branch & Bound Scheme for Two-Stage Stochastic Integer Programs, ***Shabbir Ahmed***, University of Illinois, Dept. of MIE, 40 MEB, MC-244, 1206 West Green St., Urbana, IL 61801, s-ahmed1@uiuc.edu http://www.cen.uiuc.edu/~s-ahmed1, ***Mohit Tawarmalani***, ***Nick Sahinidis***

We consider the 2-stage stochastic integer program with continuous first stage variables and binary second stage variables. After transforming the problem into the space of the tender variables, we derive several lower bounding techniques. We develop a branching scheme that produces finitely terminating B&B algorithm for this problem.

TE05 Information Systems I

Contributed Session

Chair: Robert Mahaney, University of Kentucky, 425 Gatton B&E Bldg., Lexington, KY 40506-0034, rcmaha00@pop.uky.edu

1) The Adoption of Electronic Data Interchange: A Model & Practical Tool for Managers, ***Frederick Kaefer***, Loyola University, Chicago, IL, fkaefer@wpo.it.luc.edu, ***Elliot Bendoly***

We develop a model and decision support tool for identifying the cost effectiveness of EDI adoption. The model presented allows for the simultaneous adoption of multiple modes of communication. The appropriateness of EDI adoption is predicted with greater than 85% accuracy using our decision support tool.

2) Strategic Information Systems Comprehensiveness in an Uncertain Environment, ***Henry E. Newkirk***, University of Kentucky, 425-S B&E Bldg., Lexington, KY 40506-0034, henewk0@pop.uky.edu, ***Albert L. Lederer***

Comprehensiveness in strategic information systems planning (SISP) may predict SISP effectiveness in an uncertain environment. 2 hypotheses describe expected relationships among comprehensiveness, effectiveness, and environmental uncertainty. One predicts a nonlinear relationship between comprehensiveness and effectiveness. Future managers and researchers will benefit from understanding the results of testing the hypotheses.

3) Escalating Commitment to Runaway Information System Projects, ***Robert Mahaney***, University of Kentucky, 425 Gatton B&E Bldg., Lexington, KY 40506-0034, rcmaha00@pop.uky.edu, ***Albert L. Lederer***

Project, psychological, social and organizational determinants can lead to escalating commitment by a project manager to IS development projects. Such commitment may produce runaway projects. Agency theory illustrates psychological determinants by explaining the relationship between a principal, i.e., project sponsor, and an agent, i.e., project manager.

4) Perceived Service Quality & Customers' Intention to Reuse Internet-Based Services, ***Changsoo Sohn***, Southern Illinois University, Dept. of Mgmt., Carbondale, IL 62901, changsoo@siu.edu, http://www.cba.siu.edu/changsoo

Internet-based service companies cannot compete with only low cost; they must provide high quality service. Since traditional SERVQUAL concepts are not based on Internet markets, they are difficult to apply for internet-based service companies. This study develops new constructs to measure service quality for Internet-based companies and analyzes impacts on customers' reuse.

TE06 Applications in the Automotive Industry

Cluster: OR Applications in Automotive Industry
Invited Session

Chair: Daniel J. Reaume, Gneral Motors R&D Center, Enterprise Systems Lab., MC 480-106-359, Warren, MI 48090-9055, daniel_reaume@notes.gmr.com

1) The Use of Traffic-Responsive Signal Controllers to Improve the Traffic Equilibrium, ***Isaac R. Porche***, RAND Corporation, Tech. & Applied Sciences, 1700 Main St., PO Box 2138, Santa Monica, CA 90407, porche@range.org

Real-time adaptive signal controllers are an emerging class of signal controllers which can be used effectively to encourage improved route selection of network drivers, especially when drivers anticipate the decisions of others in their choice. We discuss procedures to bias the objective functions of locally deployed real-time adaptive signal controllers to meet the aforementioned goal.

2) A Simulation Feedback Technique for Large-Scale Non-Uniform ATIS User Base Generation, ***Karl Wunderlich***, MITREtek Systems, Inc., 600 Maryland Ave. SW, Ste. 755, Washington, DC 20024, kwunderl@mitretek.org

An active area of current research is in the use of modeling techniques to estimate the impacts of ATIS deployment. Since the size and distribution of the ATIS user base is extremely difficult to predict, modelers have typically considered only various uniform geographic and temporal distributions of ATIS users...

3) Practical Models for Preventive Maintenance, ***Lisa M. Maillart***, University of Michigan, Dept. of IOE, Ann Arbor, MI 48109, maillart@engin.umich.edu, ***Stephen M. Pollock***, ***Jeffrey M. Alden***, ***Daniel J. Reaume***

Although their benefits have been well documented, preventive maintenance efforts are often inefficiently managed due to complex system interactions and difficulties with data collection. We present simple yet extremely useful models of preventive maintenance which are easily implemented with minimal data requirements.

TE07 Internet Applications: Technology II

Contributed Session

Chair: Chaiho Kim, Santa Clara University, Dept. of OMIS, School of Bus., McKenna Hall, Santa Clara, CA 95053, ckim@scu.edu

1) A Modular Software Agent Approach to Support Auctions on the Internet, ***F. Bodendorf***, Univ. of Erlangen-Nuremberg,

Lange Gasse 20, Nuremberg, 90403, Germany, bodendorf@wiso.uni-erlangen.de www.wi2.uni-erlangen.de, ***O. Hofmann***, ***D. Deschner***

Agent-based systems can support coordination tasks in an intelligent way. An approach to use a multiagent system for auctions and negotiation on the Internet is introduced. Coordination behavior of the agents is modeled by speechacts and product nets.

2) Application of Web-Enabled Fuzzy Genetic Systems, ***Ratan K. Saini***, Dayalbagh Educational Institute, Dayalbagh, Agra UP, 282005, India, dei@vsnl.com

Information processing and content support have been identified as 2 major components of group decision making. Recent developments in these 2 areas have been exploited to design and develop an intelligent group decision making and support system for efficient and effective management of operational organizations.

3) Web-Based Supply Chain Management Applications for Manufacturing Companies, ***Chaiho Kim***, Santa Clara University, Dept. of OMIS, School of Bus., McKenna Hall, Santa Clara, CA 95053, ckim@scu.edu, ***Steven Nahmias***, ***Wesley S. Shu***

We identify different types of Internet-based supply chain management applications for manufacturing companies, discuss their current uses and explore their impact on performance measures such as costs, times, quality and customer satisfaction. Our findings are based on published literature, Web postings and personal interviews.

TE08 Airline Applications

Contributed Session

Chair: Julian E. Pachon, University of Miami, 8846 SW 72nd St., Apt. H352, Miami, FL 33173, jpachon@coeds.eng.miami.edu, http://www.eng.miami.edu/~jpachon

1) A Comparison of Center/TRACON Automation Systems & Airline Time of Arrival Predictions, ***Karen R. Heere***, Raytheon, NASA Ames Research Ctr., MS 210-8, Moffett Field, CA 94035, heere@osprey.arc.nasa.gov, ***Richard E. Zelenka***, ***Rose Y. Hsu***

A statistic-based comparison of aircraft times of arrivals between CTAS air traffic control scheduling and airline predictions is presented. CTAS is found to provide much improved values, forming the foundation for airline operational improvements as observed during an airline field trial of a CTAS display.

2) A Combined Crew Partitioning - Bidlines Generator System, ***Julian E. Pachon***, University of Miami, 8846 SW 72nd St., Apt. H352, Miami, FL 33173, jpachon@coeds.eng.miami.edu, http://www.eng.miami.edu/~jpachon, ***Juan C. Morales***

The great expansion of airlines during the last decade, which generated new destinations, more frequent flight legs and increased their fleet size and crew members, has created opportunities for modeling and optimizing the design of different processes that all airlines front. We present an overview of the crew-partitioning optimization and generating crew bidlines problems...

3) Airline Seat Allocation among Multiple Fare Classes using Reinforcement Learning, ***Tapas K. Das***, University of South Florida, Dept. of IMSE, Tampa, FL 33620-5350, das@eng.usf.edu, ***Abhijit Gosavi***

Maximizing revenues generated from the sale of seats in an aircraft among different fare classes is an important problem faced by the airline industry. We solve the problem by using the semi-Markov decision model with a new multistep reinforcement learning algorithm.

TE09 Heuristic Programming

Contributed Session

Chair: Heiner Muller-Merbach, Universitat Kaiserslautern, PO Box 3049, Kaiserslautern, D-67653, Germany, hmm@sozwi.uni-kl.de http://www-biro.sozwi.uni-kl.de/

1) Computational Comparison of New Metaheuristics for the Vehicle Routing Problem, ***Anthony F. Han***, National Chiao Tung University, Dept. Transport. Eng. & Mgmt., 1001 Ta Hsueh Rd., Hsinchu, 300, Taiwan, afhan@cc.nctu.edu.tw, http://www.tem.nctu.edu.tw/~afhan/, ***Yuh-Jen Cho***

We applied 5 new metaheuristics, i.e, threshold accepting, great deluge algorithm (GDA), record-to-record travel, noising method and search space smoothing, for solving the VRP. Eleven benchmark problems were selected to test and compare the 5 metaheuristics. GDA yielded the best results with 0.32% accuracy deviation from best-known solutions.

2) New Performance Measures for Discrete Optimization Algorithms, ***Sheldon H. Jacobson***, Virginia Polytechnic Institute, Dept. of ISE, MS 0118, Blacksburg, VA 24061, jacobson@vt.edu, http://www.vt.edu:10021/eng/ise/jacobson/shj1.html, ***Enver Yucesan***

We present new performance measures for discrete optimization algorithms. These measures are used to assess the asymptotic and finite-time performance of generalized hill climbing algorithms. Theoretical and practical implications of these measures for various search strategies are discussed.

3) Tabu Search Memory Strategies for Solving the Early/Tardy Scheduling Problem, ***Ross J. James***, University of Canterbury, Dept. of Mgmt., Private Bag 4800, Christchurch, 4800, New Zealand,rjames@mang.canterbury.ac.nz,www.mang.canterbury.ac.nz/people/ross

We examine different TS longer-term memory strategies for solving the early/tardy machine scheduling problem. Computational experiments indicate that longer-term memory increases search performance, but not significantly better than a random restart procedure. Longer-term memories incorporated into the candidate selection procedure provided significantly better results.

4) The LP Transportation Problem: New Heuristics for Initial Solutions & Matrix Reduction, ***Heiner Muller-Merbach***, Universitat Kaiserslautern, PO Box 3049, Kaiserslautern, D-67653, Germany, hmm@sozwi.uni-kl.de http://www-biro.sozwi.uni-kl.de/

Some highly efficient initial solution and matrix reduction heuristics for the LP transportation problem will be presented which are not commonly applied (or referred to in the contemporary literature). Computational experience will be reported. Some of the findings are relevant for other problems, such as the TSP.

TE10 Structuring & Quantifying Values

Sponsor: **Decision Analysis Society**

Sponsored Session

Chair: Detlof von Winterfeldt, University of Southern California, Sch. of Policy Planning & Dev., Los Angeles, CA 90089

1) Decision Structure as Therapy for Decision Process: The Tillamook National Estuary Plan Case Study, ***Tim McDaniels***, University of British Columbia, Eco-Risk Res. Unit., Rm. 415, 6333 Memorial Rd., Vancouver, BC V6T 1Z2, Canada, ***Robin Gregory***

We argue that an insightful decision structure is a fundamental construct for defining quality for a decision process, evaluating a decision process and providing "therapy" in overcoming pitfalls in a decision process. A case study of the Tillamook National Estuary Plan illustrates these points.

2) Structuring Values & Exploring Tradeoffs in a Controversial Decision Context, ***Thomas Eppel***, Decision Insights, Inc., 2062 Business Center Dr., Ste 110, Irvine, CA 92612, tomeppel@aol.com

We will summarize the process and the results of incorporating value judgments from different stakeholder groups in a decision context that has evoked significant controversies. Results of sensitivity analyses that explore the impact of different tradeoff judgments on the most preferred alternative are discussed.

3) The Prominence Effect in MAU Assessment: Causes & Corrective Procedures, ***Gregory W. Fischer***, Duke University, Fuqua School of Business, Durham, NC 27708, fischer@mail.duke.edu

We will describe new research regarding the causes of the prominence effect, a discrepancy between attribute weights expressed in choice and tradeoff judgments. We will also address the practical significance of the bias and methods for reducing it.

4) Quantifying Tradeoffs for Means & Ends Objectives, ***Ralph L. Keeney***, University of Southern California, Ctr. for Telecom. Mgmt., 101 Lombard St., Ste. 704W, San Francisco, CA 94111, keeneyr@aolcom, ***Detlof von Winterfeldt***

We developed ends and means objectives and associated measures for decisions involving major environmental hazards. Five nationally known value experts provided tradeoffs for the ends objectives. Using simple models, we then calculated the implied tradeoffs for the means objectives.

TE11 Verification, Validation & Accreditation

Cluster: **Verification, Validation & Accreditation**

Invited Session

Chair: Marion L. Williams, 8500 Gibson Blvd. SE, Albuquerque, NM 98117, williamm@afotec.af.mil

1) Joint Warfare System Verification & Validation Processes, Plans & Lessons Learned, ***Michael Metz***, Innovative Management Concepts Inc., 45625 Willow Pond Plaza, Sterling, VA 20164, mmetz@imcva.com

We describe how the JWARS V&V process was designed, how the V&V plan

was developed and the lessons learned thus far from the execution. Included are the constraints that guided the process development and plan. We also describe the automated tools and processes used in the V&V effort.

2) The Integration of T&E and Verification & Validation, ***Priscilla Glasgow***, The MITRE Corp., 1820 Dolley Madison Blvd., W626, McLean, VA 22102, pglasgow@mitre.org

We will contine previous research on the relationship of the T&E process with the verification, validation and accreditation process which assesses the credibility of models and simulations. We will focus on case study findings from the JWARS, the flagship simulation for military joint campaign analysis.

3) Verification, Validation & Accreditation of the Joint Tactical Simulation, ***Suzanne M. Beers***, HQ AFOTEC/CNR, 8500 Gibson Ave. SE, Kirkland AFB, NM 87117-5558, beerss@afotec.af.mil

The Air Force Security Forces intended to use the JTS to train their combat operations personnel and for analysis of their tactics and doctrine within their newly formed Security Protection Battlelab. In order to have confidence in the JTS as a training and analysis tool, the AF/SF requested AFOTEC conduct a V&V and provide an accreditation recommendation to their commander...

4) Avoiding the Seven Deadly Sins of Verification, Validation & Accreditation when Evaluating Models for Force Analyses, ***Paul K. Davis***, RAND Corp., paul_davis@rand.org

We discuss 7 common sins related to VV&A that suppress good analysis, insight, innovation and competition in pursuit of bureaucratic and organizational matters. We then discuss a more enlightened approach that takes risk and uncertainty seriously and that reflects appropriate humility about our knowledge of future warfare. It supprts using models to develop future forces that are supremely adaptive.

TE12 Resource Allocation: Computers & Manufacturing

Contributed Session

Chair: John S. Hollywood, MIT, 77 Massachusetts Ave., Rm. E40-130, Cambridge, MA 02139, jshollyw@mit.edu, http://web.mit.edu/jshollyw/www

1) An Exact Solution Method for the Short-Term Capacity Allocation Problem, ***Elif Akcali***, Purdue University, School of IE, 1287 Grissom Hall, West Lafayette, IN 47907-1287, akcali@ecn.purdue.edu, ***Reha Uzsoy***

We address the short-term capacity allocation problem in semiconductor manufacturing. We formulate the problem as a maximum flow model on a bipartite network with integer side constraints and develop a pre-push flow-based B&B algorithm.

2) Comparison of Two Kanban Allocation Metamodels in JIT Production Systems: Neural Networks vs. Regression Models, ***Mehmet Savsar***, Kuwait University, College of Eng., PO Box 5969, Safat, Kuwait, 13060, Kuwait, mehmet@kuc01.kuniv.edu.kw, ***Hisham M. Choueiki***

Two kanban allocation metamodels are compared for a JIT production control system. First, regression models are develped and used to determine the optimum kanban allocation for a given JIT production line. Then, the regression results are compared to the previous kanban allocation results, which were obtained by using neural network metamodels.

3) A Tactical Model for the Dynamic Scheduling of Multi-Resource Jobs in Data-Processing Networks, ***John S. Hollywood***, MIT, 77 Massachusetts Ave., Rm. E40-130, Cambridge, MA 02139, jshollyw@mit.edu, http://web.mit.edu/jshollyw/www, ***Athicha Muthitacharoen***, ***Stephen C. Graves***

We consider data-processing networks in which computing jobs enter dynamically and use multiple resources simultaneously, i.e., processor, memory, communications, etc. We describe a tactical model that applies different scheduling heuristics to the network depending on the type and status of the network.

TE13 Strategic Planning

Contributed Session

Chair: Jo Min, Iowa State University, IMSE Dept., 205 Engineering Annex, Ames, IA 50011, jomin@iastate.edu

1) A Fully-Featured Strategic Sourcing Model, ***Alan J. Kosansky***, Profit Point, Inc., 713 Dover Rd., Wynnewood, PA 19096, profitpt@aol.com, ***Joseph R. Litko***

We present a product sourcing model which involves the full range of factors crucial to decisions: production costs, swaps with and purchases from regional competitors, in-bound raw materials costs, parcel-size dependent transportation costs, inventory costs which account for safety and cycle stock as well as strategic inventory builds.

2) In Search of Strategic Operations Research, ***Chris K. Anderson***, University of Western Ontario, Ivey Sch. of Business, London, Ontario, N6A 3K7, Canada, canderson@ivey.uwo.ca, ***Peter C. Bell***

Operational researchers have been slow to recognize the strategic importance of OR. There exists little, if any, literature focused on OR as a business strategy, even though successful OR has clearly been part of the business strategy of several major firms. The Edelman Prize finalist articles published from 1990-1998 are examined in an effort to evaluate the strategic significance of these OR applications...

3) Divisionalization Study for a Symmetric Oligopoly, ***Jo Min***, Iowa State University, IMSE Dept., 205 Engineering Annex, Ames, IA 50011, jomin@iastate.edu, ***P. S. Subramaniam***

We construct and analyze a symmetric oligopoly model to characterize divisionalization policies based on relevant costs and benefits. This divisionalization behavior is modeled as a 2-stage game and various conditions are derived under which the firms find it optimal to divide. Various managerial insights are obtained.

4) SIMBUST: A Simulation Model of Research & Development Budgeting Strategies, ***Christian Stummer***, University of Vienna, Bruenner Str. 72, Vienna, A-1210, Austria, christian.stummer@univie.ac.at, ***Alexander Schillinger***

Determining times and level of investments in R&D are certainly among the crucial decision problems for firms to achieve their long-term global market goals. We present a stochastic simulation model to assess various strategies for R&D budgeting and discuss our key findings.

TE14 Baseball Strategy

Cluster: Sports & Games in OR/MS
Invited Session

Chair: Robert M. Saltzman, San Francisco State University, 1600 Holloway Ave., Coll. of Bus., San Francisco, CA 94132-1722, saltzman@sfsu.edu

1) The Intentional Walk: When is it the Correct Strategy?, ***Steven Steinsaltz***, Emmanuel College, Dept. of Math., 400 The Fenway, Boston, MA 02115, steins@emmanuel.edu

In baseball, sometimes an intentional walk appears to be the obvious play, while other uses become hotly debated. Since many managers use computers and statistics to decide on other strategies, the question arises: When is an intentional walk the correct strategy using probabilities (such as batting average and on-base percentage)?

2) Operations Research Models for Rotisserie Baseball, ***Eli V. Olinick***, University of California, Dept. of IE/OR, 4135 Etcheverry Hall, Berkeley, CA 94720-1777, olinick@ieor.berkeley.edu

Rotisserie baseball, along with other fantasy sports games, has become increasingly popular in recent years and presents a host of interesting decision problems. We outline key areas of the game where OR can play an important role and present optimization models for addressing common problems faced by rotisserie baseball owners.

3) Wait Till Next year? Some Analysis of Win-Loss Records of Major League Baseball Teams, ***Robert M. Saltzman***, San Francisco State University, 1600 Holloway Ave., Coll. of Bus., San Francisco, CA 94132-1722, saltzman@sfsu.edu

If our team performs poorly this year, is there any hope for next year? We examine the relationship between team success this year and last year's regular season, this year's exhibition season and at this year's All-Star break. Impacts from free agency and expansion are considered also.

TE15 Issues in Supply Chain Management II

Cluster: Supply Chain Management
Invited Session

Chair: Eric Jack, University of Cincinnati, Dept. of QAOM, Coll. of Bus. Admin., Cincinnati, OH 45221-0130, jacke@email.uc.edu

1) Fill-Rate Optimization Models for Supply Chain Systems, ***Amanda Angle***, University of Cincinnati, Dept. of QAOM, Coll. of Bus. Admin., Cincinnati, OH 45221-0130, ***David F. Rogers***

Multi-echelon inventory management is very important when attempting to influence the performance of a supply chain. Formulation of a complete inventory model requires attempting to achieve minimal inventory levels to reduce holding costs and taking customer satisfaction into consideration. In this paper, four models of multi-echelon inventory systems are considered. Fill-rate

consideration is employed to measure the customer service level.

2) A Taxonomic Review of Supply Chain Management Research, ***Eric Jack***, University of Cincinnati, Dept. of QAOM, Coll. of Bus. Admin., Cincinnati, OH 45221-0130, jacke@email.uc.edu, ***Paul Stephens***

We provide an integrative framework to underscore the variety of research being done to support the SCM concept. We show that the path leading to SCM has evolved over the past 4 decades and that SCM benefits from a variety of concepts that were developed in various disciplines to include marketing, economics, OR, MS, operations management and logistics...

TE16 Cellular Manufacturing: Teaching Cell Design

Cluster: Cellular Manufacturing
Invited Session
Chair: Young B. Moon, Syracuse University, 433 Link Hall, Syracuse, NY 13244, ybmoon@syr.edu

1) Lean Manufacturing System & Cell Design, ***J. T. Black***, Auburn University, Dept. of IE, 207 Dunstan Hall, Auburn, AL 36849-5346, jblack@eng.auburn.edu

The design of the manufacturing system is an important but neglected aspect of concurrent engineering which was focused on the relationships between product design and process design but has often ignored the manufacturing system design. This talk presents issues and principles of manufacturing cells design and how we can teach the subject effectively.

2) Teaching Manufacturing Cell Design in an Industrial Engineering Curriculum, ***Sunderesh S. Heragu***, RPI, DSES Dept., 110 8th St., Troy, NY 12180-3590, herags@rpi.edu

We discuss whether manufacturing cell design should be taught as a separate course in an industrial engineering curriculum. We list the advantages and disadvantages of doing so in a 3-credit course.

3) An Industry Workshop on Cellular Manufacturing, ***Shahrukh A. Irani***, Ohio State University, Dept. of IWSE, 210 Baker Systems Eng. Bldg., Columbus, OH 43210-1271, irani4@osu.edu

We will describe a one-day industry workshop on "Cellular Manufacturing and Focused Factories". The attendees are taught to use production flow analysis for cell formation, capacity and machine requirements analysis with intercell flow analysis, cell layout and shop layout. Supporting changes in the production system and project planning for call implementation are also discussed.

4) A Graduate Course on Manufacturing Cells Design, ***Young B. Moon***, Syracuse University, 433 Link Hall, Syracuse, NY 13244, ybmoon@syr.edu

Experiential learning modules have been developed and adopted to teach students the concept of manufacturing cells design. Students are working in team and engaged in a realistic, but time-and space-compressed situation to learn effective communication, leadership and teamwork in addition to technical issues.

TE17 Models & Approximations in Stochastic Programming

Cluster: Stochastic Programming
Sponsor: Optimization Section
Sponsored Session
Chair: David Morton, University of Texas, Grad. Program in OR, Dept. of Mech. Eng., Austin, TX 78712, morton@mail.utexas.edu

1) A Probabilistic Lower Bound for Stochastic Programming, ***Kevin Wood***, Naval Postgraduate School, OR Dept., Monterey, CA 93943, kwood@nps.navy.mil

2) Short-Term Electricity Contracts: Evaluation & Risk Assessment, ***Samer Takriti***, IBM, TJ Watson Res. Ctr., PO Box 218, Yorktown Heights, NY 10598, takriti@watson.ibm.com, ***Lilian S.-Y. Wu***

3) Operator Splitting Methods for Stochastic Dynamic Optimization Problems, ***Lisa Korf***, University of California, Dept. of Math., Davis, CA 95616

4) Some Stochastic Integer Programming Models, ***David Morton***, University of Texas, Grad. Program in OR, Dept. of Mech. Eng., Austin, TX 78712, morton@mail.utexas.edu, ***Astrid Kenyon***, ***Kevin Wood***

TE18 Integer Programming

Contributed Session
Chair: David J. Rader, Rose-Hulman Institute of Technology, 5500 Wabash Ave., Terre Haute, IN 47803, david.rader@rose-hulman.edu http://www.rose-hulman.edu/~rader

1) A Branch & Bound Algorithm for Generalized Nonlinear Disjunctive Programming, ***Sangbum Lee***, Carnegie Mellon University, Dept. of Chem. Eng., Pittsburg, PA 15213, sangbum@andrew.cmu.edu, ***Ignacio E. Grossmann***

Nonlinear programs are addressed whose constraints are a set of disjunctions involving convex inequalities in continuous variables, and logic propositions whose Boolean variables are related to disjunctive terms. A B&B algorithm is proposed that uses the convex hull of each disjunction. Its performance is compared with current MINLP techniques.

2) Resource Constrained Scheduling of Tests in New Product Development, ***Vipul Jain***, Carnegie Mellon University, Dept. of Chem. Eng., Pittsburgh, PA 15213, vjain@andrew.cmu.edu, http://egon.cheme.cmu.edu/jain, ***Ignacio E. Grossmann***

We present MILP models to maximize the expected value of R&D projects where task failure may lead to project termination. The tradoff is between the greater sales of products from a shorter parallel schedule and the lower expected value of the total cost from a longer, sequential schedule.

3) An Integration of Ordinal Optimization, Evolutionary Computation & Linear Programming for Linear Mixed Integer Programming Problems, ***Yuh-Chyun Luo***, University of Pennsylvania, Dept. of Systems Eng., Philadelphia, PA 19104-6315, ycluo@seas.upenn.edu http://www.seas.upenn.edu/~ycluo, ***Chun-Hung Chen***, ***Monique Guignard-Spielberg***

Long computation time is needed for searching an optimal solution to a complex linear mixed integer programming problem. We present a solution framework which integrates the notions of ordinal optimization, evolutionary computation and LP. Significant time savings can be achieved.

4) Complexity Results for Facets of the Quadratic 0-1 Knapsack Polytope, ***David J. Rader***, Rose-Hulman Institute of Technology, 5500 Wabash Ave., Terre Haute, IN 47803, david.rader@rose-hulman.edu http://www.rose-hulman.edu/~rader

We describe complexity results for 3 classes of facets of the quadratic 0-1 knapsack polytope. We show that, for each of these classes, we can find all lifting coefficients from a sequential lifting in polynomial time. We will also discuss the complexity of recognizing facets from these classes.

TE19 Project Scheduling

Contributed Session
Chair: Arie Weeren, UFSIA, Prinsstraat 10, Antwerpen, B-2000, Belgium, arie.weeren@ufsia.ac.be

1) The Resource Constrained Project Scheduling Problem: Considering Space as a Resource, ***Alan R. McKendall, Jr.***, University of Missouri, E3437 Engineering Bldg. E, Dept. of IE, Columbia, MO 65211, c554858@showme.missouri.edu, ***Cerry M. Klein***, ***James S. Noble***

Traditionally, when the resource constrained project scheduling problem considers space as a resource, an assignment of start times to activities is given as a solution. Then, the space allocation problem is used to assign each activity to a specific location. A technique is given to combine these 2 problems.

2) Resource Leveling in Project Scheduling with Uncertain & Imprecise Information, ***Ines Bloemen***, UFSIA, Dept. of Applied Economics, Prinsstrat 13, Antwerp, B-2000, Belgium, ines.bloemen@ufsia.ac.be, ***Arie Weeren***

We deal with the resource allocation leveling problem by modeling the resource allocation level issue in the objective function instead of using resource constraints. Fuzzy set theory enables us to introduce a fuzzy resource allocation leveling factor which provides crucial information for the decision maker.

TE20 Economics

Contributed Session
Chair: Karl W. Einolf, Mount St. Mary's College, 317 Knott Academic Ctr., Emmitsburg, MD 21727, einolf@msmary.edu

1) Entrepreneurship & Management in Transition Economies: Problems & Possible Solutions, ***Duro Benic***, Fac. of Tourism/Foreign Trade, Lapadska Obala 7, Dubrovnik, 20000, Croatia,

dbenic@ftvt.hr

The absence of entrepreneurs who could forcefully spur economic activity and the low present level of management know-how are sore points for all transitional economies. The analysis of the present situation and possible solutions of these problems are given using the example of the Croation economy.

2) Transition Problems in the Croation Economy, ***Vesna Vrtiprah***, University of Split, Fac. Tourism & Foreign Trade, Lapadska obala 7, Dubrovnik, 20000, Croatia, bvesna@ftvt.hr, ***Ivo Ban***

Croatia chose a market economy following the democratic changes of the early 90s. Numerous problems occurred going from a planned to a market economy, i.e., defined market institutions, foreign investor distrust, drifting through privatization, etc., slowing and burdening this process. Overcoming the transitional challenges will be a long and difficult way.

3) Optimization of the Transport Infrastructure Development Strategy, ***Damir Simulcik***, Vukeliceva 4, Zagreb, HR 10000, Hrvatska, simulcikd@fpz.hr www.fpz.hr, ***Ivan Bosnjak***

We present basic conditions of determining the strategy infrastructure facilities construction and maintenance in the function of attaining already set development strategies of Croatia's tourism. Synchronization as a part of the process of realization is possible to determine the feasibility and capability of those responsible to realize the strategy and development of the transport infrastructure.

4) Transfer Pricing & Network Competition, ***Karl W. Einolf***, Mount St. Mary's College, 317 Knott Academic Ctr., Emmitsburg, MD 21727, einolf@msmary.edu, ***James A. Dearden***

In franchise networks such as the Money Access Card (MAC) system, franchisees charge one another transfer prices. We analyze the transfer price scheme that promotes the optimal network size, network use by customers and investment in the network by its members. We then examine interaction among competing networks.

5) withdrawn - author request of 3/17, ***Erin D. Baker***, Stanford University, 83E Escondido Village, Stanford, CA 94305, bakere@leland.stanford.edu

TE21 Telecommunications I

Contributed Session

Chair: Soumyo D. Moitra, Indian Institute of Management, Diamond Harbour Rd., Joka, PO Box 16757, Alipore, Calcutta, 700 027, India, sdmoitra@hotmail.com

1) Telecommunication Network Structures Design under Conditions of Indeterminancy of the Initial Information, ***Boris V. Peltsverger***, Georgia Southwestern State University, 1034 Elm Ave., Bldg. 4E, Americus, GA 31709, plz@canes.gsw.edu, ***Oleg V. Khavronin***

We discuss a problem of indeterminancy of the initial data associated with designing structures of telecommunication networks. All forms of indeterminancy can be reduced to 2 types: internal and external. Formal statements of problems are presented that reflect these types of indeterminancy and various methods for their description, using the methods of interval analysis and fuzzy sets.

2) Performance Measures for Telecommunications Networks using the Queue Inference Technique, ***Susmit H. Patel***, MITRE Corp., 1820 Dolley Madison Blvd., McLean, VA 22102, spatel@mitre.org

The queue inference technique is being extended to derive new performance measures in telecommunications networks using transactional data only, such as the arrival and departure epochs. These results have been developed to include current/emerging network traffic models such as for circuit, packet and ATM networks.

3) Design of Stacked Self-Healing Rings, ***John G. Klincewicz***, AT&T Labs., 200 Laurel Ave., Rm. D5-3C06, Middletown, NJ 07748, klincewicz@att.com

In telecommunications, a set of self-healing rings is said to be "stacked" if their optical fibers follow the same path. For such structures, it is necessary to determine which nodes should be connected to each of the rings and how traffic should be routed. We describe several variations on this problem and suggest some heuristic solution approaches.

4) The Objective Function for Optimal Telecommunications Network Planning, ***Soumyo D. Moitra***, Indian Institute of Management, Diamond Harbour Rd., Joka, PO Box 16757, Alipore, Calcutta, 700 027, India, sdmoitra@hotmail.com

We review a number of representative objective functions that have been used for optimally designing telecommunications networks. A more general form is proposed which might be suitable for future multimedia networks.

5) Minimal C-Broadcast Networks, ***Shiwoo Lee***, University of Arizona, Dept. of SIE, Box 210020, Old Engineering Bldg., #20, Tucson, AZ 85715, lee@sie.arizona.edu, http://gila.sie.arizona.edu, ***Jose A. Ventura***

C-broadcasting is an information dissemination process where a single message, originated at any node, is transmitted to all other nodes with the restriction that each node having the message can transmit it to at most c neighbors simultaneously. C-MBNs are c-broadcast networks with the minimum c-broadcast time. A network compounding algorithm to generate c-MBNs for any number of nodes is presented.

TE22 MS/OR in Forestry

Cluster: OR/MS in Forestry

Sponsor: Section on Energy, Natural Resources & Environment

Sponsored Session

Chair: Greg J. Arthaud, Yale University, Sch. of Foresty & Env. Studies, 360 Prospect St., New Haven, CT 06511, greg.arthaud@yale.edu

1) Land Management with Biological & Economic Objectives, ***David Calkin***, Oregon State University, Dept. of Forest Resources, Corvallis, OR 97331, calkind@ccmail.orst.edu, ***Claire Montgomery***, ***Stephen Polasky***, ***Nathan Shumaker***, ***Jeff Arthur***

We combine a simulation model of wildlife population dynamics with a timber management module and uses an optimization heuristic (tabu search) to trace out a production relationship between conservation objectives, specified as viability for members of a small set of species, and timber production objectives.

2) Accuracy Assessment of Forest Health Monitoring Data, ***James Pollard***, Harry Reid Center, 4505 Maryland Pkwy., Las Vegas, NV 89154-4009, pollardj@nevada.edu, ***Bill Smith***, ***Bill Bechtold***, ***Craig Palmer***

The Forest Health Monitoring Program is a multi-agency program designed to assess long-term trends in forest ecosystem health nationwide. To estimate data accuracy, we analyzed remeasurement data using a variety of conceptual designs including single versus double blind data collection and known reference plots versus stratified random plot selection.

3) After FORPLAN: Designing the Next Generation Forest Planning Tools, ***Greg J. Arthaud***, Yale University, Sch. of Foresty & Env. Studies, 360 Prospect St., New Haven, CT 06511, greg.arthaud@yale.edu

The traditional methods of harvest scheduling, primarily linear and mixed-integer programming, are not appropriate for many current forest planning issues. We consider current and possible future forest planning problems. Key areas examined include: data requirements (including spatial data), the increasing problems of interdepencies and new approaches to finding optimal or near-optimal solutions...

TE23 Management of Technology: Customers & Strategy

Contributed Session

Chair: Kamal A. Munir, McGill University, Fac. of Mgmt., 1001 Sherbrooke W., Montreal, Quebec, H3A 1G5, Canada, munir@management.mcgill.ca

1) IT, Globalization & Search for Competitive Advantage, ***Nagendra Rao***, IBM Global Government Industry, Bethesda, MD, nsrao@ibm.net, ***L.L. Jayaraman***

IT, coupled with a visionary business strategy, can confer on a company or a city long term returns on investment. Role of information technology in the pursuit of operational economies is better understood compared to strategic positioning in the competitive space. Globalization introduces a new order of complexity, with opportunities, risks and organizational challenges...

2) Influencing Customer Behavior in an Automated Response Systems Environment, ***Avinash G. Tilak***, Advanced Technology Decisions, Inc., 22 North Ridge Rd., Denville, NJ 07834-9629, avi@atdinc.com, ***James Leckinger***, ***Anthony J. Brigandi***

Most people are familiar with the frustrations of calling help lines or customer service and then spending time trying to get the task done. Even hitting "0" doesn't get you to a live person. An intelligent way to improve the design of these automated response systms is to analyze the tasks done in the system and also the tasks not done in the system...

3) Customer Care: Technology & Cost vs. Satisfaction, ***James Leckinger***, AT&T Labs., 290 Davidson Ave., Somerset, NJ 088755,

jleckinger@att.com, ***Avinash G. Tilak***, ***Anthony J. Brigandi***

Most companies are moving towards providing customer care through automated voice response systems. This may result in lowering of customer satisfaction although it saves a lot of money for the service provider. Using newer technologies to perform routine functions can reduce the dissatisfaction with the process...

4) Strategizing During Eras of Ferment: A Dynamic Model, ***Kamal A. Munir***, McGill University, Fac. of Mgmt., 1001 Sherbrooke W., Montreal, Quebec, H3A 1G5, Canada, munir@management.mcgill.ca

While firms are striving for the dominance of their particular technology, a key challenge before them is defining the problem before the customer and building a favorable perception for their technology. Drawing on actor-network theory, we outline a dynamic model which locks customers in progressively. Our model is illustrated by data from the imaging industry.

TE24 Warranty & its Impact on the Manufacturer & Consumer

Cluster: **Warranties & Warranty Related Issues**
Invited Session

Chair: Amitava Mitra, Auburn University, Coll. of Business, Office of the Dean, Ste. 516, Auburn, AL 36849-5240, mitra@business.auburn.edu

1) A Two-Dimensional Warranty Policy for Repairable Products, ***Amitava Mitra***, Auburn University, Coll. of Business, Office of the Dean, Ste. 516, Auburn, AL 36849-5240, mitra@business.auburn.edu, ***Jayprakash G. Patankar***

A 2-dimensional warranty policy using, for example, time and usage as attributes is considered. Usage is related to time through the usage rate, for which a distribution is assumed. Failed items are repaired and the failure distribution of repaired items is assumed to be different from that of new items.

2) WARE: A Software Package to Compute Warranty Reserve, ***Shau-Shiang Ja***, University of North Carolina, Dept. of OR, CB 3180, Smith Bldg., Chapel Hill, NC 27599, sja@email.unc.edu, ***Vidyadhar G. Kulkarni***

A software package, WARE, is developed to assist in the computation of the warranty reserve. The package needs the following inputs: warranty policy, lifetime distribution, stochastic model of sales processes.

3) Supplier's Responsibility for Quality: An Economic Analysis, ***Suresh Radhakrishnan***, NYU, Stern Sch. of Mgmt., Rm. 429, Tisch Hall, 40 W 4th St., New York, NY 10012, sradhakr@stern.nyu.edu

We examine a supply chain where the quality choices of the buyer and the supplier are not jointly observable. The buyer and the supplier choose their respective qualities as self-interest maximizers. Penalties on defective parts are required to mitigate the unobservable quality choice by the supplier...

TE25 Traffic Simulation & Visualization Tools

Sponsor: **Transportation Science Section**
Sponsored Session

Chair: Nathan H. Gartner, University of Massachusetts, Dept. of Civil & Environ. Eng., 1 University Ave., Lowell, MA 01854-2881, nathan_gartner@uml.edu

1) A Heuristically-Based Framework for Off-Line Calibration of Complex Simulation Models, ***Yaser E. Hawas***, United Arab Emirates University, Dept. of Civil Eng., Fac. of Eng., PO Box 17555, Al-Ain, United Arab Emirates

We describe a framework for calibration and validation of complex dynamic simulation models. A heuristically based procedure is developed to partition the simulation model functions to account for the interdependency among the functions. The procedure prioritizes the functions based on the impact of their calibration errors on the overall simulation model effectiveness.

2) A Visual Interactive System for Transportation Algorithms, ***S. Travis Waller***, Northwestern University, Dept. of ISE, 2145 Sheridan Rd., Tech. Inst., Evanston, IL 60208, travis@transcivil.nwu.edu, ***Athanasis Ziliaskopoulos***

We discuss an object-oriented framework that unifies several transportation analysis tools so that they share a common data specification and user interface. The Java user interface functions as a Web-based GIS. CORBA framework design, security, algorithm integration and communication issues are presented and discussed.

3) Modeling Travel Times on Signalized Arterial Streets, ***Andrzej P. Tarko***, Purdue University, 1284 Civil Engineering Bldg., W Lafayette, IN 47907, tarko@ecn.purdue.edu, ***David E. Boyce***, ***Gopalakrishnan Rajaraman***

A method based on the simplified theory of traffic shock waves has been developed to estimate and predict travel times along arterial streets with signalized intersections. The procedure for estimating travel times has been tested and evaluated using field data. We consider the use of the method in incident management in freeway corridors.

TE26 Quality Management

Contributed Session

Chair: Gerald C. Gonsalves, University of Kentucky, 425 Gatton B&E Bldg., Lexington, KY 40506, gcgons1@pop.uky.edu

1) Differences in Training Levels among Small Manufacturers, ***Steve Brown***, Eastern Kentucky University, College of Business, 215 Combs, Richmond, KY 40475, cbobrown@acs.eku.edu, ***Kambiz Tabibzadeh***, ***Bill Davig***, ***Terri Friel***

We found significant differences in training levels between small manufacturing firms initiating new quality programs and those without such programs. However, no positive link was found between increased training levels and improved customer satisfaction or lower cost, suggesting that the firms are not pursuing effective management strategies.

2) Total Quality Management Practices in Manufacturing: A Mapping Analysis, ***Qingyu Zhang***, University of Toledo, ISOM Dept., 2801 W Bancroft, Toledo, OH 43606, qzahgn3@pop3.utoledo.edu, ***S. Subba Rao***

We review quality dimensions, perspectives and practices, and analyze the relationship among quality dimensions, perspectives and practices and map them into a 2-dimensional grid. One axis maps the internal-external focus and the other axis is objective-subjective measurement. Some implications are discussed.

3) Improving Service Quality: A Holistic Approach, ***Edward K. Chu***, California State University, Dominguez Hills, 2049 Fulton Ave., Monterey Park, CA 91755, echu@soma.csudh.edu

By itself, training service providers improves service quality. We describe a more effective holistic approach that, in addition to training service providers, also requires improving the selection of service providers, redesigning the processes, instituting organizational changes, identifying customers' expectations and educating the customers.

4) Integration of Total Quality Management & Business Process Reengineering for Competitiveness, ***Gerald C. Gonsalves***, University of Kentucky, 425 Gatton B&E Bldg., Lexington, KY 40506, gcgons1@pop.uky.edu, ***Chen H. Chung***, ***Albert L. Lederer***

Researchers have proposed TQM and business process reengineering as competitive strategies. They disagree about the relationship between the strategies but have proposed an integrated approach using both. The approach has not been formally studied. A new framework based on the approach assesses its impact on organizational competitiveness.

TE27 Current Issues in Call Center Research

Sponsor: **Applied Probability Society**
Sponsored Session

Chair: Martin L. Puterman, University of British Columbia, Fac. of Commerce, 2053 Main Hall, Vancouver, BC, V6T 1Z2, Canada, marty@markov.commerce.ubc.ca

1) Numerical Analysis of Routing Rules for Call Centers, ***Denise M. B. Masi***, George Mason University, Sch. of ITE, Fairfax, VA 22030, dmasi@gmu.edu, ***M. J. Fischer***, ***Carl M. Harris***

Virtual call centers improve service levels, provide emergency backup, and enable extended operating hours over isolated call centers. Two call routing strategies, pre- and post-delivery, exist for creating the virtual center. We present a numerical a analysis of the relative mean call-center performance for these rules. Trade-off analyses are examined and an optimal characterization presented.

2) A Simulation-Based Study of Lucent's Routing Algorithm for Multi-Site Call Centers, ***J. B. Seery***, Bell Labs. Lucent Technologies, 600 Mountain Ave., Rm. 2C-323, Murray Hill, NJ 07974, jbs@research.bell-labs.com, ***Sem C. Borst***, ***A. D. Flockhart***, ***Martin I. Reiman***

For a variety of business reasons, many call centers are distributed among several sites. From a performance (caller waiting time) perspective, a single site would be more efficient. We describe a simulation based study of Lucent's best service routing algorithm, which shows that it delivers performance very close

to that of a single call center.

3) Agent Scheduling for Today's Call Center & Tomorrow's, ***Vijay Mehrotra***, Onward Inc., 888 Villa St., Ste. 300, Mountain View, CA 94041

Industry consultant seeks input from academic researchers to develop fast, efficient call center scheduling algorithms for systems with time varying stochastic call arrivals and call handle times, multiple call types, and multi-skilled agents. Those attached solely on Markovian models and/or long-time consuming simulations or heuristics need not apply...

TE28 Operations Management III

Contributed Session

Chair: M. Tawfik Mady, Alexandria University, Dept. of Bus. Admin., Faculty of Commerce, Alexandria, Egypt, tmady@aast.egnet.net

1) R&D for Improvement in Process Technology when Investments are Subject to Diminishing Returns, ***Fattaneh G. Cauley***, Purdue University, Krannert Sch. of Mgmt., West Lafayette, IN 47907-1310, cauleyf@mgmt.purdue.edu

It is shown when returns to investments in process technology are stochastically decreasing, a threshold level exists below which it is optimal to begin R&D and it may be otimal to reject incremental improvements in technology when the associated increase in discounted profits is greater than the costs of adoption.

2) A Look-Ahead Control Policy for AGVs in a Clean Bay for Semiconductor & LCD Production, ***Jungdae Suh***, Kyungwon University, Pokjung-Dong, Sujung-Gu, Sungnam, Kyungki, 461-701, Korea, jdsuh@mail.kyungwon.ac.kr, http://ie.kyungwon.ac.kr, ***Jaejin Jang***, ***Placid M. Ferreira***

A new AGV routing procedure using the system status in the near future is proposed. It uses the information in a highly informative manufacturing system where AGVs are playing a central role for material handling and can be used effectively for semiconductor, LCD productions and many other similar systems.

3) Business Environment & Manufacturing Strategy: Their Plant Performance Implications in Egypt, ***M. Tawfik Mady***, Alexandria University, Dept. of Bus. Admin., Faculty of Commerce, Alexandria, Egypt, tmady@aast.egnet.net

We show that business hostile has significant impact on quality, delivery and innovation strategies, while rising cost has significant effect on delivery strategy only. The relative impact of different manufacturing strategies on plant performance depends on the performance criteria. The environment strategy joint effect on performance was not significant in most cases.

4) Allocating Kanbans in a Re-entrant Line, ***Mary Beth Kurz***, University of Arizona, PO Box 210020, Tucson, AZ 85721-0020, maryk@sie.arizona.edu

The use of kanbans in a re-entrant flowline introduces difficulties in determining kanban levels not encountered in other manufacturing settings. By examining the conditions and peculiarities in these manufacturing settings, as well as organizational requirements, a different method for determining kanban allocations has been developed for a specific re-entrant flowline.

TE29 An Introduction to SAP R/3

Sponsor: Manufacturing & Service Operations Management Society

Sponsored Session

Chair: F. Robert Jacobs, Indiana University, Kelley Sch. of Bus., Bloomington, IN 47405

1) An Introduction to SAP R/3, ***F. Robert Jacobs***, Indiana University, Kelley Sch. of Bus., Bloomington, IN 47405

SAP's R/3 holds a 30 percent share of the ERP software market. Hardware and software features will be discussed together with the Accelerated SAP implementation approach. An on-line demonstration designed to highlight how the sales, operations and accounting functions are integrated in the context of a Supply Chain example will be conducted.

TE30 Product Line Planning Considering Manufacturing Effects

Sponsor: Manufacturing & Service Operations Management Society

Sponsored Session

Chair: Candace A. Yano, University of California, Dept. of IE/OR, 4135 Etcheverry Hall, Berkeley, CA 94720-1777, yano@ieor.berkeley.edu

1) Managing Design of Assembly Sequences for Product Lines that Delay Product Differentiation, ***Jayashankar Swaminathan***, University of California, Haas Sch. of Bus., Berkeley, CA 94720, msj@haas.berkeley.edu

We present integrated design and operation models for enabling delayed differentiation. Through a computational study, we provide qualitative insights on the effect of features in the product line, variance of demand for the different features on the optimal assembly design, set-up times and life cycle of the product line.

2) An Analysis of Capacitated Postponement, ***Gregory A. Graman***, University of Cincinnati, Coll. of Bus. Admin., Cincinnati, OH 45221-0130, gramanga@email.uc.edu, ***Michael Magazine***

The amount of capacity required to realize most of the benefits from postponement is small relative to the capacity needed for total postponement. A capacitated, single-period, order-up-to-level model is used to assess the impact that changes in model parameters have on capacity requirements needed to achieve the benefits from postponement.

3) Product Introductions Over Time for Heterogeneous Consumers, ***Gregory Dobson***, University of Rochester, Simon Sch. of Business, Rochester, NY 14627-0100, gdobson@tor.rochester.edu, ***Michael S. Pangburn***

A firm offers a series of new product versions of a durable good over time. The firm must determine the frequency of product introductions, and set pricing. Product versions are sold individually and within multi-version subscriptions. Given heterogeneous consumers, subscription contracts provide the firm with a price discrimination mechanism.

4) Effects of Demand Uncertainty on Product Variety & Make-to-Stock vs. Make-to-Order Decisions, ***Candace A. Yano***, University of California, Dept. of IE/OR, 4135 Etcheverry Hall, Berkeley, CA 94720-1777, yano@ieor.berkeley.edu, ***Panupol Lerssrisuriya***

We present models for analyzing the effects of demand uncertainty on the optimal number of product variations and on which products should be made to stock versus made to order when the products share manufacturing capacity. We present insights that are derived analytically and from computational results.

TE31 Queueing/Inventory

Contributed Session

Chair: Satish Vadlamani, University of Arkansas, Sch. of Business & Mgmt., PO Box 4976, Pine Bluff, AR 71611, satish@soark.net

1) Characterizing the Optimal Allocation of Storage Space in Unpaced Production Lines, ***Mark S. Hillier***, University of Washington, Box 353200, Seattle, WA 98195, mhillier@u.washington.edu

Production rates can often be improved by deliberately unbalancing buffer allocations in an inverted bowl pattern. We use a cost model to show that the bowl shape becomes more pronounced (in an absolute sense) with larger numbers of buffer spaces, but the relative shape of the bowl stays fairly constant.

2) Polling Models with Finite Buffers & Routing, ***Scott E. Grasman***, University of Michigan, 226 Village Green # 103, Ann Arbor, MI 48105, grasman@umich.edu, http://www-personal.engin.umich.edu/~grasman, ***Tava Lennon Olsen***, ***John R. Birge***

We provide the formulation and analysis of a finite buffer polling model with routing. Results provided are the generating function for queue sizes at arbitrary instants, as well as waiting times and delay. An example will be given.

3) Optimal One-for-One Policies for Perishables, ***Emre Berk***, Bilkent University, Isletme Fakultesi, Fac. of Bus. Admin., Ankara, 06533, Turkey, eberk@bilkent.edu.tr

We consider an (S-1,S) perishable inventory system facing Poisson demand with age dependent customer preferences and partial backordering. Exact analysis and approximations are presented.

4) Analysis of the Steady State Behavior of (s,S) Policies with Positive Leadtime, ***Satish Vadlamani***, University of Arkansas, Sch. of Business & Mgmt., PO Box 4976, Pine Bluff, AR 71611, satish@soark.net, ***Charles P. Schmidt***

A considerable amount of research has been conducted on (s,S) policies. Nevertheless, steady state on-hand probabilities for a single product with finite lead-time and infinite lifetime have not been developed. We outline a methodology to arrive at such steady state on-hand probabilities for some special cases and discuss results.

5) A Single-Server Queue with Markov Modulated Service Times, ***Yongpin Zhou***, University of Pennsylvania, OPIM Dept.,

Wharton Sch., 3620 Locust Walk, Ste. 1300, Philadelphia, PA 19104-6366,yongpin@wharton.upenn.edu,http://grace.wharton.upenn.edu/~zhou, ***Noah F. Gans***

We study an M/MMPP/1 queueing system in which service times have correlated exponential distributions modulated by a Markov chain. The distribution of number-in-system is shown to be a superposition of 2 matrix-geometric series. Other queueing measures are derived. We also discuss differences between the M/MMPP/1 system and its M/G/1 analogue.

TE32 Next Generation Manufacturing

Cluster: Advances in Enterprise Integration
Invited Session
Chair: Albert Jones, National Institute of Standard & Technology, Mfg. Eng. Lab., Bldg. 220, Rm. A-127, Gaithersburg, MD 20899-001, albert.jones@nist.gov

1) Reliability Estimations for Software Conformance Testing, ***Charles Hagwood***, National Institute of Standard & Technology, Mfg. Eng. Laboratory, Gaithersburg, MD 20899-0001, hagwood@cam.nist.gov

Conformance tests are written to determine if the implementation of a software package complies with agreed upon specifications. The reliability is defined as the probability that the specifications will be performed correctly. For specifications that require no errors to occur, a confidence interval for the reliability is computed.

2) Why & When to Calibrate a Measurement System, ***Raghu Kacker***, National Institute of Standard & Technology, Mfg. Eng. Laboratory, Gaithersburg, MD 20899-0001, kacker@cam.nist.gov

Part measurements require uncertainty statements but the stated uncertainty is invalid when the measurement system goes out of calibration. This costs time and money and should not be done unless necessary. We provide a simple generic formula for the calibration interval and discuss an application to coordinate measuring machines.

3) Integrating Error Models into Machine Tool Simulators, ***Michael Iuliano***, National Institute of Standard & Technology, Mfg. Eng. Laboratory, Gaithersburg, MD 20899-0001, michael.iuliano@nist.gov, ***Albert Jones***, ***Simon Frechette***

We describe a project to simulate parallelism and orthogonality errors for a turning machine. It includes an explanation of the mathematical error models, a description of the implementation of these models within the simulation and a discussion of the comparison between the simulated and real errors.

4) An Information Model of Machine Tools Performance Evaluation, ***Y. Tina Lee***, National Institute of Standard & Technology, Mfg. Eng. Laboratory, Bldg. 220, Rm. A-127, Gaithersburg, MD 20899-0001, leet@cme.nist.gov

We describe a formal model to support the exchange of machine tool performance data. The model focuses on a representation of performance data from a ball bar test and specifies the information necessary to represent machine performance data to support machine tool evaluation and analysis. The model is developed using the EXPRESS conceptual modeling language...

TE33 Logistics III

Contributed Session
Chair: Ari P. Vepsalainen, Helsinki School of Economics, Runeberginkatu 14-16, Helsinki, SF-00100, Finland, vepsalai@hkkk.fi

1) Coordination of Priorities in the Supply Chain, ***Katariina M. Kemppainen***, Helsinki School of Economics, Runeberginkatu 14-16, Helsinki, 00100, Finland, kakemppa@hkkk.fi

How can a sales company enforce consistent due dates and order priorities to be used by manufacturing and shipping companies? We apply priority indices familiar from job-shops in the shipping stage to make visible the tradeoffs between time delays and capacity utilization. An application in paper exports is discussed.

2) A Distribution Heuristic Based on Customer Channel Requirements, ***Aimo J. Inkilainen***, Helsinki School of Economics, Runeberginkatu 14-16, Helsinki, SF-00100, Finland, inkilain@hkkk.fi, ***Ari P. Vepsalainen***

We refine a new heuristic for determining the structure of distribution systems based on customer channel requirements measured by customer density and channel support needs. Comparisons to other heuristics and applications to electronic commerce environments are discussed.

3) Customer Channels for Customer-Driven Services, ***Ari P. Vepsalainen***, Helsinki School of Economics, Runeberginkatu 14-16, Helsinki, SF-00100, Finland, vepsalai@hkkk.fi, ***Jukka K. Kallio***

Existing distribution channels are configured and controlled by service providers, leaving only few routines to the customers. We study how the newly empowered customers would like the services to be reconfigured according to their own diverse needs. Our conclusion is that the customers really should ask for customer channels.

TE34 FMS Performance Issues II

Cluster: Flexible Manufacturing Systems
Sponsor: IFORS
Invite/Sponsor Session
Chair: Kathryn E. Stecke, University of Michigan, Sch. of Business Admin., 701 Tappan Rm. 5206, Ann Arbor, MI 48109-1234, kstecke@umich.edu

1) Service Level Considerations in Automated Manufacturing: Coordinated Stocking & Scheduling Policies, ***Narayan Raman***, AT&T Bell Laboratories, 101 Crawfords Corner Rd., Rm. 3J311, Holmdel, NJ 07733, ***Ashok Srinivasan***

We consider a final assembly process that assembles 3 sub-assemblies and must meet prescribed service levels. While stocking policies are employed to manage inventories of two of the sub-assemblies, a scheduling policy is used to schedule the third sub-assembly because it requires extensive customization. We will discuss several schemes for coordinating stocking and scheduling policies.

2) New Algorithms for the Performance Evaluation of Flexible Manufacturing Systems with Limited Buffers, ***Ulrich A. Tetzlaff***, George Mason University, Dept. of Dec. Sci. & MIS, Fairfax, VA 22030-4444, tetzlaff@gsba.gmu.edu

Based upon new closed form expressions for product form queueing networks with blocking, we present several exact and approximate algorithms for the performance evaluation of flexible manufacturing systems. Extensions to other kinds of production systems are possible, provided local or partial balance equations hold.

3) Scheduling Flexible Manufacturing Systems with Information Delays: Some Research Issues & Simulation Results, ***Rahul Caprihan***, University of Michigan Business School, Dept. of Op. Mgmt., 701 Tappan St., Ann Arbor, MI 48109, rahul_caprihan@ccmail.bus.umich.edu, ***Kathryn E. Stecke***

Scheduling decisions in manufacturing systems are influenced by time delays due to information intensive activities on the shop floor. We conceptualize the manifestation of information delays in the above context with the definition of 3 key modes of existence. Issues related to the effect that such delays have on system performance are discussed through simulation studies/results.

TE35 Education: Pedagogical Techniques

Contributed Session
Chair: Young H. Chun, Louisiana State University, 3190 CEBA Bldg., Baton Rouge, LA 70803-6316, chun@lsu.edu

1) Supporting Class Teaching with Power Point Presentation, ***Zvi Goldstein***, California State University, Dept. of SBAE, 800 N State College, Fullerton, CA 92834, zgoldstein@fullerton.edu, ***Barry A. Pasternack***

Supporting traditional teaching with animated graphical presentations has been found to be beneficial for both students and teachers. We demonstrate the use of animated graphical demonstration developed using Power Point for introductory MS classes. We discuss some of the benefits and potential problems with this approach.

2) On the Information Economics Approach to the Generalized Game Show Problem, ***Young H. Chun***, Louisiana State University, 3190 CEBA Bldg., Baton Rouge, LA 70803-6316, chun@lsu.edu

The game show problem has received considerable attention since it appeared in Marilyn's column in Parade Magazine. By means of the information economics approach, I consider the player's optimal decision strategy and the probability of winning the prize in a generalized version the game show problem.

3) A Birth-Death Queueing Model Spreadsheet, ***Donald L. Byrkett***, Miami University, Systems Analysis Dept., Oxford, OH 45056, byrketdl@muohio.edu, www.muohio.edu/~byrketdl

We describe a general spreadsheet model for any birth-death queueing process. There are 2 versions, one a basic template to plug into and the other a VBA enhanced user-interface to the basic template. Both will be demonstrated and available to educators for use in their classes.

4) Writing Across the OR/MS Curriculum: Effects of Integrating a Writing/Research Component into an MBA Quantitative Methods Course, ***John F. Kros***, Hawaii Pacific

University, 46-359 Haiku Rd. #A9, Kaneohe, HI 96744, jkros@hpu.edu

The effects on how business students write with regard to OR/MS after the introduction of a major writing component into an MBA QM course are examined. Input from current managers is used as a guide for outcome assessment and writing and OR/MS skills tranfer into the real world.

TE37 Software Demonstration VII

Chair: To be announced

1) Software Demonstration: ILOG OPL Studio, ***Irvin J. Lustig***, ILOG, CPLEX Division, 889 Alder Ave., Ste. 200, Incline Village, NV 89451, irv@cplex.com

ILOG OPL Studio is a new product from ILOG based on the OPL Optimization Programming Language, a new modeling language supporting linear and integer programming, constraint, programming and scheduling, with database connectivity, automatic C++ code generation and a GUI. Come hear about the new revolution in optimization!

Wednesday 08:00-09:30

WA01 Research Perspectives in MHT II

Cluster: MHT as a Health Profession
Invited Session

Chair: Ronald N. Taylor, Rice University, Jones Grad. Sch. of Admin., 6100 Main St., Houston, TX 77005

1) Inclusive Strategic Planning for Health Care Technology, ***Ronald N. Taylor***, Rice University, Jones Grad. Sch. of Admin., 6100 Main St., Houston, TX 77005

2) Information Technology Planning in the Health Sciences & Health Care, ***J. Robert Beck***, Baylor College of Medicine, Info. Technology, 1 Baylor Plaza, Houston, TX 77030

3) Expanding the New Technology Pre-Acquisition Process in Diagnostic Pathology, ***Gregory J. Buffone***, Baylor College of Medicine, Dept. of Pathology, 1 Baylor Plaza, Houston, TX 77030

4) Physician Input for Acquisition of Major Technical Equipment in a Major Medical Complex, ***Robert B. Parke***, Baylor College of Medicine, Otorhinolaryngology/Comm. Sci., 1 Baylor Plaza, Houston, TX 77030, ***Bobby R. Alford***

WA04 Networks & Graphs

Contributed Session

Chair: Pavel U. Chebotarev, Institute of Control Science, Lomonosovsky Str 3-1-140, Moscow, 117806, Russia

1) Sigma-Proximity as a Concept Dual to Distance, ***Elena V. Shamis***, Cefey Company, Ostrovityanova Str. 25-20, Moscow, 117806, Russia, e_shamis@hotmail.com, ***Pavel U. Chebotarev***

In studies of discrete structures, functions are frequently used that express the proximity of objects but do not belong to the family of metrics. We consider a class of such functions characterized by a normalization condition and an inequality which plays the same role as the triangle inequality does for metrics...

2) withdrawn - author request of 4/8, ***Pavel U. Chebotarev***, Institute of Control Science, Lomonosovsky Str 3-1-140, Moscow, 117806, Russia, ***Elena V. Shamis***

WA05 Information Systems II

Contributed Session

Chair: Mansoor Aminilari, University of Kentucky, DSIS, Sch. of Mgmt., Gatton Coll. of Bus. & Econ., Lexington, KY 40506-0034, mdumamin@ukcc.uky.edu

1) The Life Cycle of Electronic Performance Support Systems, ***Li-an Ho***, Indiana University, Instructional Systems Tech., Sch. of Education, Rm. 2276, Bloomington, IN 47405-1006, liho@indiana.edu, http://php.indiana.edu/~liho/home.html, ***Noriko Hara***

We discuss the life cycle of electronic performance support systems. The proposed life cycle includes 3 phases: design and development, deliver and maintenance. For each phase, important issues are addressed and strategies and principles are explained, along with the authors' project experiences to make those ideas more concrete.

2) An Exploratory Study on Consumer Satisfaction with Electronic Commerce, ***Dongwon Lee***, University of Arizona, McClelland Hall #430, MIS Dept. Coll. of Bus. Admin., Tucson, AZ 85721, dlee@mail.bpa.arizona.edu http://www.u.arizona.edu/~dongwon, ***Taeha Kim***, ***Joongho Ahn***

While EC has become as an important issue with the growth of the Internet in Korea, there are insufficient empirical research efforts concerning its status. I will ascertain which factors make the consumers not use electronic means and how perceived risks and conveniences influence customer satisfaction when consumers are exposed to the purchase process on the net...

3) Generalizations as Data & Behavior Abstractions, ***Dale L. Lunsford***, University of Southern Mississippi, Box 5077, Hattiesburg, MS 39406, lunsford@cba.usm.edu, ***Waleed A. Muhanna***

We discuss 2 dimensions of the generalization relationship type, identifies 3 types of generalizations, compares the treatment of generalizations in object-oriented and structured analysis methods, and presents the results of 1 study that employed generalizations as a manipulation of an application domain's semantic richness.

4) Searching for Information: Experiences with a Text-Based & an Image-Based Decision Support System, ***Mansoor Aminilari***, University of Kentucky, DSIS, Sch. of Mgmt., Gatton Coll. of Bus. & Econ., Lexington, KY 40506-0034, mdumamin@ukcc.uky.edu, ***Ram Pakath***

The impact of media choice on information-gathering and decision-making behavior in the presence of time pressure has received relatively little IS research attention. We describe the findings of a laboratory experiment involving hypothetical text-based and image-based DSSs in a hypothetical task setting.

WA06 Manufacturing I

Contributed Session

Chair: Jamal Ouenniche, Eindhoven University of Technology, PO Box 513, Paviljoen F14, Eindhoven, 5600 MB, The Netherlands, j.ouenniche@tm.tue.nl

1) The Sales Pitch: Supply Chain Management & its Competitive Advantage, ***Amy L. Fay***, SUNY, 27 Main St., Geneseo, NY 14454, alf99uno.cc.geneseo.edu, ***Jillian Porter***, ***Jack S. Cook***

In this period of global downsizing, companies are examining the components necessary to construct a competitive supply chain. Supply chain creation often involves a thorough selection process and a period of building trust. We examine supply chain management and its competitive advantage as well as risks involved in implementation.

2) Electronic Data Interchange & Reengineering Supply Chain Activities in the Food Industry, ***Craig A. Hill***, Georgia State University, Dept. of Mgmt., PO Box 4014, Atlanta, GA 30302-4014, mgtcah@langate.gsu.edu, ***Gary D. Scudder***

Information technology, specifically EDI, is used to facilitate the routine transfer of information between organizations. EDI is considered to be an enabling technology for the development of supply chain management. We explore the effects of reengineering interorganizational activities during the EDI implementation process within the food industry.

3) Managing Multi-Product Inventory Systems with Setup Costs using Downward Conversion, ***Jun Zhang***, Carnegie Mellon University, GSIA, 5000 Forbes Ave., Pittsburgh, PA 15213, jz2k@andrew.cmu.edu, ***Uday S. Rao***, ***Jayashankar Swaminathan***

We consider a single period multi-product inventory problem with stochastic demand, setup cost and one-way product downward conversion. The problem is modeled as a 2-stage integer stochastic program with recourse. Two heuristics are developed based on the structure of the problem and managerial insights are given.

4) Sequencing, Lot-Sizing & Scheduling in Job Shops: New Solution Methods, ***Jamal Ouenniche***, Eindhoven University of Technology, PO Box 513, Paviljoen F14, Eindhoven, 5600 MB, The Netherlands, j.ouenniche@tm.tue.nl, ***J. Will M. Bertrand***

We propose several heuristics, based on the G-group approach underlying assumptions, to solve the multi-product, finite horizon, sequencing, lot-sizing and scheduling problem in a deterministic job shop environment where the objective is to minimize the sum of setup and inventory holding costs and evaluate their performance.

WA07 Internet Applications: Electronic Commerce

Contributed Session

Chair: Xiang Fang, University of Kentucky, 425 Gatton B&E Bldg., Lexington, KY 40506, xfang0@pop.uky.edu

1) Web Technology Learning Curve for Electronic Commerce:

Implications for Research & Practice, ***Q. B. Chung***, Villanova University, 800 Lancaster Ave., Villanova, PA 19085, qchung@email.vill.edu, ***James Otto***

The Internet and its offspring technologies continue to change the rules by which the business is run and it is evident that successful businesses are motivated to keep up with such technological advancement. We describe how Web technologies are adopted for enhanced competitiveness in EC.

2) Resource-Based Theory & Electronic Commerce, ***Youlong Zhuang***, University of Kentucky, 425 Gatton B&E Bldg., Lexington, KY 40506, yzhua0@pop.uky.edu, ***Albert L. Lederer***

EC is changing the way business is conducted. By doing so, it has the potential to improve the competitivness of organizations. Resource-based theory offers a possible explanation of how organizations might use their resources to maximize the benefits of EC applications and thus, compete more successfully.

3) Firewalls as Part of Secure Electronic Transaction, ***Anssi Mattila***, University of Jyvaskyla, Sch. of Bus. & Economics, PO Box 35, Jyvaskyla, 40351, Finland, anmima@tukki.jyu.fi

Network security aspects in terms of firewall routers will be discussed. We focus on the SET standard and what it has to offer to Internet security. As a result, practical tools to further develop telecommunication systems will be provided. This pioneer study is conducted in a practical environment by using quantitative methods.

4) The Opportunities & Risks of Electronic Commerce, ***Xiang Fang***, University of Kentucky, 425 Gatton B&E Bldg., Lexington, KY 40506, xfang0@pop.uky.edu, ***Albert L. Lederer***

Electronic commerce can produce benefits and risks for organizations. Examples of benefits include reduced purchasing and inventory costs. Examples of risks are lack of security and vulnerability to legal action. The need to study such benefits and risks is becoming more crucial as new information technologies become increasingly available.

WA08 Railway Applications

Contributed Session

Chair: Danny C. Myers, Bowling Green State University, Dept. of Applied Stats. & OR, Bowling Green, OH 43403, nyers@cba.bgsu.edu

1) Quality Control as a Factor in Improving the Passenger Railway Transportation on PKP, ***Soja Wojciech***, ul. Gdanska 4, Radom, 26-600, Poland, wojteks@ra.onet.pl, ***Dyr Tadeusz***

Quality control is a very important element in the politics of the modern transportation enterprises. It embraces planning, systematic analysis and evaluation of the transportation services. The paper presents authors' concept of quality control system, for creating product strategy.

2) withdrawn - author request of 3/5, ***Leon W. P. Peeters***, Erasmus University, Rotterdam Sch. of Mgmt., Burg. Oudlaan 50, PO Box 1738, Rotterdam, 3000 DR, The Netherlands, l.peeters@fac.fbk.eur.nl, ***Leon G. Kroon***

3) Scheduling Railwagons with Maintenance Requirements, ***Danny C. Myers***, Bowling Green State University, Dept. of Applied Stats. & OR, Bowling Green, OH 43403, nyers@cba.bgsu.edu

We discuss the problem of generating schedules for railway wagons that serve a given timetable of trips and also allow for timely maintenance of the wagons. A heuristic approach has been developed seeking to minimize the number of wagons required to cover the scheduled routes. Computational results will be given using data from the German railway system.

4) Optimizing Intermodal Rail Operations, ***Alexandra M. Newman***, Naval Postgraduate School, 2773 Park St., Berkeley, CA 94702, ***Candace A. Yano***

We propose a model to increase the operational efficiency of intermodal trains. Using specialized procedures, we obtain near-optimal solutions for rail networks with varying structures and restrictions. We contrast these solutions with current operations and conclude that substantial savings and an increase in the quality of service can be realized.

WA09 Dynamic Programming

Contributed Session

Chair: Matthew Pelkki, University of Kentucky, Dept. of Forestry, Lexington, KY 40546-0073

1) Sequential Pricing with Unknown Demand: Informative Prices & Profit Maximization, ***Miguel S. Lobo***, Stanford University, Durand 110, Information System Lab., Stanford, CA 94305-9510, mlobo@stanford.edu, http://www.stanford.edu/~mlobo, ***Stephen Boyd***

Practical policies for the monopolistic pricing problem are discussed for discrete time, continuous prices and demand. One class of policies are heuristics, where a measure of informativeness is maximized. Another is an approximation of the dynamic programming solution. Both exploit convex optimization methods for computational tractability...

2) Stochastic Dynamic Programming using High-Order Approximation, ***Charles R. Philbrick***, Washington State University, Dept. of Civil & Environ. Eng., Pullman, WA 99164-2910, russp@wsu.edu, http://www.wsu.edu/~russp

New discrete DP methods have been developed for the optimal control of stochastic systems with 7 or more state variables. This is achieved by stage-wise decomposition and by accurate approximation of the characteristic value function using cost-to-go derivatives. We demonstrate real-time control of multi-reservoir systems.

3) A Dynamic Market-Agent Pricing Model, ***Baichun Xiao***, Long Is University, 720 Northern Blvd., CW Post, Brookville, NY 11548, bxiao@liu.edu, ***Patrick T. Harker***, ***Youyi Feng***

We study a multi-agent system in which 2 market agents compete for customers. To optimize profit, each agent prices the perishable products at various levels. We formulate the problem into a dynamic pricing model and derive an analytical solution. We show how individual behavior leads to market equilibrium.

4) withdrawn - author request of 4/5, ***Matthew Pelkki***, University of Kentucky, Dept. of Forestry, Lexington, KY 40546-0073

WA10 Decision Analysis II

Contributed Session

Chair: Vicki Bier, University of Wisconsin, Mech. Engineering Bldg., 1513 University Ave., Rm. 451, Madison, WI 53706, bier@ie.engr.wisc.edu

1) Determinants of Decision Making Strategies in Consumer Choice, ***Ann-Renee Blais***, Ohio State University, 142 Townshend Hall, 1885 Neil Ave., Columbus, OH 43210, blais.8@osu.edu, ***Elke U. Weber***

We investigate how product categories and purchase situations (in-store vs. on-line) influence risk perceptions and decision strategies in consumer choice.

2) Quasi-Bayesian Sequential Acceptance Sampling for Binomial Processes, ***Kathleen Whitcomb***, University of South Carolina, Coll. of Bus. Admin., Columbia, SC 29208, whitcomb@darla.badm.sc.edu, ***Dennis Oberhelman***

A quasi-Bayesian approach is applied to Bayesian sequential acceptance sampling for the case of binomial sampling and beta prior distributions. Although this approach employs imprecise priors, it usually requires less computation to reach a terminal decision.

3) Myopic Utility: A Framework for Asset Dependent Decision Making, ***Dan Belk***, Florida Institute of Technology, 2627 Belle Meade Dr., Huntsville, AL 35811-1909, dbelk@redstone.army.mil, ***Frederick B. Buoni***

Subjective expected utility theory provides for a global utility function. We present a framework based on subjective expected utility which reflects the changes in preference with changes in a decision maker's initial asset position. Results of a survey testing the presence of the myopic effect are presented.

4) Multivariate Distributions on the Simplex & Positive Orthant, ***Vicki Bier***, University of Wisconsin, Mech. Engineering Bldg., 1513 University Ave., Rm. 451, Madison, WI 53706, bier@ie.engr.wisc.edu

We summarize some convenient multivariate distributions on the unit simplex and the positive orthant. Emphasis will be on analytically tractable distributions that permit a wide range of correlation structures. Examples will include the generalized Dirichlet, adaptive Dirichlet, Liouville and multiple Dickey distributions.

WA11 Military Applications II

Contributed Session

Chair: Bruce W. Fowler, US Army Aviation Missile Command, ATTN: AMSAM-RD-AS, Redstone Arsenal, AL 35898-5242, fowler-bw@redstone.army.mil

1) Operational Performance of the Canadian Forces SAR Aircraft, ***Bao Nguyen***, Department of National Defence, Ctr. for OR & Analysis, Box 17000 Station Forces, Winnipeg, Manitoba, R3J

3Y5, Canada, bnjuyen@ora.dndnca, ***Kevin Ng***

A pre-emptive goal programming model has been devised to select the optimal location of SAR bases in Canada. The outcomes provide a guaranteed service within SAR range and minimize the transit cost to SAR incidents that lie outside this coverage range. A queueing simulation was used to analyze the detailed effectiveness of current and potential DND SAR systems...

2) A Distributed Interactive Stochastic Combat Simulation, ***Yoon G. Hong***, Hansung University, Dept. of IE, 389 2 Ka Samsun-dong Sungbukku, Seoul, 136-792, Korea, yhong@hansung.ac.kr, ***Soon J. Kwon***

The theory of stochastic combat is applied to the area of distributed interactive simulation. A group of computers simulate a given combat situation interactively through the Internet. This has a connection with the previous study we call "combat networking" in combat analysis. Results are compared with some traditional methods.

3) Nuclear Weapon Assignment Model, ***Mark A. Gallagher***, US Air Force, AFIT, 2950 P St., WPAFB, OH 45433-7765, mgallagh@afit.af.mil, ***Jeffery W. Weir***, ***Scott D. Blunk***, ***Stephen D. Garrett***

We developed a nuclear weapon planning tool. This large-scale integer program assigns the best weapons against targets. Our approach preprocesses decision variables to account for 3 nonlinearities: damage compounding, bomber target tie-ups and geographically targeting limitations of sea-launched and inter-continental ballistic. We discuss background, formulation and solution techniques.

4) The Physics of War III: Discontinuous Temporal Aggregation, ***Bruce W. Fowler***, US Army Aviation Missile Command, ATTN: AMSAM-RD-AS, Redstone Arsenal, AL 35898-5242, fowler-bw@redstone.army.mil

We discuss the problem of aggregating discontinuous - non continuous temporally - engagements by expanding on 2 earlier technologies: the engagement field and extensive formal aggregation.

WA12 Global Manufacturing & Strategy

Contributed Session

Chair: Yutaka Umezawa, University of Tokyo, Faculty of Econ., Hongo 7-3-1, Bunkyo-ku, Tokyo, 113-0033, Japan, umezawa@e.u-tokyo.ac.jp

1) The Determinants of Global Strategic Alliances, ***Moses Acquaah***, University of Wisconsin, School of Bus. Admin., PO Box 742, Milwaukee, WI 53201, macquaah@csd.uwm.edu

Global strategic alliances between firms are now a ubiquitous phenomenon. The literature has treated the reasons for their formation as if they are mutually exclusive. We develop a model from the resource-based view that links the reasons together and argues that only the transaction cost motive presents a necessary and sufficient condition for the choice of a strategic alliance...

2) Global Supply Chain Simulation, ***Yen-Hung Chen***, 909 E Las Colinas Blvd., 16th Floor, Irving, TX 75039, yen_hung@yahoo.com

We provide a global supply chain simulation model. A global supply chain is viewed as a series of facilities that perform the procurement of raw materials, its transformation to intermediate and end products and distribution and selling of the end products to customers. Then, based on the operations described, the simulation model includes simulation modules of procurement...

3) Integrating Product Development & Manufacturing Decisions, ***Hernan Wurgaft***, EDS, 5116 Simpson Lake Rd., W. Bloomfield, MI 48323, hernanwb@speedlink.net

We present our experience using models to consider product development and manufacturing decisions. Important interactions occur when deciding which products to develop and how to capacitize development and manufacturing resources. Our models address these decisions in the general context of global supply chain planning.

4) Global Supply Chain Management: A Theoretical & Empirical Study, ***Yutaka Umezawa***, University of Tokyo, Faculty of Econ., Hongo 7-3-1, Bunkyo-ku, Tokyo, 113-0033, Japan, umezawa@e.u-tokyo.ac.jp

We discuss the strategic importance and fundamental difficulty of the challenge to integrate the flow of products and the flow of data into a manufacturer/wholesaler/retailer global supply chain that may possibly achieve dramatic improvements in critical measures of each participant's performance such as cost, quality and speed.

5) International EOQ Model, ***Antonio Rios-Ramirez***, ITESM, 2120 East Paisano #38-22, El Paso, TX 79905, arios@campus.chi.itesm.mx

This research is an extension and adaptation of the EOQ basic model modifying 2 aspects. We first consider a multi-country aggregate demand affected. Next, we consider the multi-exchange rate for the carring costs. These points are the beginning of the globalization models needed to face inventory management in international environments.

WA13 Organizational Theory I

Contributed Session

Chair: Theo J. B. M. Postma, University of Groningen, Fac. of Economics, PO Box 800, Groningen, 9700 AV, The Netherlands, t.j.b.m.postma@eco.rug.nl

1) Organizational Restructuring & the Impact of Knowledge Transfer, ***Zhiang Lin***, University of Texas at Dallas, Sch. of Mgmt., JO51, Richardson, TX 75083, zlin@utdallas.edu

This paper examines the impact of prior task knowledge in organizational restructuring using a computer simulation model. The study reveals that the direction of change, the nature of the external environment, and the learning mechanism can all have moderating effects.

2) A Study of the Strategic Factors of Agricultural Organizations in Taiwan, ***Lee Tzong-Ru***, National Chung-Hsing University, Dept. of Agriculture Mktg., 250 Kuokuang Rd., Taichung, Taiwan, ROC, trlee@dragon.nchu.edu.tw

Agriculture in Taiwan is characterized by small-scale, small-area farming and low production for each individual farmer. In order to increase competitiveness, Taiwan's agricultural agency creates Production-Marketing groups. This study uses them as an example and uses Analytic Hierarchy Process (AHP) method to seek key strategic factors for these agricultural organizations.

3) Management Theory & the Natural Environment: A Review, ***Emmanuel B. Raufflet***, McGill University, Fac. of Mgmt., 1001 Sherbrooke St. West, Montreal, Quebec, H3A 2G5, Canada, raufflet@managemetn.mcgill.ca

We review the natural environment issue in the most frequently cited management journals (1988-1997). The analysis highlights contributions and limitations of management perspectives on the natural environment. A research agenda is proposed.

4) Top Management Team & Board Characteristics & Firm Performance in The Netherlands, ***Theo J. B. M. Postma***, University of Groningen, Fac. of Economics, PO Box 800, Groningen, 9700 AV, The Netherlands, t.j.b.m.postma@eco.rug.nl, ***H. van Ees***

We survey the evidence on the relationship between board and top management characteristics and firm performance in the Netherlands. To this aim, we develop and test hypotheses using sources from the strategic management and the corporate governance literature.

WA14 Sports & Gaming Models in OR/MS I

Cluster: Sports & Games in OR/MS
Invited Session

Chair: Keith Willoughby, University of Saskatchewan, Coll. of Commerce, Saskatoon, SK, S7J 2G3, Canada, willoughby@commerce.usask.ca

1) withdrawn - chair request of 4/7, ***Kevin J. Leonard***, University of Toronto, Fac. of Medicine, 12 Queens Park Crescent West, Toronto, Ontario, M5S 1A8, Canada, k.leonard@utoronto.ca

2) A Simulation Study of College Football, ***Rick L. Wilson***, Oklahoma State University, Coll. of Bus., MSTM Program, Stillwater, OK 74078-0555, rlwilsn@okway.okstate.edu

We simulate US college football seasons, studying, among other things, the likelihood that the 2 "best" teams will meet in the Super Alliance Championship game. Descriptive data will be presented examining the impact of the new championship game format on determining the mythical national champion.

3) A Decision Analysis Approach to Curling, ***Keith Willoughby***, University of Saskatchewan, Coll. of Commerce, Saskatoon, SK, S7J 2G3, Canada, willoughby@commerce.usask.ca, ***Kent J. Kostuk***

A frequently-debated decision in the sport of curling concerns the strategy of a team late in the game. This team may purposely "blank" an end in order to retain last-shot advantage. We use DA to investigate this situation and illustrate the outcomes of respective strategies.

WA15 Software Systems for Supply Chain Management

Cluster: Supply Chain Management
Invited Session

Chair: Javad Seyed, Deyes II, Inc., 1933 Amity Hill Ct., Raleigh, NC 27612, javad@deyes.com

1) Customer-Centric Supply Chain Control Structures & Algorithms, ***Ali H. Awni***, Manugistics, Inc., 2115 East Jefferson St., Rockville, MD 20852-4999, aawni@manu.com

We are witnessing a power shift from vendors to end-customers. New organizational structures and control approaches are emerging to manage the new customer-driven supply chains. These changes will be discussed and their effects on the notion of SC optimization and algorithmic requirements for SCM suites will be explored.

2) Tackling Manufacturing Scheduling Problems in Industry, ***Myrick Crampton***, Manugistics, Inc., 23 Inverness Wy East, #100, Englewood, CO 80112, ***Mani Agrawal***

We present an overview of the scheduling problems encountered in the industry, algorithmic approaches and a development framework. The focus would be on how Manugistics applies OR and object modeling techniques to handle complex scheduling problems.

3) Advanced Solutions for Supply Chain Management, ***Christopher Givens***, Paragon Management Systems

We compare and contrast traditional ERP solutions with APS technology and describes how APS solutions can enable manufacturers to optimize manufacturing and inventory decisions while providing real-time and accurate availability commitments to customers in real-time.

WA16 Cellular Manufacturing: Layout Issues

Cluster: Cellular Manufacturing
Invited Session
Chair: Alice E. Smith, University of Pittsburgh, 1031 Benedum Hall, Dept. of IE, Pittsburgh, PA 15261, aesmith@pitt.edu, aesmith@engrng.pitt.edu

1) Facility Layout using Multiple Part Samples, ***Shahrukh A. Irani***, Ohio State University, Dept. of IWSE, 210 Baker Systems Eng. Bldg., Columbus, OH 43210-1271, irani4@osu.edu

Traditionally, a facility planner uses a single sample of parts to design the layout for a facility. Job-shops often process multiple samples of parts. Two methods, dynamic graph clustering and graph matching, have been developed to merge the layouts corresponding to different samples of parts. Both methods try to find the common sub-graphs in the adjacency graphs that correspond to the different layouts.

2) Facility Layout & Production System Design, ***Russell D. Meller***, Auburn University, 308 Dunstan Hall, Dept. of ISE, Auburn, AL 36849, rmeller@eng.auburn

The facility layout problem is important since the layout supports the production system. How does explicit consideration of the production system change the facility layout problem? A case-study and a general model will be proposed to address this question.

3) Operational Issues in Facilities Design, ***Sarawoot Chittratanawat***, University of Missouri, Dept. of IMSE, E3437 Engineering Bldg. East, Columbia, MO 65211, c541625@showme.missouri.edu, ***James S. Noble***, ***Cerry M. Klein***

We address the problems associated with using the traditional flow X distance measure for facility design. A more comprehensive facility design model is developed based on operational issues. Examples are presented illustrating the benefit of a more integrated approach.

4) Incorporating Input & Output Station Location in Block Layout, ***Bryan A. Norman***, University of Pittsburgh, 1048 Benedum Hall, Dept. of IE, Pittsburgh, PA 15261, banorman@pitt.edu, ***Alice E. Smith***

We consider the problem of locating the input and output stations for departments in a facility to minimize the total travel distance. Exact and heuristic methods are proposed that are incorporated into a methodology for locating input and output stations within the departments of a layout during the block layout design.

WA17 Multistage Stochastic Programming

Cluster: Stochastic Programming
Sponsor: Optimization Section
Sponsored Session
Chair: Chanaka Edirisinghe, University of Tennessee, Coll. of Bus., Knoxville, TN 37996

1) Experience With Abridged Nested Decomposition, ***John R. Birge***, University of Michigan, 1877 IOE, 1205 Beal Ave., Ann Arbor, MI 48109-2117, jbirge@umich.edu, http://www-personal.engin.umich.edu/~jbirge, ***Christopher J. Donohue***

2) Views & Representations of Stochastic Programs, ***H. I. Gassmann***, Dalhousie University, Sch. of Bus. Admin., Halifax, Nova Scotia, B3H 1Z5, Canada, hgassman@mgmt.dal.ca

3) Computational Experience with Multistage Dantzig-Wolfe Decomposition, ***Chanaka Edirisinghe***, University of Tennessee, Coll. of Bus., Knoxville, TN 37996, ***Andrew Mart***, ***Ike Patterson***

4) A Stochastic Scenario Decomposition Algorithm for Multi-Stage Stochastic Linear Programming, ***Suvrajeet Sen***, University of Arizona, Dept. of SIE, Tucson, AZ 85721, sen@sie.arizona.edu, ***Julia Higle***, ***Brenda Rayco***

WA18 Integer Programming Applications & Software

Cluster: Integer Programming
Sponsor: Optimization Section
Sponsored Session
Chair: Sebastian Ceria, Columbia University, Sch. of Business, Computer OR Ctr., New York, NY 10027, sebas@cumparsita.gsb.columbia.edu http://www.columbia.edu/~sc244

1) EMOSL: An Entity Modeling Subroutine Library, ***Robert C. Daniel***, Dash Associates, Blisworth House, Church Ln, Northants, NN7 3BX, UK, rcd@dash.co.uk, http://www.dash.co.uk/

EMOSL, a completely integrated modeling and LP+MIP optimization library, lets you develop mathematical programming algorithms "efficiently" in the language which you have expressed the model. Examples will be presented from areas as diverse as cutting planes, decomposition, successive LP and heuristics in IP.

2) An Implementation of a Branch & Cut Algorithm for the Mathematical Programming Package XPRESS-MP, ***Hugues Marchand***, London School of Economics, Dept. of OR, Houghton St., London, WC2A 2AE, UK, hmarchand@core.ucl.ac.be, http://www.dash.co.uk/

We present an implementation of a general purpose B&C algorithm for the mathematical programming package XPRESS-MP. We show how to use simple cutting planes for elementary knapsack sets to obtain a robust B&C code solving large classes of MIP problems.

3) Integer Programs in Supply Chain Management, ***Sebastian Ceria***, Columbia University, Sch. of Business, Computer OR Ctr., New York, NY 10027, sebas@cumparsita.gsb.columbia.edu http://www.columbia.edu/~sc244

We explore basic models in supply chain management and discuss specific issues related to the efficient solution of these problems. We will show that special purpose cutting planes, tailored heuristics and branching rules can have a significant effect on the solution of these problems.

4) New Mathematical Programming Approaches for Cell Suppression in Statistical Disclosure Control, ***Jose-Jose Salazar-Gonzalez***, Universidad de La Laguna, Dept. Estadistica, IO y Comp., Fac. de Matematicas, Rm. 821, Tenerife, 38271, Spain, jjsalaza@ull.es, ***Matteo Fischetti***

A statistical agency collects data to be processed and published. This data is often obtained from individual respondents under a pledge of confidentiality: statistical agencies have the responsibility of not releasing any data or data summaries from which individual respondent information can be revealed; on the other hand, statistical agencies aim to publish as much information as possible...

WA19 Single Machine Scheduling

Contributed Session
Chair: Edward Mooney, Montana State University, MIE Dept., Bozeman, MT 59717-3800, emooney@ie.montana.edu

1) A Problem Space Algorithm for Single Machine Weighted Tardiness Problems, ***Sekcuk Avci***, Lehigh University, IMSE Dept., 200 Mohler Lab., W Packer Ave., Bethelehem, PA 18015, sea4@lehigh.edu, ***Selim Akturk***, ***Robert H. Storer***

We propose a problem space GA for the single machine weighted tardiness problem which uses a base heuristic to decode solutions. The approach first applies global dominance conditions; then, decoded solutions are brought to local optimality through time-dependent dominance conditions. This approach yields excellent, near-optimal solutions.

2) New Properties of the Single Machine Total Tardiness Problem, ***Edward C. Sewell***, Southern Illinois University, Dept. of

Math., Edwardsville, IL 62026-1653, esewell@siue.edu

We reduce the range of times in which a job can complete in an optimal schedule, extend Lawler's decomposition principle by permitting decomposition on jobs other than just the largest one and reduce, by a factor of n, the time and space complexity of Lawler's dynamic program which remains the only known pseudopolynomial algorithm for the problem.

3) Single Machine Scheduling - A New Approach, ***Edward Mooney***, Montana State University, MIE Dept., Bozeman, MT 59717-3800, emooney@ie.montana.edu

A new representation yields effective solution heuristics for the single machine problem with lateness penalties and sequence-dependent setup times. Computational results are presented that show the method to be efficient and effective. Observations are made on generalization to other problems.

WA20 Optimization Models in Transportation

Contributed Session

Chair: Roger B. Grinde, University of New Hampshire, Decision Sci. Dept., 15 College Rd., Durham, NH 03824, roger.grinde@unh.edu

1) Toll Pricing Approaches & Methods, ***Mehmet B. Yildirim***, University of Florida, Ctr. for Applied Opt., ISE Dept., 303 Weil Hall, Gainesville, FL 32611, ybayram@ise.ufl.edu, http://www.ise.ufl.edu/ybayaram, ***Donald W. Hearn***

The toll pricing problem in traffic assignment is a large-scale optimization problem that addresses how tolls can be determined to achieve feasible traffic flow. We describe the relation between inverse optimization and the toll pricing framework. We also propose a method to solve the problem minimizing the total number of toll booths to achieve a given traffic flow.

2) Solving the Multiple Constrained Shortest Path Problem with a Lagrangian Relaxation, ***Dongjoo Park***, Texas A&M University, 301F CE/TTI Tower, College Station, TX 77843-3136, dpark@tamu.edu, ***Laurence R. Rilett***

With the advent of intelligent transportation systems (ITS), the identification of optimal paths with multiple resources or route constraints has become important. We solve the multiple constrained shortest path problem using a Lagrangian relaxation approach. Computational complexity is provided with experiences with real-world traffic networks.

3) Solving a Bi-Modal Variant of the Traveling Salesman Problem, ***Roger B. Grinde***, University of New Hampshire, Decision Sci. Dept., 15 College Rd., Durham, NH 03824, roger.grinde@unh.edu

A bi-modal variation of the TSP is investigated. Specifically, parking areas can be used from which one hikes to a number of customers. Further, in the motivating application (mountain climbing), 1-way hikes are allowed through the shuttling of 2 cars. The formulation, solution approach and results are presented.

WA21 Telecommunications II

Contributed Session

Chair: Giri K. Tayi, SUNY, School of Bus., 1400 Washington Ave., Albany, NY 12222, g.tayi@albany.edu

1) Subpath Restoration: A Decomposition Approach for Modular Spare Capacity Allocation in Telecommunication Networks, ***Gheorghe M. Spiride***, SMU, PO Box 750122, Dallas, TX 75275-0122, gspiride@seas.smu.edu, http://www.seas.smu.edu/~gspiride, ***Jeffery L. Kennington***, ***Suku Nair***

We present optimization models that compute the modular spare capacity required by telecommunications networks in order to recover from single link failures. The proposed decomposition approach allows us to obtain good solutions for realistically-sized sample networks.

2) withdrawn - author request of 3/26, ***Shin-Yi Wu***, 1805 Spruce, Philadelphia, PA 19103, r5725006@im.ntu.edu.tw, http://www.im.ntu.edu.tw/~r5725006

3) Placing Inspection Stations on Telecommunication & Transportation Networks, ***Giri K. Tayi***, SUNY, School of Bus., 1400 Washington Ave., Albany, NY 12222, g.tayi@albany.edu, ***Daniel J. Rosenkrantz***, ***S. S. Ravi***

Placing inspection stations is a common problem in telecommunication and transportation networks. We formulate this problem under a variety of minimization objectives. Our results include efficient algorithms for many formulations and complexity results as well as pseudo-polynomial algorithms for other formulations.

4) A Channel Allocation Algorithm for Traffic in the Multiple Hierarchical Cellular Systems, ***Jeong-Kee Kim***, Hanyan University, Dept. of IE, Sa 1 Dong, Ansan, Kyounggi-Do, 425-791, Korea, ***Sun Hur***

We propose an effective channel allocation algorithm in hierarchical cellular systems which serves voice-data integrated traffic. We reserve a few hands-off dedicated channels and calculate the blocking probability of hands-off calls varying the number of dedicated channels to find the proper number of dedicated channels satisfying the quality of service.

WA22 Vehicle Routing I

Contributed Session

Chair: Christopher M. Rump, SUNY, Dept. of IE, Buffalo, NY 14260-2050, crump@eng.buffalo.edu, http://www.acsu.buffalo.edu/~crump

1) Enroute Coordination in Vehicle Routing, ***Catherine M. Rivers***, Massey University, RD 3, Marton, 5460, New Zealand, crivers@clear.net.nz ourworld.compuserve.com/homepages/RiversPartners

Coordination is the process by which payloads are re-distributed among vehicles between leaving the depot and arriving at a customer. It includes spilt delivery and load swapping. When applied to systems in the Euclidean plan and rectilinear grid, coordination can reduce both fleet size and total distance travelled.

2) A New Approach to Multiple Vehicle Route Generation, ***Christopher J. Donohue***, ALPHATECH, Inc., 2101 Wilson Blvd., Arlington, VA 22201, chris.donohue@dc.alphatech.com, ***Dimitri P. Bertsekas***, ***John N. Tsitsiklis***

We present a new approach for generating coordinated routes for multiple vehicles servicing hundreds of customers. The method will be demonstrated and computational results will be provided. The method has applications in vehicle routing and multiple asset mission planning.

3) Vehicle Routing Problems with Varying Degrees of Dynamism, ***Marius M. Solomon***, Northeastern University, MS Dept., 314 Hayden Hall, 360 Huntington Ave., Boston, MA 02115, ***Karsten Lund***, ***Oli G. Madsen***, ***Jens M. Rygaard***

In a dynamic VRP, vehicles are dispatched to satisfy service requests that evolve in real-time. We examine the solution of such problems by solving static routing problems each time 1 or several input updates have occurred. We report on experiments conducted on problems with varying degrees of dynamism.

4) Time-Dependent Routing of Hazardous Materials under Dynamic Weather Systems, ***Vedat Akgun***, SUNY, 2658 Creekwood Cr., Apt. 12, Dayton, OH 45439, akgun@acsu.buffalo.edu, ***Rajan Batta***, ***Christopher M. Rump***

Given a transportation network, we consider the problem of finding a preferred path for hazmat transportation when the network characteristics are time dependent. Accident probabilities and travel times may be affected considerably in the case of adverse weather conditions. We analyze the existing algorithms and design a new algorithm to solve the problem.

WA23 Management of Technology: Models & Methods

Contributed Session

Chair: Jayant V. Saraph, Metropolitan State University, 730 Hennepin Ave. S, Ste. 807, Minneapolis, MN 55414, jsaraph@msus1.msus.edu

1) International Transfer of Information Technology: A Suggested Model, ***Adel M. Aladwani***, Kuwait University, PO Box 34927, Kuwait, 73251, Kuwait, adwani@kuc01.kuniv.edu.kw

Despite mounting efforts by scholars to explain the process of transferring technology internationally, there is still a puzzle as to how the transfer process actually happens and what underlying conditions are involved in the transfer process. We try to explore these issues.

2) Impact of Time Uncertainty on the Economic Planning of Programmable Automation under Uncertainty about Future Product Mix Requirements, ***Themis Gennadis***, American Computers & Engineers, 6 Aegeou Pelagous, Agia Paraskevi, 153-41, Greece, tgenadis@ace-hallas.gr

We discuss the development and analysis of a mathematical programming model for the economic justification of new manufacturing technology, upon the scrapping of old equipment, and upon levels of output for firms which focus on new product opportunities when its demand is deterministic.

3) Understanding the Value of Data Warehousing: An Options Perspective, ***Ram L. Kumar***, University of North Carolina, 363B Friday Bldg., 9201 University City Blvd., Charlotte, NC 28223,

rlkumar@email.uncc.edu, http://www.coe.unc.edu/~rlkumar

Some organizations have made, and other are considering, large investments in data warehousing. However, the benefits are not always clear. We will present and illustrate an options-based framework for evaluating and justifying investments in data warehousing.

4) Applications of Activity-Based Costing to the Product Design Function, ***Jayant V. Saraph***, Metropolitan State University, 730 Hennepin Ave. S, Ste. 807, Minneapolis, MN 55414, jsaraph@msus1.msus.edu

Product designers make many choices on design variables that can affect activities such as supplier selection, development and quality control, manufacturing processing, assembly, packing and distribution. ABC can be used to predict product cost structures related to each design configuration. We explore how ABC can be deployed by designers to minimize downstream unit product costs.

5) The Impact of Spin-Off Mechanisms on the Industry Innovation in Catching-Up Economies, ***Chang-Yung Liu***, National Sun Yat-sen University, PO Box 59-59, Kaohsiung, Taiwan, ROC, cyliu@cm.nsysu.edu.tw

Catching-up and growth in the high-technology industry are 2 of the most important issues to all developing countries. Usually, government-sponsored research institutes take responsibility to upgrade the industrial sector's technological capability through various technology transfer channels. One of the most effective methods of technology transfer is through the spin-off mechanism...

WA24 Product Warranty Modeling & Analysis

Cluster: Warranties & Warranty Related Issues
Invited Session

Chair: Boyan Dimitrov, Kettering University, Sci. & Math. Dept., 1700 W 3rd Ave., Flint, MI 48504-4898, bdimitro@kettering.edu

1) Warranty: Risk Reducing Information, ***Dimitar G. Christozov***, American University in Bulgaria, Blagoevgrad, 2700, Bulgaria, dgc@nws.au.bg, ***Plamen S. Mateev***

We address the relation between concepts of warranty and information. The idea of equivalence of the term of information with the terms of risk as probability and believe as subjective probability is presented. Their impact on users decisions, made in the selection stage of the purchasing process, is discussed...

2) Extension & Generalizability of Agreement Coefficients, ***Dimitar M. Dimitrov***, Kent State University, 507 White Hall, Coll. of Education, Kent, OH 44242-0001, ddimitrov@emerald.educ.kent.edu

Integrating the Cohen's kappa for pairwise agreement among raters using nominal scale, Conger (1980) proposed a g-wise kappa for agreement among all raters in combinations of g raters selected from a set of raters. We provide an extension of g-wise kappa to include agreements among g or less (e.g., g or g -1) raters across all combinations of g raters, and generalizability estimates of g-wise kappas.

3) Warranty Analysis of an Age-Dependent Failure Model for Repairable Product, ***Stefanka S. Chukova***, Kettering University, Science & Math Dept., 1700 Third Ave., Flint, MI 48504-4898, schukova@kettering.edu, ***Boyan Dimitrov***

An age-dependent failure model is proposed for modeling the warranty cost for repairable product under non-homogeneous Poisson scenario. The model assumes improvement of the product via a repair due to an age reduction factor which affects the repair costs. Expected warranty costs under different warranty policies are evaluated, and illustrated by numerical examples.

4) On the Selection of a Warranty Program, ***Sahib Esa***, Lule University, Div. of Quality Tech. & Stats., Lule, SE 971 87, Sweden, sahib.esa@ies.luth.se, ***Boris Kovatchev***

We introduce criteria for selection of the best process from a family of stationary processes and study their statistical properties and outline their application to quality control. The approach is from time series analysis perspective, and applications to quality control are outlined. Problems of this kind appear in various situations in quality control and optimal control...

5) Error-Grid Analysis & Warranty Evaluation of Blood Glucose Meters, ***Boris Kovatchev***, University of Virginia, Health Sciences Ctr. Drawer F, Blue Ridge Hospital, Charlottesville, VA 22901

Error-grid analysis is a statistical method for evaluation of the accuracy of portable devices for home blood glucose monitoring, based on assumptions for clinical proximity between the meter readings and reference solutions. Data are automatically recorded by most blood glucose meters and the method uses it for periodic scanning of the accuracy of the device...

WA25 Optimum Path Algorithms on Transportation Networks

Sponsor: Transportation Science Section
Sponsored Session

Chair: Hani S. Mahmassani, University of Texas, Dept. of Civil Eng. & MSIS, Austin, TX 78712-1076, masmah@mail.utexas.edu

1) A Genetic Algorithm Approach for Dynamic Bus Routing Problems, ***Steven Chien***, NJIT, Inst. for Transport., Tiernan Hall, Rm. 274, Newark, NJ 07102, chien@megahertz.njit.edu, ***Zhaowei Yang***

With the development of advanced public transportation systems (APTS), dynamically dispatching and routing buses have been recognized by transit agencies. A dynammic cost model is developed for optimizing a feeder bus route location and its headway in irregularly shaped areas with grid type networks and heterogeneous demand. GAs are evaluated as an effective approach to quickly search the optimal solution.

2) Least Expected Time Paths with Recourse in Stochastic, Time-Varying Transportation Networks, ***Elise D. Miller-Hooks***, Pennsylvania State University, 212 Sackett Bldg., Dept. of Civil & Environ. Eng., University Park, PA 16802, edm3@psu.edu

An efficient algorithm is presented to determine the least expected time paths in stochastic, time-varying networks, i.e. networks where arc weights are random variables with time-varying distribution functions. This algorithm determines the optimal hyperpaths along which to route drivers who are permitted to update their decisions in response to revealed travel times on traveled arcs.

3) A k-Loopless Shortest Path Algorithm: Design, Implementation & Computational Results, ***Hidiye Tuydes***, Northwestern University, Dept. of ISE, 2145 Sheridan Rd., Tech. Inst., Evanston, IL 60208, h-tuydes@nwu.edu, ***Athanasis Ziliaskopoulos***

We introduce an efficient algorithm that computes k-loopless paths on a general network. A simple data structure that allows eliminating loops is discussed. The algorithm is computationally tested on actual and random networks with promising results.

4) Properties of Online Stochastic Shortest Path Problems, ***S. Travis Waller***, Northwestern University, Dept. of ISE, 2145 Sheridan Rd., Tech. Inst., Evanston, IL 60208, travis@transcivil.nwu.edu, ***Athanasis Ziliaskopoulos***

We discuss shortest path problems where the travel times on links are random variables and vehicles transversing the network acquire information as they progress. We present system properties and specific examples with solution algorithms.

WA26 Quality Control I

Contributed Session

Chair: Thomas E. Love, Case Western Reserve University, 10900 Euclid Ave., Cleveland, OH 44106, tel3@po.cwru.edu

1) Sequential Inspection for SPC-Quarantined Production, ***Timothy S. Vaughan***, University of Wisconsin, Dept. of Mgmt. & Mktg., Eau Claire, WI 54702-4004, vaughats@uwec.edu

Suppose a control chart has signaled an out-of-control condition and all units produced since the last in-control SPC sample have been quarantined. By inspecting units in reverse of the production sequence, it is possible to identify the point at which the process went out-of-control.

2) A Bivariate Method to Control the Placement of an Electronic Component, ***Ariel Sepulveda***, University of Puerto Rico, PO Box 9107, Mayaguez, PR 00681-9107, a_sepulveda@rumac.upr.clu.edu

Placing electronic components in the right spot is an everyday problem in the electronics industry. A bivariate control chart is proposed to monitor the placement process such that vertical and horizontal displacement and rotation of the component can be diagnosed right from the control chart.

3) Economic Design for Multivariate Exponentially Weighted Moving Average Control Charts, ***Thomas E. Love***, Case Western Reserve University, 10900 Euclid Ave., Cleveland, OH 44106, tel3@po.cwru.edu, ***Kevin W. Linderman***

Designing Multivariate Exponentially Weighted Moving Average (MEWMA) control charts means making rational decisions about several parameters: the

upper control limit, the sample size, the time interval between samples, and the exponential smoothing constant. We develop a model for the selection of MEWMA chart parameters based on economic criteria.

WA27 Applied Probability

Contributed Session

Chair: Steve Drekic, University of Western Ontario, Dept. Stat. & Actuarial Sci., Western Sci. Centre, London, Ontario, N6A 5B7, Canada, drekic@fisher.stats.uwo.ca

1) Threshold-Based Interventions to Improve Performance in Preemptive Priority Queues, ***Steve Drekic***, University of Western Ontario, Dept. Stat. & Actuarial Sci., Western Sci. Centre, London, Ontario, N6A 5B7, Canada, drekic@fisher.stats.uwo.ca, ***David A. Stanford***

A single-server priority queueing model is introduced where a job's service attempt is protected only after a sufficient amount of service has been successfully rendered. Several intervention policies to initiate the protection are discussed and incorporated into the general queueing model. Various numerical examples addressing performance will be presented.

2) Recent Results in Risk-Sensitive Decision Processes, ***Emmanuel Fernandez-Gaucherand***, University of Arizona, SIE Dept., PO Box 210020, Tucson, AZ 85721-0020, emmanuel@sie.arizona.edu, cimarron.sie.arizona.edu/modeling/modeling., ***Rolando Cavazos-Cadena***

We review several key and revealing results recently obtained by the authors in the area of Markov decision processes (MDPs) with risk-sensitive optimality criteria. In particular, MDPs with exponential, long-run average criteria are studied. Counter-examples to claims in the literature, among others, are presented.

3) Modularity Results for Markov Decision Processes with Risk-Sensitive Criteria, ***Guadalupe Avila-Godoy***, University of Arizona, Mathematics Dept., Tucson, AZ 85721-0020, avila@math.arizona.edu, ***Emmanuel Fernandez-Gaucherand***

MDPs with discounted exponential criteria are considered. Modularity results are presented that imply monotone optimal solutions. Applications to machine scheduling, inventory control and resource allocation are discussed.

4) withdrawn - author request of 3/16, ***Andrew W. Braunstein***, Iona College, Hagan School of Bus., 715 North Ave., New Rochelle, NY 10801, abraunstein@iona.edu, ***Michael McGrath***, ***Donn R. Pescatrice***

5) Properties of an Inverse Gaussian Mixture of Bivariate Distribution & its Generalization, ***Dhaif K. Al-Mutairi***, Kuwait University, PO Box 21, Khaldiya, 72461, Kuwait, dhaif@kuc01.kuniv.edu.kw

A parametric family of bivariate distributions is derived for describing the lifelengths of a system of 2 dependent components operating under an unknown environment when component conditional lifetime distribution follows Olkin's bivariate exponential and the environment follows an inverse Gaussian distribution. Further generalization of the family of bivariate joint distributions is presented...

WA29 Quantitative Models of Quality

Sponsor: Manufacturing & Service Operations Management Society Sponsored Session

Chair: Susan Slotnick, Arizona State University West, MC 2451, 4701 W Thunderbird Rd, PO Box 37100, Phoenix, AZ 85069-7100, slotnick@asu.edu

1) Estimating the Relationship Between Technology Investment & Hospital Service Quality: Proposing & Testing a Structural Equation Model, ***Lynn Ling X. Li***, Butler University, Coll. of Bus. Admin., Indianapolis, IN 46208-3485, lli@thomas.butler.edu, ***Guangping Huang***

As US hospitals and health care organizations become more competitive, investments in technology and quality improvement are keys to survival. The general theory is that hospital technology drives quality. Included in this study are clinical and information technologies. To test the theory, a structural equation model is suggested and evaluated.

2) ISO Certification & Its Impact on Operational & Financial Performance: An Empirical Study, ***Mohan Gopalakrishnan***, Arizona State University West, Sch. of Mgmt., MC 2451, PO Box 37100, Phoenix, AZ 85069-7100, mogopal2vax2.concordia.ca

We look at the impact of ISO certification or quality awards on the operational and financial performance of firms. Literature Analysis, case studies and surveys would be used as primary data sources to evaluate the impact. In addition, "event study methodology" will be used to measure the effects.

3) Customer Satisfaction & Long-Term Firm Value: The Role of Uncertainty, ***Sanal Mazvancheryl***, University of Michigan, Business Sch. 02721, Davidson Hall, 701 Tappan, Ann Arbor, MI 48109, mazvanch@umich.edu

Extant literature is ambiguous on whether or not customer satisfaction is associated with firm performance. We propose a modeling framework based on the concept of uncertainty in innovation and imitation, Lippmann & Rumelt, 1982, which shows that satisfaction can indeed affect firm value and lead to differences in firm performance.

4) Determining Quality Levels Over Time: Effects of Inventory & Reputation, ***Kathy A. Paulso Gjerde***, Butler University, Coll. of Bus. Admin., Indianapolis, IN 46208-3485, kpaulson@butler.edu, ***Susan Slotnick***

In order to investigate the relationships between a firm's reputation for quality, decisions on quality implementation and inventory, we propose a profit-maximization model that incorporates costs of quality enhancement, and production, adverse quality, and inventory. Revenue is a function of demand and price, in turn influenced by defect rates.

WA30 Issues in Productivity & Inventory Control

Sponsor: Manufacturing & Service Operations Management Society Sponsored Session

Chair: Tava Lennon Olsen, University of Michigan, 2845 IOE, 1205 Beal Ave., Ann Arbor, MI 48109-2117, tlennon@umich.edu, http://www-personal.engin.umich.edu/~tlennon

Co-Chair: Rachel Zhang, University of Michigan, Dept. of IOE, Ann Arbor, MI 48109, rzhang@engin.umich.edu

1) Managing a Customer Following Target Reverting Policy: Inventory Control & Value of Information, ***Srinagesh Gavirneni***, Schlumberger, 8311 North FM 620, Austin, TX 78726, nagesh@slb.com, ***Sridhar Tayur***

We consider a capacitated 2-stage supply chain in which the customer provides the supplier with information about the timing of future orders. We allow for randomness in customer order arrivals but work under the assumption that the customer is making every effort to follow the schedule. Such an operating policy is called a "target reverting" policy...

2) Balanced Policies for Assembly Systems, ***Paul Zipkin***, Duke University, Fuqua Sch. of Bus. Admin., Durham, NC 27708-0120, paul.zipkin@duke.edu, zipkin@mail.duke.edu

We present an intuitive interpretation of Rosling's analysis of assembly systems with stochastic demands. It relates the notion of a balanced echelon base-stock policy to project networks. The author has found this approach useful in teaching.

3) Modeling Vendor-Managed Inventory, ***Michael J. Fry***, University of Michigan, IOE Dept., 1205 Beal Ave., Ann Arbor, MI 48109-2117, mjfry@engin.umich.edu, ***Roman Kapuscinski***, ***Tava Lennon Olsen***

VMI is a supply-chain agreement that shifts the burden of inventory management to the supplier. Many benefits are subjectively attributed to VMI but little mathematical analysis has been attempted to quantify these benefits. We use analytical models to evaluate VMI and examine several contractual issues that occur under such an agreement.

4) Optimal Multiple Modular Design, ***Wanshan Zhu***, University of Michigan, IOE Dept., 1205 Beal Ave., Ann Arbor, MI 48109-2117, zhuws@engin.umich.edu, ***John R. Birge***, ***Rachel Zhang***

We present a nonlinear decomposition approach for solving the multiple modular design problem (MMDP). The MMDP is decomposed into a master problem and a sequence of sub-problems. The convexity of the master problem is proven and an algorithm is suggested integrating a descent direction finding procedure and a simplex-like method.

WA31 Multiechelon Inventory Systems

Contributed Session

Chair: Mohammed A. Hajeeh, Kuwait Institute for Scientific Research, Techno-Economics Div., Kuwait, 13109, Kuwait, hajeeh@kisr.edu.kw

1) On Delivery Policies in Multi-Echelon Inventory Systems,

Jonas L. H. Andersson, Lund University, Dept. of IE, PO Box 118, Lund, 22100, Sweden, jonas.andersson@ie.lth.se

A one-warehouse, several-retailers inventory system is considered. All installations apply batch ordering (R,nQ)-policies. Deliveries from the warehouse are completed in fixed delivery batches, i.e., truckloads or package sizes. We evaluate exact holding and backorder costs.

2) The Value of Retailer Information to a Manufacturer in a Two-Echelon Supply Chain, ***Michael E. Ketzenberg***, University of North Carolina, Kenan Flagler Bus. Sch., CB 3490, McColl Bldg., Chapel Hill, NC 37599-3490, mketz@aol.com, ***Ann E. Maruchek***, ***Harvey M. Wagner***

We explore the value of retailer information to a manufacturer through the comparative performance of an information-based replenishment policy and a traditional replenishment policy under a variety of conditions. Results show that information value increases for a snaller number of retailers, larger case-packs and higher service level.

3) Heuristic Methods for Centralized Control of Arborescent Multi-Echelon Inventory Systems, ***Johan Marklund***, Lund University, Dept. of IE, PO Box 118, Lund, S-22100, Sweden, johan.marklund@ie.lth.se, ***Sven Axsater***, ***Edward A. Silver***

A periodic-review single-warehouse-multiple-retailer system faces stochastic demand. To minimize holding and backorder costs, we suggest and evaluate 2 tractable heuristics for situations where service requirements and/or demand characteristics differ across retailers.

4) Allocation Model for Spare Parts with Imperfect Repair, ***Mohammed A. Hajeeh***, Kuwait Institute for Scientific Research, Techno-Economics Div., Kuwait, 13109, Kuwait, hajeeh@kisr.edu.kw

We present analytical and simulation models for imperfect repair multi-echelon inventory systems. Computational results and comparisons with the perfect repair case will be presented.

WA32 Stochastic Processes

Contributed Session

Chair: Nandamudi L. Vijaykumar, Brazilian Inst. of Space Research, Lab. Computing & Applied Math., PO Box 515, Sao Jose dos Campos, SP 12201-970, Brazil, vijay@lac.inpe.br, http://www.lac.inpe.br/~vijay

1) On Comparing State Charts with State Transition Diagrams, Queueing Networks & Petri Nets for Use in Performance Models, ***Nandamudi L. Vijaykumar***, Brazilian Inst. of Sp Research, Lab. Computing & Applied Math., PO Box 515, Sao Jose dos Campos, SP 12201-970,Brazil,vijay@lac.inpe.br,http://www.lac.inpe.br/~vijay, ***Solon V. Carvalho***, ***Vakulathil Abdurahiman***

Some popular tools such as state transition diagrams, queueing networks and Petri nets are used in representing performance models. We show that state charts may also be used in representing these models. State charts' main features are also compared with the above mentioned tools.

2) A Markovian Model for Optimizing Maintenance Systems with Partial Information, ***Monica M. De Marchi***, Brazilian Institute of Sp, Lab. Computing & Applied Math., PO Box 515, Sao Jose dos Campos, SP 12201-970, Brazil, monica@lac.inpe.br http://www.lac.inpe.br/, ***Solon V. Carvalho***, ***Paulo R. Morais***

We consider a model denoting deteriorating systems with partial information. Deterioration is modeled using a discrete-time Markov process. Inspection gives an insight of the internal state of the system that undergoes 1 of the 2 possible actions: production or repair. Numerical results will be presented.

3) Optimization of a Manufacturing System with Coxian Repair Times & Partial Information, ***Rita de Cassia Rodrigues***, Laboratory of Computing and Applied Mathematics, Brazilian Inst. of Sp Res., PO Box 515, Sao Jose dos Campos, SP 12201-970, Brazil, rita@lac.inpe.br http://www.lac.inpe.br/, ***Solon V. Carvalho***

We study a manufacturing system with 2 different servers where times to failure are exponentially distributed and the repair times follow Cox distribution. This system is modeled as a Markov decision process with full and partial information. The aim is to minimize the long run expected cost of the system.

4) A Heuristic Algorithm for Stochastic Root Finding, ***Huifen Chen***, Da-Yeh University, Dept. of IE, 112 Shan-Jiau Rd., Dah-Tsuen, Chang Hwa, 515, Taiwan, huifen@aries.dyu.edu.tw, ***Hungshen Chen***

We propose a heuristic algorithm for stochastic root-finding problems (SRFPs), solving a system of equations using only the function estimates. This algorithm applies the deterministic Broyden's method into the framework of retrospective approximation, a generic SRFP algorithm. Simulation results are shown to evaluate the algorithm performance.

WA34 Flexible Manufacturing Systems

Contributed Session

Chair: John J. Liu, University of Wisconsin, Sch. of Bus., Milwaukee, WI 53211, jjl@uwm.edu

1) Using Processor Stations as Transfer Points in Tandem AGV Systems, ***Chiguhn Lee***, University of Michigan, 1205 Beal Ave., Ann Arbor, MI 48109-2117, chikuhnz@umich.edu www-personal.engin.umich.edu/~chikuhnz, ***Yavuz A. Bozer***

While tandem AGV systems offer simplicity and flexibility, conveyors connecting adjacent zones is a limitation. We show alternative ways to eliminate conveyors by using processor stations as transfer points. We also present an analytical model to evaluate the impact of blocking between AGVs sharing a transfer station.

2) Real-Time Scheduling Policies of Flexible Manufacturing with Both Setup Times & Costs, ***Wei-Min Lan***, University of Michigan, 1111 S. State St., Ann Arbor, MI 48104, weilan@engin.umich.edu www-personal.engin.umich.edu/~wielan, ***Tava Lennon Olsen***

Using fluid models, we derive lower bounds for the average production cost per unit time in a variety of flexible manufacturing systems with both setup times and costs. We discuss scheduling methods based on these lower bounds.

3) Optimal Overlapping in Innovate-to-Order Production, ***John J. Liu***, University of Wisconsin, Sch. of Bus., Milwaukee, WI 53211, jjl@uwm.edu, ***Liming Liu***

Innovate-to-order production has become increasingly popular in such industries as software engineering services. We formulate it as a differential game with 2 players: the design team who seeks maximum design flexibility, and the manufacturing team who strives for the least-cost technology.

4) A Design Algorithm for MLAGV in a Flexible Manufacturing System, ***Sun Hur***, Hanyan University, Dept. of IE, Sa 1 Dong, Ansan, Kyounggi-Do, 425-791, Korea, hursun@email.hanyang.ac.kr, ***Hyun-Churl Ahn***, ***Young-Hae Lee***

We build a queueing network which consists of machines and arcs used for transfer products between machines. Using the upper bound probability of the diffusion approximation, we suggest an algorithm for determining the number of machine buffers and the number of AGVs and loading capacity which can be evaluated from the arc queue service capacity.

WA35 Models for Teaching Effectiveness in Technology & Innovation Management Courses - Some Experiences

Sponsor: Forum on Education

Sponsored Session

Chair: Michael K. Badawy, Virginia Tech., PO Box 3987, Merrifield, VA 22116-2931, mbadawy@vt.edu

1) Models for Teaching Effectiveness in Technology & Innovation Management Courses - Some Experiences, ***Abbie Griffin***, University of Illinois, 350 Commerce West, Champaign, IL 61820, abbieg@uiuc.edu, ***Michael K. Badawy***

This informal session will explore some experiences the speakers have had in teaching a variety of courses in the field of technology and innovation management. The teaching approaches used, class and field experiences, along with student feedback, will be shared and articulated. A dialogue with the audience will be initiated with an ample opportunity for discussion.

Wednesday 09:45-11:15

WB01 Research Perspectives in MHT III

Cluster: MHT as a Health Profession

Invited Session

Chair: Alan L. Porter, Georgia Institute of Technology, Ctr. Tech. Assessment & Policy, Sch. of ISyE, Atlanta, GA 30332-0205

1) Bibliometric Profiling of Genetic Detection Technology R&D, ***Alan L. Porter***, Georgia Institute of Technology, Ctr. Tech. Assessment & Policy, Sch. of ISyE, Atlanta, GA 30332-0205, ***Anthony Gutierrez***, ***Webb Myers***, ***Eduardo Coelho***, ***Nils Newman***, ***Petert Rzeszotarski***

2) Information Systems/Information Technology in a Managed Care Environment, ***Nilmini Wickramasinghe***, Case Western

Reserve University, Weatherhead Sch. of Mgmt., 10900 Euclid Ave., Cleveland, OH 44106, nsw2@po.cwru.edu

Drawing from the literature concerning knowledge workers and IS/IT as well as synthesizing and extending established economic theories on goal alignment, a theoretical framework is presented to evaluate and understand the role for IS/IT in the alignment of goals between the primary care physician and health maintenance organization.

3) Signaling Model: An Approach to Hospital Advertising, ***Paul S. Koku***, Florida Atlantic University, Coll. of Bus./University Tower, 220 E 2nd Ave., Ft. Lauderdale, FL 33301

WB05 Information Systems III

Contributed Session

Chair: Wesley S. Shu, Santa Clara University, Dept. of OMIS, Kenna 323, Santa Clara, CA 95053, wshu@scu.edu

1) The New Guidelines for Writing Spreadsheets, ***John F. Raffensperger***, University of Canterbury, Dept. of Mgmt., Private Bag 4800, Christchurch, New Zealand, jraffensperger@mang.canterbury.ac.nz

Spreadsheet style usually means separating data, calculation and output. Users do not want this style. Furthermore, it is hard to read and prone to error. We present a new style based on writing, emphasising readability. We define a canonical form of a spreadsheet and introduce the first spreadsheet readability index.

2) Spatial Analysis of Attribute Commonalities for a Twin Metropolis, ***James B. Pick***, University of Redlands, Dept. of Mgmt. & Business, 1200 East Colton Ave., Redlands, CA 92373-0999, pick@uor.edu, http://www.uor.edu/FacultyFolder/JPick, ***James W. Hettrick***, ***Edgar W. Butler***, ***Elliott Ellsworth***

A new application of GIS analysis is developed and applied to study the international twin metropolis of San Diego-Tijuana. Information from the US and Mexican censuses are organized as metadata. Cluster and discriminant analyses are applied to small area spatial coverages to determine metropolitan zones of common sets of characteristics.

3) Crossing the Gap: Can Macroeconomic Analysis Solve the Information Technology Productivity Puzzle, ***Wesley S. Shu***, Santa Clara University, Dept. of OMIS, Kenna 323, Santa Clara, CA 95053, wshu@scu.edu

The micro-macroeconomic gap has further complicated IT productivity. Macroeconomic behavior is not a pure aggregate of firm-level because there is no single macroeconomic decision maker who allocates resources optimally. To solve this problem, an aggregate production function with efficiency distribution on capital use has been applied to measure IT productivity.

WB06 Manufacturing II

Contributed Session

Chair: David W. Glenn, University of Michigan, IOE Dept., 1205 Beal Ave., Ann Arbor, MI 48109-2117, dwglenn@umich.edu

1) A Multiattribute Utility Analysis Method for Ceramic Diamond Grinding Process Design Optimization, ***David W. He***, University of Toledo, Dept. of MI/ME, Toledo, OH 43606, dhe@eng.utoledo.edu

A rigorous multiattribute utility analysis method for design optimization of the ceramic diamond grinding process is presented. Design optimization includes the determination of types of abrasive wheels and cutting conditions. Design attributes and design constraints are clearly defined and the design optimization is formulated as an NLP problem with an objective function of utility maximization.

2) Variance Amplification of Aggregated (Q,r) Orders in Supply Chains, ***Akram A. El-Tannir***, American University of Beirut, 850 Third Ave., 19th Fl., New York, NY 10022-6297, at05@aub.edu.lb

Variance amplification happens due to the accumulation of orders in the upper levels of supply chains; this is one of the causes of the bullwhip effect. We aim to model a multi-echelon aggregated (Q,r) order using renewal processes to analyze this phenomenon and to suggest ways to reduce its impact.

3) Joint Process Adjustment for Improving Manufacturing Quality of Assembled Parts, ***David W. Glenn***, University of Michigan, IOE Dept., 1205 Beal Ave., Ann Arbor, MI 48109-2117, dwglenn@umich.edu

Processes producing parts for assembly can be adjusted either separately or jointly. Joint adjustment can enhance improvement and reduce cost if the assembly process is well understood. We describe potential savings using joint policies as a function of adjustment cost, adjustment precision and assembly model parameters. We use an example for auto-body manufacturing.

4) Angles of Wrap in Filament Wound Cylinders, ***Samir V. Amiouny***, Concordia University, Mech. Eng. Dept. H549, 1455 de Maisonneuve W, Montreal, Quebec, H3G 1M8, Canada, amiouny@alcor.concordia.ca, ***Suong V. Hoa***

Filament wound cylinders are manufactured by successive layering of fiber and resin. The mechanical properties of the resulting medium are strongly dependent on the orientation of the fibers in the different layers. We look at the combinatorial problem of optimizing those orientation angles.

WB07 Internet Applications: Case Studies

Contributed Session

Chair: Donna Maupin, Kentucky Small Business Development Ctr., 225 Gatton B&E Bldg., Lexington, KY 40506-0034, djmaup00@pop.uky.edu

1) Preparing & Delivering University Courses on the Internet, ***Zeynep Onay***, Middle East Technical University, Dept. of Mgmt., Ankara, 06531, Turkey, onay@man.metu.edu.tr

The Internet has emerged as a powerful medium in higher education. An increasing number of courses are being offered asynchronously over the Web. We will discuss the various requirements for meeting the challenge of creating an effective learning environment through the Internet.

2) Internet Banking: A Case Study of a Turkish Bank's Strategy & its Customers, ***Nui Polatoglu***, Istanbul Bilgi University, Inonu Cad No. 28, Kustepe Sisli, Istanbul, 80310, Turkey, npolatoglu@bun.edu.tr, ***Serap Ekin***

Based on an electronic mail survey of Internet banking customers of a bank, we investigate several factors including user demographics, perceived benefits and risks and patterns of usage. We also conduct in-depth interviews with managers on EC strategies. We will present our findings and analyses.

3) Corporate Usage of Web Cookies: A Study of Fortune 100 Firms, ***Bill Wagner***, Villanova University, Mgmt. Dept., 800 Lancaster Ave., Villanova, PA 19085, wagner@ucis.vill.edu, ***Mohammad K. Najdawi***

One method of collecting and distributing information on the WWW has been through the use of "cookies". The primary concern consumers have expressed with the application of cookies is in their ability to attach itself to the computers hard drive and invade one's privacy. We will examine cookies and analyze their usage by web sites of the Fortune 100 firms.

4) Web-Based Applications & the Value Chain, ***Donna Maupin***, Kentucky Small Business Development Ctr., 225 Gatton B&E Bldg., Lexington, KY 40506-0034, djmaup00@pop.uky.edu, ***Albert L. Lederer***

Observers have suggested that the use of Web-based applications throughout the value chain of an organization can improve competitiveness. Research must assess how these applications can do this. Findings would provide executives with a basis for decision making and strategic planning to improve their organization's competitiveness.

WB08 OR/MS in the Miami Valley

Cluster: OR/MS in the Miami Valley

Invited Session

Chair: Mufit Ozden, Miami University, Dept. of Systems Analysis, 230 Kreger Hall, Oxford, OH 45056

1) Operations Research Support Modeling & Simulation at Veridian, ***Jeffrey R. Sackett***, Veridian Engineering, 5200 Springfield Pike, Ste. 200, Dayton, OH 45431, jsackett@dytn.veridian.com

OR is used extensively in support of the M&S efforts conducted at Veridian. We will identify the major OR techniques used to support M&S analyses at Veridian. Additionally, we will demonstrate how specific OR techniques were applied to selected projects for the US Air Force.

2) Assessing Warranty Cost, ***John A. Long***, PRICE Systems, L. L.C., 101 Woodman Dr., Ste. 12, Dayton, OH 45431, john.long@pricesystems.com

A warranty is an implicit or explicit part of nearly every thing we buy. The problem for the manufacturer is determining the warranty cost so that it can be added to the total purchase cost. This paper outlines a procedure for determining warranty cost using the PRICE HL model.

3) Adoption of New Technology: The Case of Non-Contact

Laser Gauges, ***Larry B. Weinstein***, Wright State University, 3640 Colonel Glenn Hwy, MSIS Dept., 271 Rike, Dayton, OH 45430, lweinstein@wright.edu

Increased worldwide competition has driven industry to find ever faster and more accurate techniques for product inspection. NCLGs are becoming an accepted technology for meeting these requirements, in particular, for on-line diameter measurement. We describe benefits, problems and issues associated with the use of NCLGs.

4) A New Stochastic Optimization Algorithm for Making Continuous Decisions in Simulation, ***Mufit Ozden***, Miami University, Dept. of Systems Analysis, 230 Kreger Hall, Oxford, OH 45056

A new stochastic algorithm, stretch/fold, has been developed using a machine learning approach and tested in simple queueing problems whose analytical solutions are tractable. A set of nonlinear objective functions, defined over these decision problems, are optimized during the simulation of these problems to determine the global optima.

WB09 Decision Support Systems

Contributed Session

Chair: Bonnie E. Rubenstein, University of Maryland, Dept. of IS, 1000 Hilltop Circle, Baltimore, MD 21250, brubenst@umbc.edu

1) A Knowledge-Based System for Production Planning, ***Guoqiang Zhang***, City University of Hong Kong, Dept. of MS, Kowloon, Hong Kong, China, mszhang@cityu.edu.hk, ***Jue Xue***, ***K. K. Lai***

We propose and develop a knowledge-based system for production planning in CIM. The expert experience, mathematical models and comprehensive information are integrated in the system. A heuristic method is presented.

2) The Building Blocks of Organizational Decision Support Systems, ***Mark P. Sena***, University of Kentucky, 3401 Oak Point Ct., Lexington, KY 40515, mpsena0@pop.uky.edu, http://sac.uky.edu/~mpsena0/dis320

Although research on ODSSs began nearly a decade ago, few applications of such systems exist. We extend the notion of an ODSS by providing a classification of different types of ODSSs and by describing the supporting technologies and application software that could comprise an ODSS.

3) Methodology of Building Decision Support Systems using Agent-Based Models, ***Radoslaw A. Zapert***, PricewaterhouseCoopers, 1301 Ave. of the Americas, New York, NY 10019-6013, radoslaw.zapert@us.pwcglobal.com, ***Huanrui Hu***

We describe a methodology, developed at PricewaterhouseCoopers, to create DSSs to forecast consumer behavior using multi-agent simulations. The methodology includes a method of designing operational agent-based simulations, programming environment IceCore, techniques of linking simulations with data warehouses or data marts for near real-time what-if analyses...

4) A Genetic Approach for Including Decision-Maker Preferences in Computerized Decision Support Systems, ***Bonnie E. Rubenstein***, University of Maryland, Dept. of IS, 1000 Hilltop Circle, Baltimore, MD 21250, brubenst@umbc.edu

A genetic approach to DSSs is presented that partners decision-makers with a computerized decision support tool for effective inclusion of decision-maker preferences. This approach enhances the ability of traditional decision support tools to respond to preferences and find solutions that are consistent with decision-maker goals and objectives.

WB10 Decision Analysis III

Contributed Session

Chair: Te-Wei Wang, Southern Illinois University, PO Box 2302, Carbondale, IL 62902-2302, tewei@siu.edu, http://www.cba.siu.edu/tewei/

1) withdrawn - author request of 3/29, ***Liping Liu***, Susquehanna University, 514 University Ave., Selinsgrove, PA 17870, liu@infosys.susqu.edu, ***Prakash P. Shenoy***

2) Financial Decision Making: Are Women Really More Risk Averse?, ***Renate Schubert***, Swiss Federal Inst. of Technology Zurich, Wirtschaftsforschung, ETHZ, Weinbergstr. 35, Zurich, CH-8092, Switzerland, schubert@wif.reok.athz.ch, ***Martin Brown***, ***Matthias Gysler***, ***Hans Wolfgang Brachinger***

According to a widespread view, women are more risk averse than men in financial decision making. Our experimental results question the prevalence of this gender stereotype. In insurance and investment contexts, no significant gender differences occur, and in loss gambling frames, women are even more risk prone than men.

3) Use Network Model for PC Upgrade/Replacement Decision, ***Te-Wei Wang***, Southern Illinois University, PO Box 2302, Carbondale, IL 62902-2302, tewei@siu.edu, http://www.cba.siu.edu/tewei/

Network models have been used to solve equipment replacement problems. We discuss how both deterministic and stochastic network models can be used to solve PC upgrade/replacement problems.

4) A New Technique for Estimating Confidence Intervals on DEA Efficiency Estimates, ***Janice Forrester***, Cytera Systems, Inc., 9220 SW Barbur Blvd., Ste. 119-148, Portland, OR 97219, janicef@hevanet.com, ***Timothy R. Anderson***

Previous chance constrained DEA approaches are surveyed followed by a new approach to chance constrained DEA. We calculate a confidence band for the estimated production function such that we can specify with a predetermined level of confidence and interval constraining the most likely production function.

WB11 Military Applications III

Contributed Session

Chair: James A. Sena, California Polytechnic State University, Coll. of Business, San Luis Obispo, CA 93407, jsena@calpoly.edu

1) withdrawn - author request of 3/3, ***Darren R. Law***, Univ. of Central Florida/SAIC, 352 Royal Palm Dr., Melbourne, FL 32935, law@cs.ucf.edu

2) Displaying Instrumented Range Data in Distributed Interactive Simulation Applications, ***William S. Murphy***, United States Army, PO Box 8692, Monterey, CA 93943, murphyw@mtry.trac.nps.navy.mil

Instrumented data from live maneuver exercises at 2 Army instrumented ranges was converted into Distributed Interactive Simulation (DIS) Protocol. The 2 ranges were the National Training Center and the Mobile TEXCOM Experiment Center.

3) Automated Trend Detection in Flight Safety, ***Luminita Stemate***, Department of National Defence, CAS/DASOR, 101 Colonel By Dr., Ottawa, Ontario, K1A 0K2, Canada, luminita@ora.dnd.ca

We propose an automated monitoring system whose main function is to detect any increasing trends in the number or rate or air and ground accidents/incidents in a timely manner. The multi-level monitoring is based on statistical tools such as control charts and non-parametric tests.

4) A Collaborative Decision Support System for Navy Pier & Port Management, ***James A. Sena***, California Polytechnic State University, Coll. of Business, San Luis Obispo, CA 93407, jsena@calpoly.edu

Agent-based collaborative decision support is a methodology utilizing domain specific intelligence system to partner with human decision makers to reach a consensus solution to a complex problem. We describe the collaborative infrastructure assessment tool (CIAT) that provides a collaborative planning tool in support of the US Navy pier and port management.

WB12 Intelligent Manufacturing

Contributed Session

Chair: Sungzoon Cho, Seoul National University, San 56-1 Shinrum-Dong, Seoul, 151-742, ROK, zoon@snu.ac.kr http://plaza.snu.ac.kr/~soon

1) An Interactive Neural-Fuzzy Error Recovery System for Robotic Assembly, ***Jorge Avila-Soria***, Purdue University, Sch. of IE, 1287 Grissom Hall, Rm. 126, W Lafayette, IN 47907-1287, avila@ecn.purdue.edu, ***Shimon Y. Nof***

Robots with error-recovery capabilities increase the automation level of the production processes for which they are used. We present an intelligent neural-fuzzy system (NEFUSER) designed to provide error-recovery capabilities for pick-up and assembly operations in a robotic assembly workcell. This recovery approach also allows human-robot-computer interaction.

2) Comparing Reactive Kanban Systems, ***Katsuhiko Takahashi***, Hiroshima University, Fac. of Engineering, Kagamiyama 1 chome, Higashi-Hiroshima, 739-8527, Japan, takahasi@pel.sys.hiroshima-u.ac.jp, ***Nobuto Nakamura***

For responding to the unstable changes in product demand, we have proposed a reactive kanban system which can detect the changes and adjust the number of kanbans. Recently, another reactive kanban system was proposed for the same purpose. We analyze and compare the performances of the 2 systems.

3) Automatic Speed Control in Sintering Plants using Neural Networks, *Sungzoon Cho*, Seoul National University, San 56-1 Shinrum-Dong, Seoul, 151-742, ROK, zoon@snu.ac.kr http://plaza.snu.ac.kr/~soon, ***Min Jang***

Sintering transforms powder ore into lumped ore to be used in blast furnaces. The powder ore, mixed with water and cokes, is put on a slowly moving pallet. The pallet speed has been manually set by operators. We discuss design and implementation of an automated neural net-based speed controller.

WB13 Organizational Theory II

Contributed Session

Chair: A. D. Amar, Seton Hall University, Sch. of Business, South Orange, NJ 07059, amaramar@shu.edu

1) Organizational Knowledge Creation During Planning Processes: The Key Role of Cross-Fertilization, *Marie-Leandre Gomez*, ESSEC, 201 Maple Ave., Apt. D17, Ithaca, NY 14850, d95005@edu.essec.fr

Whereas organizational knowledge has become a major concern for researchers and managers, the effects of planning on knowledge creation have not been clearly analyzed yet. The study of 23 planning processes, from strategic planning to operational planning, hightlights the consequences of functional and hierarchical diversity of organizatioal knowlege creation.

2) Object Analysis in Organizational Design, *Mohammad K. Najdawi*, Villanova University, Dept. of Mgmt., 800 Lancaster Ave., Villanova, PA 19085-1678, najdawi@ucis.vill.edu, ***Q. B. Chung***

Object analysis in organizational design offers an alternate method for addressing the increased complexity experienced by management while maintaining the flexibility and adaptability required to complete in todays markets. We examine how the management principles of software development may apply to general management structures.

3) The Evolving Model of Leadership for Contemporary Organizations, *A. D. Amar*, Seton Hall University, Sch. of Business, South Orange, NJ 07059, amaramar@shu.edu

We model standard, contemporary leadership behavior and its drawbacks, and list the reasons that make it unfit for organizations of the 21st century. An alternative model of leadership is presented that will enhance creativity in organization. The model is designed with the particular needs of organizations in high-tech and research industries in mind.

4) Integrating the Globalized Firms: An Interpretive Framework, *RashmiAssudani*, McGill University, Faculty of Mgmt., 1001 Sherbrooke St. W, Montreal, Quebec, H2X 2E4, Canada, assudanr@management.mcgill.ca

Technological, economic and political changes are augmenting rapid globalization of firms. Different communication modes, i.e., internet and intranet, etc., have been suggested for integrating the firms and for achieving the global market goals. We argue for the use of an interpretive framework in deciding the media choice for integration of globalized firms.

WB14 Sports & Gaming Models in OR/MS II

Cluster: Sports & Games in OR/MS
Invited Session

Chair: Timothy C. Krehbiel, Miami University, Dept. of Decision Sci. & MIS, Oxford, OH 45056, krehbitc@muohio.edu

1) Three Challenging OR Problems in Creating Sports League Schedules, *John B. Moore*, Sportstar Computing, 444 Malabar Dr., Waterloo, Ontario, N2K 2P7, Canada, sportstar@sentex.net

We describe 3 specific decision models that are found in developing equitable schedules for "house" leagues. These involve generating balanced round-robin sequences of matches; assigning home and away venues; and "smoothing" playing times. The author's experiences in implementing these schedules for real-world leagues is described.

2) A Sports Time Machine, *Scott Berry*, Texas A&M University, Dept. of Statistics, College Station, TX 77843-3143, berry@stat.tamu.edu, ***C. Shane Reese, Patrick D. Larkey***

Within a sport the careers of the players overlap to some degree. This network of overlaps, or bridges, is used to compare players whose careers took place in different eras. The goal is to compare all players directly -- a mathematical time machine. We address baseball, hockey, and golf.

3) Dynamic Programming in Sports: A Survey of Applications, *John M. Norman*, University of Sheffield, Mgmt. School, 9 Mappin St., Sheffield, S1 4DT, UK, j.norman@sheffield.ac.uk

We survey applications of dynamic programming to decision problems faced by active participants in sports: the applications include baseball, the broad jump, cricket, the pole vault, darts, tennis, ice hockey, sailing, orienteering and Australian rules football.

4) withdrawn - author request of 2/18, *Geoffrey R. Hileman*, 3408 Deerlope Trail, Williamsburg, VA 23188-2491, grhile@math.wm.edu

5) A Bayesian Predictive Analysis of the New York Yankees 1998 Regular Season Performance, *James J. Cochran*, Miami University, Farmer Coll. of Bus. Admin., Dept. of DS/MIS 311 Upham Hall, Oxford, OH 45056, cochrajj@econqa.cba.uc.edu

We use a Bayesian predictive approach to estimate the probability that, going into the 1998 regular season, the New York Yankees would win 114 games.

WB15 Applying Software Applications in Different Industries

Cluster: Supply Chain Management
Invited Session

Chair: Javad Seyed, Deyes II, Inc., 1933 Amity Hill Ct., Raleigh, NC 27612, javad@deyes.com

1) Supply Chain Solutions for High-Tech Manufacturers, *Christopher Givens*, Paragon Management Systems

We describe some key issues and challenges faced by the high-tech supply chain and how advanced planning and scheduling systems can be used to solve these problems. Managing common components, deployment and availability commitments will be discussed.

2) Supply Chain Solutions for Textile Manufacturers, *Kameron Hadavi*, Paragon Management Systems

We describe some key issues and challenges faced by textile manufacturers and how advanced planning and scheduling systems can be used to solve these problems. Key issues addressed are optimizing supply chain flow and visibility, global reductions of inventories, maximizing machine utilization and increasing responsiveness of the entire enterprise to the market.

WB16 Cellular Manufacturing: Design Considerations

Cluster: Cellular Manufacturing
Invited Session

Chair: Timothy L. Urban, University of Tulsa, 600 S. College Ave., Coll. of Bus. Admin., Tulsa, OK 74104, urban@utulsa.edu

1) Cost Justified Cellular Manufacturing (Re)Design, *Rakesh Nagi*, SUNY, 342 Bell Hall, Box 602050, Buffalo, NY 14260, nagi@eng.buffalo.eduwww.acsubuffalo.edu/~nagi, ***Harshvardahan Singh***

We present an integrated mathematical programming formulation that incorporates important manufacturing and financial considerations for cellular/hybrid manufacturing. For the redesign of conventional shops, it considers the moving/installation costs of machines and respects budgetary limits over a redesign horizon. The objective is to maximize the net present worth of the investments and savings in material handling.

2) A Methodology for Design of Modular Layouts, *Ali K. Kamrani*, University of Michigan, IMSE Dept., 2250 Eng. Complex, 4901 Evergreen Rd., Dearborn, MI 48128-1491, kamkode@umich.edu

Modular design is an engineering methodology that will organize and structure a complex product, process or system into a set of components or activities that could be developed independently of each other and then assembled together. A gear train system is being designed using the developed methodlogy...

3) A Heuristic Method for Production Planning in Cellular Manufacturing Systems, *Mingyuan M. Chen*, University of Regina, Fac. of Engineering, ISE Dept., Regina, SK, S4S 0A2, Canada, mingyuan.chen@uregina.ca

We address production planning in cellular manufacturing systems. A non-linear mathematical programming model is developed to minimize material handling, inventory and system set-up costs. The model is solved heuristically. Numerical examples are provided to illustrate the model and test the solution approach.

4) The Bidirectional Loop Layout Problem, *Timothy L. Urban*, University of Tulsa, 600 S. College Ave., Coll. of Bus. Admin.,

Tulsa, OK 74104, urban@utulsa.edu

We examine the machine layout design problem in which the movement of parts takes place through a bidirectional, closed-loop path. Model formulation and solution methodologies for this problem are presented and compared to existing techniques.

WB17 Convex Programming
Contributed Session

Chair: Carlton H. Scott, University of California, Grad. Sch. of Mgmt., Irvine, CA 92697, chscott@uci.edu

1) Convex Programs with Unattained Infima, ***Wieslawa T. Obuchowska***, University of Nebraska, Dept. of Mathematics, Omaha, NE 68182, tobuchow@unomaha.edu

We consider a problem of minimizing convex function over the convex region R where the objective function and the feasible region have a common direction of recession. Many algorithms, if applied to this class of programs, do not guarantee convergence to the global infimum. Our approach to this problem leads to derivation of the equation of the feasible parametrized curve C(t)...

2) A Characterization of Ill-Posed Data Instances for Convex Programming, ***Manuel A. Nunez***, Chapman University, Sch. of Bus. & Econ., 333 N. Glassell St., Orange, CA 92866, mnunez@chapman.edu

Given a data instance of a convex program, we provide a collection of conic linear systems such that the data instance is ill-posed if and only if at least one of those systems is satisfied. This result is derived from a characterization of the boundary of feasible data instances.

3) On a Convex Fractional Program, ***Carlton H. Scott***, University of California, Grad. Sch. of Mgmt., Irvine, CA 92697, chscott@uci.edu, ***Thomas R. Jefferson***

For f convex and g positive concave, it is known that f*2/g is convex. Various applications are given as well as duality results for different combinations of such functions.

WB18 Nonlinear Programming
Contributed Session

Chair: Harold P. Benson, University of Florida, Warrington Coll. of Bus. Admin, Dept. of DIS, 351 BUS, Gainesville, FL 32611, cyeonwc@nervm.nerdc.ufl.edu

1) Weakly Equivalent Conditions of Convex Functions, ***Yu-Ru Syau***, Yuan-Ze University, Dept. of IE, Chung-Li, 320, Taiwan, ROC, ieyrsyau@ie.yzu.edu.tw

We will give 2 equivalent conditions that a lower semicontinuous function is a convex (resp. quasi-convex) function by introducing the concept of weakly convex (resp. quasi-convex) functions.

2) Approximating Quadratic Programming Problems with Linear Constraints via Semi-Definite Programming Relaxation, ***Beong Choi***, University of Michigan, IOE Dept., Ann Arbor, MI 48109, bchoi@engin.umich.edu, ***Romesh Saigal***

General QP problems are hard to solve. For certain QP problems, SDP relaxation to approximate global optimum and derive theoretical bounds has been successful. We consider QP problems with linear constraints. Obtaining bounds for these problems has been known to be difficult. We also investigate how these bounds can be useful in a B&B setting.

3) Analysis of an Outcome Space Formulation of the Multiplicative Programming Problem, ***George M. Boger***, University of Florida, Warrington Coll. of Bus. Admin, Dept. of DIS, 351 BUS, Gainesville, FL 32611, bogergm@chip.cba.ufl.edu, ***Harold P. Benson***

Many approaches proposed for solving a mathematical programming problem involving the product of functions in its objective function rely on solving an outcome space reformulation of the problem. We analyze the reformulated problem according to whether or not it satisfies the general case, the convex case or the polyhedral case.

WB19 Lot Sizing
Contributed Session

Chair: Lotfi K. Gaafar, Kuwait University, PO Box 5969, Kuwait, Safat, 13060, Kuwait, gaafar@kuc01.kuiv.edu.kw

1) New Lot-Sizing Formulations for Less Nervous Production Schedules, ***Osman Kazan***, 123 Kenville Rd. Apt. B, Buffalo, NY 14215-2448, kazan@acsu.buffalo.edu, ***Christopher M. Rump, Rakesh Nagi***

We extend the traditional definition of nervousness in a rolling horizon production system to include not only the cost of scheduling a new setup but also the costs for cancelling a setup or changing the production quantity. In this environment, we compare 3 methodologies: modifications of the well-known Wagner-Whitin algorithm and Silver-Meal heuristic as well as a new MILP.

2) Simultaneous Lot-Sizing & Sequencing on Parallel Machines with Sequence-Dependent Changeover Times, ***Paulo M. Franca***, State University of Campinas, CP 6101, FEEC/DENSIS, Campinas SP, 13081-970, Brazil, franca@densis.fee.unicamp.br, http://www.densis.fee.unicamp.br, ***Valdeli M. Moscatelli, Alistair R. Clark***

We consider the problem of efficient lot-sizing and sequencing on parallel machines with sequence-dependent changeover times. The MIP model allows 2 changeovers per period and the objective function aims to minimize costs of holding inventory as well as stockout costs. Solutions provided by a SA approach are compared to optimal solutions obtained with CPLEX.

3) A New Manufacturing Lot Size Model including WIP Inventory Costs, ***Tim J. Nye***, University of Waterloo, MS Dept., Waterloo, Ontario, N2L 3G1, Canada, tjnye@uwaterloo.ca

Traditional lot sizing models (EOQ/EPQ) include finished goods inventory cost, but not WIP inventory cost, which can be much higher in manufacturing. We present a new analytic model for lot sizing that includes WIP costs, and compare its predictions and implications with those of traditional models.

4) A Neural Network Model for Solving the Lot-Sizing Problem, ***Lotfi K. Gaafar***, Kuwait University, PO Box 5969, Kuwait, Safat, 13060, Kuwait, gaafar@kuc01.kuiv.edu.kw

A neural network model is applied to the MRP problem of lot-sizing. The model's performance is evaluated under different scenarios and compared to common heuristics that address the same problem. Results show that the developed ANN model is capable of solving the lot-sizing problem with notable consistency and reasonable accuracy.

WB20 Traffic & Transportation Modeling
Contributed Session

Chair: Xi-zhao Zhou, Shanghai Maritime University, Dept. of Mgmt., Shanghai, 200135, China

1) Using AVI-Based Travel Time Information for Freeway Incident Detection, ***Laurence R. Rilett***, Texas A&M University, 301F CE/TTI Tower, College Station, TX 77843-3136, rilett@tamu.edu, ***Dongjoo Park***

We develop incident detection algorithms using AVI information. After estimating link travel times using neural network, the probability of an incident is calculated based on Bayesian theory. The detection rate, false alarm rate, and time-to-detection are also calculated based on number of AVI vehicles, link length, and the travel time distributions.

2) On the Variability of Travel Time & Its Affect on Route Choice, ***Chang-Jen Lan***, Oak Ridge National Lab, Ctr. for Transp. Analysis, Bldg. 3156, MS-6073, Oak Ridge, TN 37831, lanc@ornl.gov

The effectiveness of route guidance is subject to the accuracy of the travel time information. The existing traffic assignment models fail to explicitly take into account the variability concerning travel time. This study models this variability and accesses its affect on route choice behavior through simulation.

3) An Origin-Destination Estimation Framework for Incident-Induced Congested Freeways, ***Deb Bhattacharjee***, Ernst & Young LLP, 55 Almaden Blvd., San Jose, CA 95113, deb.bhattacharjee@ey.com, ***Kumares C. Sinha***

Freeway OD estimation becomes difficult under incident-induced congested traffic. We propose an on-line, real-time framework to account for the diverted traffic under ATIS. Simulation-based studies on the Borman Expressway revealed that the proposed dynamic linear route diversion model significantly improved the real-time OD estimated using a Kalman filter algorithm.

4) About Studies on a Mixed Deterministic UE Assignment Model based on Opposite Traffic Flow Distributions, ***Xi-zhao Zhou***, Shanghai Maritime University, Dept. of Mgmt., Shanghai, 200135, China, ***Bing-quan Fan***

Considering characteristics of Chinese urban mixed traffic, a mixed deterministic UE assignment model is developed, based on opposite traffic flow disturbance. Its uniqueness and equivalence to the Wardropian principle of UE is also proved. Finally, we give the model's algorithms.

WB21 Telecommunications III
Contributed Session

Chair: Alex Bangash, Bell Labs., Lucent Technologies, 101 Crawfords Corner Rd., Rm. 2L-518, Holmdel, NJ 07733, abangash@lucent.com

1) Locating Gateways to Interconnect Existing Communications Networks, ***Ali Amiri***, Oklahoma State University, 210 Business, Dept. of Mgmt., Stillwater, OK 74078, amiri@okway.okstate.edu

We consider the problem of locating gateways to interconnect existing communications networks in order to miminize the internet and intranet queueing delays subject to a budget constraint. An integer programming formulation is presented and a heuristic solution procedure is developed.

2) An Optimization Model for Determining Revenue Requirements for Private Line Data Services, ***Jayendra Ramesan***, AT&T Laboratories, Rm. 7C-519, 600 Mountain Ave., Murray Hill, NJ 07974, jramesan@homer.att.com, ***Lakshman P. Sinha***

A multiple objective, multi-period, non-linear optimization model was developed to generate revenue requirements for individual services in the private line business. The model represents first application for AT&T private line services where information derived from customer satisfaction scores is used in estimating revenue requirements. Also, the model has gaming capabilities.

3) Demand Signal Response, ***Dan Hancock, Alex Bangash***

Bell Laboratories designed a consensus-based demand planning process for its fiber optics apparatus plant. The process is characterized by the effective use of statistical tools for forecasting at the lowest level. Pooled domain expertise is used for managing product life-cycle libraries, capturing organizational learning and valuation of decisions and consequences.

4) Solving Large Minimum Cost Multicommodity Flow Problems using the Cycle Matrix, ***Isaac P. Santos***, PPGI CT UFES, Rua Henrique Coutinho, 79/1001 Centro, Vitoria ES, 29020570, Brazil, ips@inf.ufes.br, ***Saulo Bortolon***

We describe an algorithm to obtain the minimum cost flow on multicommodity networks. It uses a working basis (WB) with size equal to the saturated arcs cardinality, allowing to solve very large networks. The size-changing WB is updated attaching a non-square pivoting matrix to a product form WB representation. Examples are shown.

5) An Optimization Approach to Solve the E1 into VC4 Routing Problem, ***Saulo Bortolon***, PPGI CT UFES, Rua Henrique Coutinho, 79/1001 Centro, Vitoria ES, 29020570, Brazil, bortolon@inf.ufes.br, ***Sidnei Guerra, Roney Pignaton***

We describe a method to route E1 channels over a VC4-based SDH network. This problem arises in the design of metropolitan optical networks and leads to large combinatorial optimization problems. We propose both a problem partitioning and an optimization modeling that are strongly based on network engineering rules.

WB22 Vehicle Routing II

Contributed Session

Chair: James H. Bookbinder, University of Waterloo, Dept. of MS, Waterloo, Ontario, N2L 3G1, Canada, jbookbinder@uwaterloo.ca

1) An Algorithm for Dynamic Driver-Task Assignment in Vehicle Routing & Scheduling, ***Darren D. Hang***, HKUST, Dept. of IE/EM, Clear Water Bay, Kowloon, Hong Kong, hangdj@ust.hk, ***Raymond K. Cheung***

We consider the problem of assigning drivers to a set of tasks with time-windows and stochastic service times. A stochastic programming model and an algorithm that can produce solutions quickly are presented. Finally, we discuss the results from our numerical experiments.

2) Dynamic Fleet Management Models for Long Haul Networks, ***Cenk Caliskan***, University of Southern California, Dept. of ISE, GER 240, Los Angeles, CA 90089-0193, caliskan@usc.edu http://www-scf.usc.edu/~caliskan, ***Randolph W. Hall***

We develop operational models to optimize the movement of resources within long haul networks. In a typical long haul network, there is a demand between each pair of nodes, delivery movements are constrained to be cyclic and there is a time limit on the routes of drivers. This time limit is usually the result of union agreements, federal or state regulations or rules...

3) Vehicle Routing with Unrestricted Backhauls, ***James H. Bookbinder***, University of Waterloo, Dept. of MS, Waterloo, Ontario, N2L 3G1, Canada, jbookbinder@uwaterloo.ca, ***Haldun Sural***

Suppose that a private carrier makes deliveries and also has a number of (optional) backhauls. Deliveries need not precede backhauls. We find the least-cost mixed tour by selecting the most profitable backhauls, subject to overall capacity. We tighten the sub-tour elimination constraints and develop valid inequalities. Computational results are reported.

4) Bus Routing & Allocation, ***Manisha Kathuria***, ITT, 58 BG-1, Paschim Vihar, New Delhi, 110063, India, mkathuria@hotmail.com, ***Sanjiv Kapoor***

We address the problem of bus routing in city transportation. A graph network models city roads. Transportation demands are source-destination pairs. Routes required must minimize cost and provide safety by controlled congestion. Congestion is modeled by link capacities. We provide an ILP model, a non-linear model, relaxations and combinatorial heuristics.

WB23 Management of Technology: Case Studies

Contributed Session

Chair: Syed Shahabuddin, Central Michigan University, 1306 East Preston, Mt. Pleasant, MI 48858-3929, 3m3eplg@cmich.edu

1) Management of Technological Innovation in Small Manufacturing Companies, ***Sharon M. Ordoobadi***, Kansas State University, IMSE Dept., Coll. of Eng., 237 Durland Hall, Manhattan, KS 66506, share@ksu.edu

We study the dynamics of technological process. Objectives are: identifying technological as well as psychological barriers to this process; determining factors that have contributed to the success of those who have been successful in introducing innovations; developing tools to assist in decision making and management of innovations.

2) Core Competencies, Core Capabilities & Knowledge Management: A Competitive Performance Analysis, ***Sergio Takahashi***, University of Sao Paulo, Fac. Econ., Bus. Admin. & Acct, Av. dos Bandeirantes 3900, Ribeirao Preto, SP 14040-900, Brazil, sergiota@usp.br

We present an integrated analysis between competencies, capabilities and knowledge in enterprises. The management of these elements in the context of capacity-based competition is also presented and the aspects related with innovation strategy are mainly discussed. A case study in the manufacturing company is analyzed, supported by the theory presented...

3) A Case Study of How Effectively Collaboration Technology Can Support the Virtual Teams, ***Choong Kwon Lee***, Southeast Missouri State University, Dempster Hall, #268, One University Plaza, Cape Giradeau, MO 63701, cklee34@hotmail.com, ***Sangjin Yoo***

An exploratory study (Warkentin et al. Decision Sciences 28,4) reports that virtual teams communicate less efficiently than face-to-face teams. Is this true generally? The content validity of the study is tested by the case of a non-profit organization that has recently attempted to transfer its structure to the virtual.

4) Social Consequences of Information Technology, ***Syed Shahabuddin***, Central Michigan University, 1306 East Preston, Mt. Pleasant, MI 48858-3929, 3m3eplg@cmich.edu

IT is an economic vehicle in the development of a country; however, it has undesireable consequences for developming countries. It could create economic classes at both extremes and since developing countries have no safety net, the consequences could be disastrous. I want to discuss the role of technology and its social consequences.

WB24 The Warranty-Reliability-Quality-Nexus: Analytical Models & Applications

Cluster: Warranties & Warranty Related Issues

Invited Session

Chair: Ashok Kumar, Grand Valley State University, 301 W Fulton, Grand Rapids, MI 49504, kumara@gvsu.edu

1) Analytical Models for Studying Quality-Warranty Trade-Offs in a Strategic Context, ***Ashok Kumar***, Grand Valley State University, 301 W Fulton, Grand Rapids, MI 49504, kumara@gvsu.edu, ***Jaideep G. Motwani, Zubair M. Mohamed***

As the competitive battlegrounds among global industries have shifted from price to quality, many dimensions of quality have assumed a strategic role. Viewed in this context, guarantee and warranty analyses need to be recast and restructured to reflect this new reality. We assume some convenient, albeit logical and practical, relationships between quality and warranty on one hand...

2) Benchmarking Quality among Police Departments, ***Alok Baveja***, Rutgers University, Sch. of Business, Third & Penn St., Camden, NJ 08102, ***Michael A. Redmond***

We develop an AI-empowered software tool driven by socioeconomic, law

enforcement and crime data for cities nationwide. Developed in partnership with local police departments, this tool provides several capabilities for police administrators to improve the quality of service of their departments.

3) Warranty Practices in the UK, ***Il-Woon Kim***, University of Akron, Sch. of Accountancy, Akron, OH 44325-4802, ikim@uakron.edu, ***John A. Brierly***

We survey product warranty practices of large manufacturing companies in the UK. Issues examined include nature of product warranty, administration of warranty and the cost of warranty services. Considering that the majority of the published on product warranty are theoretical in nature, we provide real field data which may be useful in validating results of theoretical research in this area.

4) Using Taguchi Methods to Rein in Warranty Costs, ***Rahul Caprihan***, University of Michigan Business School, Dept. of Op. Mgmt., 701 Tappan St., Ann Arbor, MI 48109, rahul_caprihan@ccmail.bus.umich.edu, ***Ashok Kumar***

The warranty and guarantee costs incurred by a company are determined by the performance of its products in the field. To reduce such costs, a company must act so as to maximize its quality of conformance with respect to design specifications. Taguchi methods provide an excellent vehicle for determination of parameters that lead to optimized performance of processes...

WB25 Online Methodologies for Real-Time Transportation Systems

Sponsor: Transportation Science Section
Sponsored Session

Chair: Yaser E. Hawas, United Arab Emirates University, Dept. of Civil Eng., Fac. of Eng., PO Box 17555, Al-Ain, United Arab Emirates

1) An Investigation of Online Consistency Issues in Networks with ATIS/ATMS, ***Srinivas Peeta***, Purdue University, Sch. of Civil Eng., West Lafayette, IN 47907-1284, ***Srinivas Bulusu***

Some hierarchial issues related to on-line operational consistency in the deployment of a dynamic traffic assignment system are explored. Results from simulation experiments on a test network are discussed.

2) An Online Reactive Scheme for Incident Traffic Management, ***Dung Le Doan***, Northwestern University, 2145 Sheridan Rd., Evanston, IL 60208, ***Omar Sawaya***

We introduce an on-line reactive scheme to divert drivers around traffic incidents. The model employs relevant traffic attributes obtained from an on-line traffic monitoring system to develop alternate route recommendations to be disseminated through variable message signs.

3) Online Consistency Checking & Update of User Behavior Model Parameters, ***Srinivas Bulusu***, Purdue University, 1284 Civil Bldg., West Lafayette, IN 47907, ***Srinivas Peeta***

We study the interactions between user behavior parameters and on-line consistency checking in the context of on-line traffic assignment in networks with advanced information systems.

WB26 Quality Control II

Contributed Session

Chair: Kevin W. Linderman, University of Minnesota, 321-19th Ave. South, Minneapolis, MN 55455, klinderman@csom.umn.edu

1) A Unified Approach for Statistical Process Control, ***Wei Jiang***, HKUST, Dept. of IE/EM, Clear Water Bay, Kowloon, Hong Kong, jiangwei@ust.hk, http://www.ust.hk/~jiangwei, ***K.-L. Tsui***, ***Fugee Tsung***

To effectively monitor the autocorrelated processes, various residual-based control charts are studied based on the view of the monitoring outputs from feedback control schemes, wherein the EWMA chart is reexamined as the outputs from an equivalent P-control scheme, and extended to the general PID charts to integrate with the PID controllers.

2) Statistical Monitoring & Control of Manufacturing Systems with Correlated Stages, ***Paul F. Zantek***, University of Maryland, Smith School of Bus., Van Munching Hall, College Park, MD 20742-1815, pzantek@rhsmith.umd.edu, www.rhsmith.umd.edu/DIT/Faculty/zantek.htm

We propose a new procedure for monitoring process and product quality in manufacturing systems with correlated stages. The procedure contains a data reduction algorithm used to simplify the monitoring of large numbers of process and product variables. We present an empirical application using quality control data from a major electronics manufacturer.

3) Implementing the Economic Design of Multivariate Exponentially Weighted Moving Average Charts, ***Kevin W. Linderman***, University of Minnesota, 321-19th Ave. South, Minneapolis, MN 55455, klinderman@csom.umn.edu, ***Thomas E. Love***

We present a solution procedure for determining an economic design for the MEWMA control chart. Since the in-control and out-of-control average run lengths must be estimated, practitioners need insight for selecting optimal values of the design parameters. A sensitivity analysis attempts to provide this insight for a useful class of problems.

4) Lot Streaming for Quality Control in Two-Stage Production, ***Elkafi Hassini***, University of Waterloo, Dept. of MS, Waterloo, Ontario, N2L 3G1, Canada, ehassini@uwaterloo.ca, http://mansci2.uwaterloo.ca/~ehassini, ***Raymond G. Vickson***

We develop lot streaming policies to optimize expected product quality in failure-prone 2-stage production. After a delay, random stage one failures are detected at stage two, then the stage one process is restored to good condition. We consider both LIFO and FIFO processing at stage two.

WB27 Queueing/Inventory II

Contributed Session

Chair: Guan Chang, SUNY, Maritime College, 6 Pennyfield Ave., Bronx, NY 10465, guanx@ibm.net

1) Predicting Response Times in Processor-Sharing Queues, ***Amy L. Ward***, Stanford University, Dept. of EES & OR, Stanford, CA 94305-4023, award@leland.stanford.edu, ***Ward Whitt***

We investigate the possibility of reliably predicting response times in real-time in the M/G/1 processor-sharing queue. The proposed prediction is the conditional mean given current system state information. We identify conditions under which the conditional response time distribution clusters about its mean and compare different forms of information.

2) Nonparametric Methods for Inventory Control, ***Brian T. Downs***, Aspen Technology, Inc., 10575 Kay Freeway, Ste. 350, Houston, TX 77024, brian.downs@aspentech.com, ***Richard D. Metters***, ***John H. Semple***

We propose a nonparametric order-up-to S model that is designed for environments having many products, resource constraints, lags in delivery and lost sales. Assumptions about demand distributions are not required. In experiments where theoretically optimal policies could be computed, our model's policy cost within 1.6% of the optimum.

3) Intelligent Gates: The Solution for Efficient Intermodal Transfer, ***Guan Chang***, SUNY, Maritime College, 6 Pennyfield Ave., Bronx, NY 10465, guanx@ibm.net, ***Easwaran Sundaram***

The gates at the entrances of marine container terminals serve as a critical point in the intermodal transfer. Any traffic congestion at the gates can cause severe problems and inefficiency in the intermodal chain. Queueing analysis clearly indicates the need for developing intelligent gates for marine container terminals. We use the Port Authority of New York/New Jersey as a classic example.

4) The Impact of Unobservable Lost Sales on Policy Costs, ***Xiaomei Ding***, University of British Columbia, 909 E Las Colinas Blvd., 16th Floor, Irving, TX 75039, xiaomei_ding@i2.com, ***Martin L. Puterman***

We demonstrate the impact of unobservable lost sales on the newsvendor policy cost through simulation. We compare expected cost based on the maximum likelihood estimator of the unknown demand distribution parameters under lost sales to the expected cost using some demand distribution estimaotrs which ignore lost sales.

WB29 Decision Models & Technologies for Supply Webs

Sponsor: Manufacturing & Service Operations Management Society
Sponsored Session

Chair: Vatin Chalermdamrichai, University of Wisconsin, Dept. of IE, 1513 University Ave., Madison, WI 53706, chalermd@cae.wisc.edu

1) The Value of Leadtime Reduction in a Multicommodity Production & Distribution System, ***Don Warsing***, University of North Carolina, Kenan-Flager Bus. Sch., CB 3490, Chapel Hill, NC 27599-3490, dwarsing@email.unc.edu, ***Ann E. Maruchek***, ***Noel Greis***

In an environment of extreme demand uncertainty, a manufacturer may derive significant economic benefit from using faster manufacturing and distribution

processes to "buy" time to postpone production. The slack time can be used to reduce uncertainty by collecting additional information. We present an analytic model to determine the optimal benefit.

2) Models for Bid Construction in Auction-Based Manufacturing Systems, ***Seeronk Prichanont***, University of Wisconsin, Dept. of IE, 1513 University Ave., Madison, WI 53706, prichano@cae.wisc.edu, ***Mayuresh Oke***, ***Raj Veeramani***

We will describe methods for Pareto-optimal multi-attribute bid construction and for dealing with uncertainty resulting from pending bids during bid construction. Insights gained from simulation results will be discussed.

3) Inventory Planning With Shelf Life Constraints, ***Anand Iyer***, 909 E. Las Colinas Blvd., 16th Fl., Irving, TX 75039, iyer@i2.com

Several industries are faced with shelf life constraints which must be accounted for in developing an inventory policy. We examine the context in which these problems arise and present some preliminary work on solving these problems.

4) Nested Partitioning of Solution Space: A Novel Approach to Optimal Process Planning, ***Vatin Chalermdamrichai***, University of Wisconsin, Dept. of IE, 1513 University Ave., Madison, WI 53706, chalermd@cae.wisc.edu, ***Raj Veeramani***

We will discuss a novel solution approach to the highly combinatorial process plan optimization problem of multi-spindle/multi-turret turning centers. This optimizer module is a key element of a hybrid user-interactive computer-intelligent process planning system that we have developed for this highly versatile class of CNC machines.

WB30 Operations Research at Schlumberger

Sponsor: Manufacturing & Service Operations Management Society Sponsored Session

Chair: Srinagesh Gavirneni, Schlumberger, 8311 North FM 620, Austin, TX 78726, nagesh@slb.com

1) Optimal Equipment Allocation, ***C. M. Kenyon***, Schlumberger, 8311 North FM 620, Austin, TX 78726, ckenyon@slb.com

Well stimulation is an important oil-field service requiring several equipment types at a well site and takes several hours. Optimal allocation of equipment to jobs and to organization districts for high resource utilization is vital. This problem combines bin covering and vehicle routing. We develop mathematical programs and present results.

2) Simulation of A Signal Quality Survey, ***Peter Mullarkey***, Schlumberger Austin Production Center, 8311 N. FM 620, End-to-End Simulation Dept., Austin, TX 78726, mullarkey@austin.apc.slb.com, ***Douglas J. Morrice***

We describe a simulator for a large outdoor operation called a signal quality survey. Design and implementation of the simulator follows an object-oriented approach with a primary focus of modeling operations cycles. We discuss the benefits of using discrete event simulation of this application. We also report on some of the challenges encountered during the implementation stages of the project.

3) Implementing Decision & Risk Analysis in a Large Organization, ***Gary A. Lundeen***, Schlumberger, 8311 North FM 620, Austin, TX 78726, lundeen@austin.apc.slb.com

Two issues are critical to successful introduction and sustaining of D&RA within a large organization. A high profile success story should be completed, and secondly, a formal D&RA introduction and training program should be implemented. A D&RA introduction model used at Schlumberger is presented.

4) Managing a Flowshop With Multiple Products, Setup Times & Random Demands, ***Srinagesh Gavirneni***, Schlumberger, 8311 North FM 620, Austin, TX 78726, nagesh@slb.com

The objective is to determine good batch sizes and reorder levels for products in a flowshop with random demands and setup times. The arrival process and the processing times are dependent on the batch sizes and reorder levels which makes the model analytically intractable. We utilize simulation, perturbation analysis and approximations to determine heuristic values.

WB31 Planning Models

Contributed Session

Chair: Susara Van den Heever, Carnegie Mellon University, Dept. of Chemical Eng., 5000 Forbes Ave., Doherty Hall, Pittsburgh, PA 15213, susara@andrew.cmu.edu, http://egon.cheme.cmu.edu/susara

1) Optimally Reorganizing Navy Shore Infrastructure, ***Mitchell C. Kerman***, Naval Postgraduate School, 1411 Cunningham Rd., Code OR/KM, Monterey, CA 39343, mckerman@nps.navy.mil, ***Gerald G. Brown***, ***Robert F. Dell***

Regionalization, outsourcing and homebasing are current US Navy initiatives to reduce shore infrastructure spending. The Regionalization and Outsourcing Optimization Model (ROOM) suggest an optimal combination of these alternatives for a Navy shore installation. In a test case, ROOM's recommendations reduce first-year personnel spending by more than $9.5 million.

2) A Simulation Model of Blast Furnaces, ***Goutam Dutta***, Indian Institute of Management, PMQ Area, Vastrapur, Ahmedabad, Gujarat, 380015, India, goutam@iimahd.ernet.in

A blast furnace is a manufacturing system where the production of hot metal depends on a number of interacting variables. We present a simulation model based on system dynamic principles. The model has been validated with real-world data from a large integrated steel plant in southeast Asia.

3) An Optimal Aggregation/Disaggregation Scheme for Solving Multiperiod Design & Planning Models in the Process Industry, ***Susara Van den Heever***, Carnegie Mellon University, Dept. of Chemical Eng., 5000 Forbes Ave., Doherty Hall, Pittsburgh, PA 15213,susara@andrew.cmu.edu,http://egon.cheme.cmu.edu/susara, ***Ignacio E. Grossmann***

We address multiperiod MINLP models for design and planning in the process indstry. We propose an iterative aggregation/disaggregation scheme in which we iterate between an aggregate design problem and a disaggregate planning problem. A nonlinear integer subproblem is solved after each iteration to determine the leve of aggregation in the next iteration.

4) An MIP Model for Rolling-Horizon Lot-Sizing with Sequence-Dependent Setup Times, ***Alistair R. Clark***, University of the West of England, Fac. of Comp. Studies & Math., Coldharbour Ln, Bristol, BS16 1QY, UK, alistair.clark@uwe.ac.uk, http://www.csm.uwe.ac.uk/~arclark/

An MIP model that permits multiple setups per period is formulated for lot-sizing on parallel machines with sequence-dependent setup times. From this, a rolling horizon model that generates schedules for the immediate period only is developed as well as a practical solution approach that balances speed and quality.

WB32 Intelligent Systems

Contributed Session

Chair: D.-J. Wu, Drexel University, 101 N. 33rd St., Philadelphia, PA 19104, wudj@drexel.edu

1) A Hybrid Intelligent System for Urban Planning, ***Li D. Xu***, Wright State University, Dept. of MSIS, Dayton, OH 45435, lxu@paladin.wright.edu, ***Shan Feng***

We present a hybrid system in which a knowledge-based DSS is integrated with a multilayer ANN for urban planning. We discuss the structure of the system and provide an example of an application.

2) Software Agents for Business Strategy Discovering, ***D.-J. Wu***, Drexel University, 101 N. 33rd St., Philadelphia, PA 19104, wudj@drexel.edu

The search for efficient and sustainable business strategies in an ever-changing environment is critical for the success of today's business. We introduce a new approach based on software agents, that is capable in providing adaptive business strategies to help the managers reduce mental efforts and search costs.

3) Internet Applications of Perceptual Text Categorization, ***Atsushi Inoue***, University of Cincinnati, 2444 Madison Rd. #303, Cincinnati, OH 45208, ainoue@ececs.uc.edu, http://www.ececs.uc.edu/~ainoue, ***Anca L. Ralescu***

Two perspective Internet applications of a text categorization with respect to user's perceptions based on soft computing such as fuzzy sets and mass assignment theory are introduced: an email classifer and a Web search engine. The focus is the behavior of capturing perceptions along with its usefulness in these Internet applications.

4) ASSG: An Expert System for Sandy Grasslands in North China, ***Ning Liang***, University of Central Florida, Dept. of Comp. Sci., Orlando, FL 32816, nliang@cs.ucf.edu, ***Li D. Xu***

An expert system, ASSG, for the hilly, sandy grassland ecosystems in North China was developed. The system combined the empirical knowledge and theoretical research results to develop optimal managerial strategies for land use, plant species/variety selection and optimal coverage of plants.

5) Logical Support Vector Machines, ***Donghui Wu***, RPI, 110 8th St., Amos Eaton Rm. 301, Troy, NY 12180, wud2@rpi.edu, http://www.rpi.edu/~wud2

We introduce an extension of SVMs, known as logical SVMs. Logical SVMs first discretize features of training data into logical representation, then construct SVMs. Logical SVMs simplify and speed up the training of SVMs and achieve better performance on some real world application and benchmark datasets.

WB35 Panel: Issues in Doctoral OR/MS Education - A Few Words from the Student Perspective

Sponsor: **Forum on Education**
Sponsored Session

Chair: Susan K. Norman, University of Cincinnati, Dept. of QAOM, Coll. of Bus. Admin., Cincinnati, OH 45221, normansk@econqa.cba.uc.edu

1) Panel: Issues in Doctoral OR/MS Education - A Few Words from the Student Perspective, ***Douglas J. Morrice***, University of Texas, MSIS Dept., CBA 5.202, Austin, TX 78712-1175, morrice@mail.utexas.edu, ***Michael J. Fry***, University of Michigan, IOE Dept., 1205 Beal Ave., Ann Arbor, MI 48109-2117, mjfry@engin.umich.edu, ***Mary Beth Kurz***, University of Arizona, PO Box 210020, Tucson, AZ 85721-0020, maryk@sie.arizona.edu, ***Jennifer R. Goodhart***, University of California, Dept. of IE & OR, 4135 Etcheverry Hall, Berkeley, CA 94720, goodhart@ieor.berkeley.edu, ***Brian D. Neureuther***, Texas Tech University, Coll. of Bus. Admin., Area of ISQS/MS 2101, Lubbock, TX 79409-2101, otbri@coba.ttu.eduwww.ba.ttu.edu/~otbri,***NatasaChristodoulidou***, Arizona State University, Coll. of Bus., Dept. of Mgmt., PO Box 874006, Main Campus, Tempe, AZ 85287-4006, natasa@asu.edu, ***Joel Sokol***, MIT, 305 Mmemorial Dr., Cambridge, MA 023139, jsokol@mit.edu

This panel discussion will focus on the experiences, both positive and negative, that its members have had in their respective OR/MS doctoral programs. Panelists will discuss what preparation has helped them most in their program, what additional preparation would have been most helpful when they started their programs, what aspects of their program most pleased and displeased them...

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Arbel, A. SA13
Argote, Linda SD23
Arif, Mohammed TA06
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Armacost, Robert L. MC19, MD24, TA06
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Bambos, Nicholas SD27
Ban, Ivo TE20
Bander, James MD17, SB34
Bandyopadhay, Subir TC06, TD06
Bangash, Alex SD28, TD12, WB21
Baptiste, Philippe SC16
Barcena, Nicolas Serrano TD07
Bar-Gera, Hillel MA25, MD25
Barkhi, Reza SC32
Barr, Richard S. MC32
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Bartholdi, III, John TC15
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Bassett, Matthew H. TA06
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Bayus, Barry L. SC34, SD06
Bazsa, Emoke M. TD31
Bechtold, Bill TE22
Beck, J. Robert WA01
Becker, Alyson E. TC12
Beers, Suzanne M. TE11
Begue, Christophe MA30
Belanger, France SC32
Belanger, Nicolas MC25
Belassi, Walid A. SA21
Beling, Peter A. MA24, TA08
Belk, Dan WA10
Bell, David MA10, SD10
Bell, Peter C. TE13
Ben-Akiva, Moshe E. TD25
Bendoly, Elliot TE05
Benic, Duro TE20
Benini, Luca TA12
Benjaafar, Saifallah TC16
Bennett, Jerome D. MA17
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Bensaou, Ben M. TA23
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Berk, Emre TC31, TE31
Berling, Peter MC24
Berman, Oded SA31, SB31, SC31, TA19
Bernshteyn, Mikhail TC26
Bernstein, David TC25, TD25
Bernstein, Joshua I. SC06
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Regin, Jean-Charles SA14, TD14
Reilly, Charles H. SA33
Reilly, Patricia TD01
Reiman, Martin I. TD21, TE27
Reineke, David M. SC26
Reiss, Philip SB27
Reklaitis, G. V. SD21
Repenning, Nelson MA06
Retzlaff-Roberts, Donna L. MC31
ReVelle, Charles TD22
Reynolds, Jr., Marion R. SD26
Rhee, Eun Young SD08
Richardson, George P. MA13
Rider, Brian TD21
Rieder, Ulrich MC27
Rilett, Laurence R. WA20, WB20
Riley, Hannah MD13
Rios, Roger Z. SB22
Rios-Ramirez, Antonio WA12
Ritchken, Peter SA24
Rivers, Catherine M. WA22
Ro, Young MA23
Robershotte, Mark A. MD24
Robinson, Robert MD13
Robinson, Robert B. MD16
Rodosek, Robert SD14
Roelofs, Marcel MD37
Rogers, David F. MD29, OP36, TE15
Rohleder, Thomas TD24
Rohrbaugh, John MA13
Rolland, Erik MC14
Rom, Walter O. MD33, SA21
Romanelli, Elaine SC15
Romeijn, H. Edwin TD18
Ronconi, Debora P. TD19
Rong, Qiang MD26
Roodbergen, Kees Jan SD31
Rosenblatt, Meir J. SD15
Rosenfield, Donald B. MC08
Rosenkrantz, Daniel J. WA21
Rosenthal, Richard E. TA14, TC07
Rosenwein, Moshe B. TD29
Roske, Vincent P. MC11
Roth, Aleda V. SD29
Rouff, Chris SA17
Roundy, Robin TA30
Rowe, John SA17
Rowinski, Jakub P. TA33
Roztocki, Narcyz TC03
Rubenstein, Bonnie E. WB09
Rubin, Jonathan MD22
Rubio-Ardanaz, Jose M. MD25
Rubloff, Gary MA19
Ruck, John L. MC09
Rudi, Nils MC15
Rudkevich, Aleksandr SD20
Rump, Christopher M. MA31, WA22, WB19
Russell, Carl T. MD11
Russell, Robert A. TC05
Rustenburg, J. W. TD28
Ruszczynski, Andrzej TD17
Ryan, Patrick J. MD05
Ryan, Sarah M. MD27, TD16
Rygaard, Jens M. WA22
Ryoo, Hong Seo TA04
Rzeszotarski, Petert WB01
Sackett, Jeffrey R. WB08
Sadka, R. SA13
Sadowski, Deborah A. ST05
Sahinidis, Nick TA04, TD18, TE04
Saigal, Romesh WB18
Saigal, Sanjay SB14
Saini, Ratan K. TE07
Sairamesh, J. MA21, SA32
Salazar-Gonzalez, Jose-Jose WA18
Salem, Ameer H. MC19
Salle, Richard T. La TA05
Salling, Mark MA07
Salmeron, J. MA20, TA20
Saltzman, Matthew J. MD18
Saltzman, Robert M. TE14
Samu, S. SA08
Sanchez, Jenny Ryan MA14
Sanchez, Susan SC05, TD35
Sanderson, Susan Walsh MC06, MD06
Sankaran, Siva R. TD35
Santhanam, Radhika TD05
Santillo, Liberatina MA22
Santos, Alfonso H. M. SB20
Santos, Isaac P. WB21
Saraph, Jayant V. WA23
Sarathy, Rathindra TD05
Sardano, Dina MA24
Sarker, Bhaba TC30
Sarkissian, Robert SA18
Sarmiento, Ana Maria TC30
Sarper, Huseyin SB26
Satchell, Stephen E. SD10
Satten, Glen MC30
Savage, Sam L. MA37, SB13
Savard, Gilles SC25
Savas, Selcuk SB30
Savaskan, Canan R. TD06
Savelsbergh, Martin SC20, SD04, TA18
Savsar, Mehmet TE12
Sawaya, Omar TA25, WB25
Saxena, Rajiv SA28
Schaffhauser-Linzatti, Michaela M. MD34
Schandl, Bernd MD18
Scheller-Wolf, Alan MC29, SC15
Scherer, William T. MC05
Schillinger, Alexander TE13
Schlipf, John S. SA23
Schmeiser, Bruce SA05
Schmidt, Charles P. TE31
Schmidt, Glen MA15, SB01
Schmoker, James W. SA20
Schneible, Meghan S. TC12
Schneider, Michael A. SB04, TD20
Schneidereit, Gabriele TA21
Schrage, Linus SC24
Schroeder, Roger SA30
Schubert, Renate WB10
Schultz, Kenneth L. SB29
Schultz, Ruediger MA20, TE04
Schwartz, Eduardo TA27
Schwarz, Leroy B. TC29

Scott, Carlton H. WB17
Scott, Kelley TC25
Scrich, Cintia R. MC19
Scudder, Gary D. WA06
Sebastiani, Lambert MD11
Secomandi, Nicola SA20
Sedzro, Komlan T. MA24
Seery, J. B. TE27
Seguin, Rene MA14, TD09
Segura, Baldomero SB21
Seiford, Lawrence M. MD32, ST29
Selim, Basma MD24
Semet, Frederic MC03, SB31
Semple, John H. WB27
Sen, Pradyot K. TA34, TC34
Sen, Suvrajeet TD17, TT17, WA17
Sena, James A. WB11
Sena, Mark P. WB09
Sepil, Canan MC05
Sepulveda, Ariel WA26
Serebriakov, Igor TD01
Servi, L. D. TC21, TD21
Seshadri, Sridhar TD29
Sethi, Suresh MD27
Sewell, Edward C. WA19
Sexton, Thomas R. TA12, TC32
Seyed, Javad SA19, WA15, WB15
Shahabuddin, Perwez MA05, SA05
Shahabuddin, Syed WB23
Shakun, Melvin F. TC13, TD13
Shamis, Elena V. WA04
Shanthikumar, J. George TC19, TC29
Shapiro, Alexander SC04
Shapiro, Gerald W. SA25
Sharda, Ramesh MC01
Sharp, Gunter P. SB12
Sharrah, Ghanima MC22
Shattuck, James H. SC17
Shaw, Dong X. TC17
Shaw, III, Charles H. MD09
Shaw, Tina L. TC18
Shen, Ling MC28
Shen, Zuo-jun SB28
Shenoy, Prakash P. WB10
Sherali, Hanif D. TC18
Sherif, Yosef S. TC14
Shi, Jianjun MA26, MC26, MD26, TA26, TD26
Shi, R. Z. MA19
Shiflett, Ray SB27
Shih, Jhih-Shyang SB22
Shih, Li-Hsing MD28
Shim, Wonsik MD07
Shiode, Shogo SC31
Shore, Haim SA26
Shortle, John MA14
Shriesheim, Chester SB29
Shrivastava, Paul TD37
Shu, Wesley S. TE07, WB05
Shubik, Martin TD29
Shumaker, Nathan TE22
Shumsky, Robert MA29
Siddiq, Fouzia MC22
Siems, Thomas F. MC32
Silkman, Richard TC32
Silver, Edward A. WA31
Simchi-Levi, David MC28, SB28, SD04, SD19, ST15
Simmons, Donald E. MD31, TC24
Simon, John T. SD31
Simulcik, Damir SB25, TE20
Singh, Harshvardahan WB16
Singh, Mahender P. SA27
Sinha, Atish P. TD05
Sinha, Kumares C. WB20
Sinha, Lakshman P. WB21
Sinha, Praveen TA34
Skabardounis, Alex TA25
Skriver, Anders J. V. SB04
Sloan, Thomas W. TC19
Slomp, Jannes MD29
Slotnick, Susan WA29
Smart, Bill MA33
Smeers, Yves MD20
Smith, Alice E. MA12, MC14, SA09, SC26, TC03, TC16, WA16
Smith, Benjamin T. MC18
Smith, Bill TE22
Smith, Craig E. SA15
Smith, James E. TA27
Smith, Jeff SD22
Smith, N. Ty TD01
Smith, Robert E. SA08
Smith, Robert L. MD27
Smith, Scott M. SB08
Smith, Steve SC29
Smunt, Timothy L. MD30, SA29
Snoap, Kevin J. SB14
Snodgrass, Anthony W. TD20
Snyder, Stephanie TD22
Sobek, II, Durward K. MD06, SC06
Sobel, Matthew J. MD27, TD29
Sobieszczanski-Sobieski, Jaroslaw TA09
Soewandi, Hanijanto SC21
Sohn, Changsoo TE05
Soja, Wojciech TD06
Sokol, Joel WB35
Solomon, Marius M. WA22
Sommer, Rainer TD32
Son, Ki Hyoung MA31
Song, Jing-Sheng TD30
Sonnenwald, Diane H. SD06
Sorenson, Karen D. MA05
Soriano, Patrick MC21, TD09
Soroush, Hossein H. TC19
Soumis, Francois MC25
Souza, Gilvan C. MA15, TC28
Sox, Charles R. MD27
Spector, Charles TC01
Spiride, Gheorghe M. WA21
Spivak, Semjon I. MA24
Squillante, Mark S. TD27
Sridharan, V. MA28
Srikant, R. TD27
Srinidhi, Bin TC34
Srinivasan, Ashok TE34
Srinivasan, Mandyam M. SA27
Sriskandarajah, Chelliah SA16
Srivastava, Rajesh SC22
Srivastava, Sadanand MA17
Staats, Richard C. SD17
Stading, Gary L. SC13
Stalinski, Piotr Z. TD31
Stamber, Kevin L. MC05
Stanford, David A. WA27
Stanford, Kenneth L. SC17
Staniec, Cyrus MD11
Starko, Kenton TD01
Staudenmayer, Nancy A. SA06
Stecke, Kathryn E. TD34, TE34
Steele, Kent TA06
Steiner, George SA16
Steinsaltz, Steven TE14
Stemate, Luminita WB11
Stephens, Paul TE15
Stephenson, Paul A. SA16
Stevens, Scott P. TA05
Stewart, K. SA17
Stiber, Neil A. SB10
Stine, P. TC22
Stojkovic, Mirela MC25
Stone, Tamara SA07
Storbeck, James E. MD32
Storer, Richard W. SC17
Storer, Robert H. MC19, SC19, TA30, WA19
Stough, Roger R. MC07
Stoumbos, Zachary G. SD26
Stout, Suzanne TC23
Strange, Niels MC22
Stuart, Julie Ann SC22
Stummer, Christian TE13
Subramaniam, P. S. TE13
Subramanian, Dharmashankar SD21
Subramanian, Girish H. SC09
Suer, Gursel A. MD12
Suh, Jungdae TE28
Suhl, Leena TD35
Sun, Baocheng MA26
Sun, David TA20
Sun, Wu TA25
Sun, Xiao-Ling TD33
Sun, Xiaoqing SC19
Sundaram, Easwaran WB27
Sundararajan, Arun SD32
Sunil, V. TA19
Supatgiat, Chonawee TC20
Sural, Haldun SA31, WB22
Suresh, Nallan C. MD16, MD29
Svoboda, Alva J. TA20
Swaminathan, Jayashankar TC30, TE30, WA06
Swann, Julie L. MC28
Swann, Ken TD08
Sweeney, Robert J. MC24
Sweigart, James R. SD09
Swink, Morgan L. MA35, TA06
Syau, Yu-Ru WB18
Tabibzadeh, Kambiz MC28, MD31, TE26
Tadeusz, Dyr WA08
Tadisina, Suresh K. SD09
Taghaboni-Dutta, Fataneh SD31
Takahashi, Katsuhiko WB12
Takahashi, Sergio WB23
Takai, Ayako TD12
Takeda, Akiko SC18, TA32
Takriti, Samer TE17
Tang, Christopher S. MC15
Tapia, Juan Carlos MD12
Taraseiskey, Rina TD06
Tardif, Valerie MC06
Tarko, Andrzej P. TA25, TE25
Tastebro, Thomas SB10
Tatikonda, Mohan V. SD06
Tawarmalani, Mohit TE04
Tayi, Giri K. WA21
Taylor, James G. MA11, MC11
Taylor, Raymond G. SD07
Taylor, Ronald N. WA01
Taylor, Terry A. MC15
Tayur, Sridhar MC29, MD14, SC15, WA30
Tegarden, David P. SC32
Teillet, Rafael Menendez TD07
Tekin, Eylem TC31
Tenbrunsel, Ann MD13
Terlaky, Tamas MC04
Terwiesch, Christian SB06
Tetzlaff, Ulrich A. TE34
Thiagarajan, Sashi SB27
Thibault, Daniel W. SB17
Thienpaitoon, Sira SD22
Thomas, L. Joseph SB29
Thomas, Robert SD29
Thomke, Stefan MD06, SA06, SC34
Thompson, George SA19
Thompson, Gerald L. MC18
Thompson, Kimberly M. SB10
Thorsen, Bo Jellesmark MD22
Thrall, Robert M. TA32
Tian, Xin MA25
Tilak, Avinash G. TD07, TE23
Tirupati, Devanath TA29
Toktay, L. Beril TD30
Tong, Judy MC28
Tormos, Pilar SB21
Trafalis, Theodore B. TD04
Trappey, Amy J. C. TD32
Trappey, Charles V. TD32
Travis, Laurel E. TC22
Treharne, James T. MD27
Trichur, Vinai SD32
Trick, Michael A. TD14
Troutt, Marvin D. SD09
Truchon, Jay SA28
Trumbo, Mark MD08
Truszczynski, Miroslaw SA23
Truszkowski, Walter SA17
Tsay, Andy A. SB15, TA15
Tseng, Paul Y. MD25
Tsikriktsis, Nikos TC24
Tsitsiklis, John N. WA22
Tsui, K.-L. WB26
Tsui, Kwok-Leung SD26
Tsung, Fugee SA26, WB26
Tsurkov, Vladimir I. SB34
Tuenter, Hans TC32
Tukel, Oya Icmeli SA21
Tuncel, Levent SB18
Turnquist, Mark A. TA14
Tuydes, Hidiye WA25
Twomey, Janet M. SA09
Tyagi, Rajeev SD08
Tzong-Ru, Lee WA13
Umezawa, Yutaka WA12
Urban, Timothy L. SB30, WB16
Uryasev, Stanislav TC04
Usher, John S. SC26, TC03

Uzsoy, Reha SD16, SD22, ST23, TE12
Uzumeri, Mustafa V. TA26
Vadlamani, Satish TE31
Valle, Alejandro G. del SC25
Van den Heever, Susara WB31
van Donselaar, K. TD28
van Ees, H. WA13
Van Hentenryck, Pascal TT08
van Houtum, Geert-Jan TD28
Van Hove, John C. SD21
van Mieghem, Jan A. MA23, SD27, TA15
van Nunen, J. MA22
Van Voorhis, Timothy P. TC19
Van Wassenhove, Luk N. SB06, TA23, TD06
Van Zandt, Gary M. SD09
Vaninsky, Alexander Y. TC32
VanMarter, William H. MC34
Vaughan, Timothy S. WA26
Vazquez, Ramon MD12
Veeramani, Raj SC30, SD30, WB29
Venkateswaran, Venkat SA34
Ventura, Jose A. TA12, TD16, TE21
Vepsalainen, Ari P. TE33
Vician, Chelly TA13
Vickson, Raymond G. SB04, WB26
Vijaykumar, Nandamudi L. WA32
Vikas, Shree SA20
Villalobos, J. Rene MD26
Vis, Iris F. A. SD28
Viswanathan, Narayanan SD30
Viswanathan, Shivakumar SD32
Vogt, William J. SC17
von Winterfeldt, Detlof TA10, TE10
Voss, Stefan TA21
Vossen, Thomas SD25
Vovor, Tsevi MC18
Vrtiprah, Vesna TE20
Wachs, Allise MD27
Wagner, Bill MC35, WB07
Wagner, Harvey M. WA31
Wakefield, Kirk L. SD11
Waldes, John TA08
Walker, Ronald J. MD35
Waller, S. Travis TC25, TE25, WA25
Walter, Arnaldo C. SB20
Wang, Chia-Li SB27
Wang, Chi-Tai SD31
Wang, Chung-Hsiao TD08
Wang, Jen-Hung MC19
Wang, Jinhui SA26
Wang, Jin-Yuan TA24
Wang, Michael SD09
Wang, Qian MA31
Wang, Renyou MD04
Wang, Te-Wei WB10
Wang, Yongge SA34
Wang, Yu-chou TD32
Wang, Yufei MC21
Wang, Yun MC35
Ward, Allen C. SC06
Ward, Amy L. WB27
Warner, Marc MA34
Warner, Rona C. SA09
Warsing, Don WB29
Wasserman, Kimberly TC27, TD27
Watanabe, Taiji SD18
Waterer, Hamish SC20
Wathieu, Luc SD10, TD10
Way, Bruce B. MA13
Weber, Bruce W. SB24
Weber, Elke U. MA10, MD10, WA10
Webster, Cliff O. SC11
Webster, Scott T. MA30, SD16
Wee, Kwenang TC29
Weeren, Arie TE19
Wegryn, Glenn MC08
Wei, Chien-Hung TA05
Wei, Wayne Wang TD28
Weidow, David MA17
Weihua, Shi MC24
Wein, Lawrence M. MC30, TD30
Weinstein, Larry B. MC16, WB08
Weintraub, Andres MC03, MD03, TA22
Weir, Jeffery W. WA11
Wellington, John F. SC13
Welter, G. SA17
Wen, Daling SA10
Wendell, Richard E. SC24
Werner, Frank M. SC16
Wesolowsky, George O. SA31, SC31
West, Martin MD31
West, Timothy D. SD12
Whinston, Andrew B. SA32
Whitcomb, Kathleen WA10
White, III, Chelsea C. MD17, SB34, SC28
White, Leroy SB33
Whiting, Philip TC27
Whitt, Ward WB27
Whybark, Clay SD22
Wickramasinghe, Nilmini WB01
Wiecek, Margaret M. MD18
Wikum, Erick MD17
Wiley, Mark TC37
Wilhelm, Wilbert E. TC18
Wilkinson, David TE01
Willems, Sean P. MC29
Williams, Marion L. TE11
Williams, Richard MC24
Willis, John B. MA24
Willoughby, Keith WA14
Wilmott, Courtney MA17
Wilson, Amy R. SC07
Wilson, Dan MA14
Wilson, George R. SD28
Wilson, John G. MC27
Wilson, John M. SD14
Wilson, Rick L. WA14
Windschitl, Paul D. MD10
Wing, Vern F. MC11
Winkler, Robert L. TA10
Wirth, Andrew SA16
Wisner, Priscilla S. SD12
Wojciech, Soja WA08
Womer, N. Keith SD11
Wong, Julius P. SC12
Wong, Richard T. MC21
Wong, Sze Sze SA06
Wood, Kevin TE17
Wortman, Martin A. MA27
Wouters, M. TD28
Wright, Ronald H. TA35
Wu, C. F. Jeff SD26
Wu, D.-J. WB32
Wu, David TA30, TC30
Wu, Donghui WB32
Wu, Fred MA16, SC30
Wu, George MC10, MD10
Wu, Jiahao MD21, MD25, TC25
Wu, Lilian S.-Y. TE17
Wu, Peiling SD28
Wu, S. David MA16
Wu, Shin-Yi WA21
Wu, Yangru SB09
Wu, Yenchun J. MA28
Wunderlich, Karl TE06
Wunneburger, Douglas F. MA07
Wurgaft, Hernan WA12
Wurl, Robin C. MA26
Wyatt, Katherine SA14
Xiande, Zhao MA28
Xiao, Baichun WA09
Xie, Ying SD08
Xu, Li D. WB32
Xue, Jue WB09
Xue, Jungong TC21
Yan, Houmin MD27
Yang, Jian TA17
Yang, Rachel B. MC31
Yang, Ta-Hui TC25
Yang, Zhaowei WA25
Yano, Candace A. SD25, TC29, TE30, WA08
Yao, David D. TD27
Yao, Yin-Ho TD32
Ye, Hengqing SB34
Ye, Qiang TC21
Ye, Yinyu SC18
Yee, Shang-Tae TA12
Yen, Joyce TE04
Yen, Vincent C. SC04
Yew, Bee K. SC09
Yildirim, Mehmet B. WA20
Yoo, Sangjin WB23
Yoon, Eunsang SD21
Yoon, Tay Yong SD20
Yoshikura, Hideaki TA11
Yu, Chien-Ning SD20
Yu, Gang TA17
Yu, Liang SD03
Yu, Liyang TC26
Yucesan, Enver TA23, TE09
Yue, Wei Thoo SD03
Zaider, Marco SD04
Zajic, Tim SD27
Zakeri, Golbon MC20
Zanjacomo, Paulo R. SC18
Zantek, Paul F. WB26
Zapert, Radoslaw A. MA05, SD13, WB09
Zaric, Gregory S. MC30
Zelenka, Richard E. TE08
Zenios, Stefanos MC30, TC29
Zhang, Chuqian TA28
Zhang, Ding MD21, TC25
Zhang, G. Peter SB09
Zhang, Guoqiang WB09
Zhang, Jun WA06
Zhang, Li TD27
Zhang, Michael SA28
Zhang, Qingyu TE26
Zhang, Rachel TC20, WA30
Zhang, Shuzhong MC04
Zhang, Xiong SC18
Zhao, Wen SC01
Zheng, Shaohui TD30
Zheng, Yu-Sheng SB15, TA17
Zhou, Chao TD25
Zhou, J. MD29
Zhou, Nairong TA26
Zhou, Sean SB16
Zhou, Tracy SB29
Zhou, Xi-zhao WB20
Zhou, Yongpin SB29, SC01, TE31
Zhu, Hui TA08
Zhu, Joe MC32
Zhu, Lihua MC21
Zhu, Wanshan WA30
Zhuang, Youlong WA07
Zickafoose, Dave SB04, TD20
Zigurs, Ilze TA03
Zijm, W. H. M. TD28
Ziliaskopoulos, Athanasis TA25, TC25, TD25, TE25, WA25
Zimmel, Sheri L. MC32
Zipkin, Paul TD30, WA30
Ziyad, Nigel SA17
Zobel, Christopher W. MC05
Zuidwijk, Rob A. TD19

Sunday 08:00-09:30

SA04 Decision Analysis & Support
SA05 Efficiency of Simulations
SA06 Interdependence & Flexibility in Product Development
SA07 Health Service Delivery: Fiscal & Knowledge Management
SA08 Advertising & Education Concepts
SA09 Analysis of Complex Problems using Real Data Sets
SA10 Decision Analysis I
SA11 RAHMORS I
SA12 Session 1
SA13 Multiple Criteria Optimization: Methods
SA14 Topics in Disjunctive Programming & Constraint Programming
SA15 Managing Uncertainty & Information Flow in Supply Chains
SA16 Models for Modern Manufacturing I
SA17 Spacecraft Autonomy
SA18 Parallel Implementation of Interior Point Methods for Large-Scale Optimization
SA19 Supply Chain Optimization in the Pharmaceutical Industry
SA20 Issues in North American Natural Gas Modeling
SA21 Applications in Project Management
SA22 Expert Systems
SA23 Satisfiability
SA24 GARCH Option Pricing Models
SA25 Transportation Applications I
SA26 Reliability & Quality Control I
SA27 Advances in the Analysis of Polling Systems
SA28 Constrained Vehicle Routing & Scheduling
SA29 Product & Process Design Issues
SA30 The Relationship Between Product Development Speed & Quality
SA31 Continuous Location Problems
SA32 Economics of Electronic Commerce
SA33 Combinatorial Problem Generation Methods
SA34 Optimization Techniques I

Sunday 09:45-11:15

SB01 1999 George E. Nicholson Student Paper Prize Competition I
SB04 Optimization Techniques III
SB05 Simulation Output Analysis
SB06 Managing the Back-End of Product Development
SB07 Health Care Research
SB08 New Research Methods
SB09 Forecasting with Neural Networks
SB10 Value of Information
SB11 RAHMORS II
SB12 Session 2
SB13 Multiple Criteria Optimization: Applications
SB14 Perspectives on OR Consulting
SB15 Supply Contracts & Coordination Issues
SB16 Models for Modern Manufacturing II
SB17 Military Space Applications
SB18 Complexity Issues in Linear & Convex Optimization
SB19 Order/Assembly Scheduling
SB20 Perspective for Power System Planning in a Competitive Environment
SB21 Parallel Computing, Genetic Algorithms & Practice in Project Management
SB22 Environmental Issues I
SB23 Genetic Algorithm Theory & Application
SB24 IT & Financial Services
SB25 Transportation Applications II
SB26 Reliability & Quality Control II
SB27 Queues: Theoretical & Applied Approaches
SB28 Methods in Logistics
SB29 Some Effects of Worksharing Arrangements on Processing Times
SB30 Facility Layout
SB31 Location Decisions
SB32 Economics of Networks & Network Games
SB33 Community Operational Research
SB34 Optimization Techniques II
SB35 Undergraduate OR/MS Project Showcase I

Sunday 12:30-14:00

SC01 1999 George E. Nicholson Student Paper Prize Competition II
SC03 Telecommunication Systems: Modeling & Analysis
SC04 Optimization Techniques IV
SC05 Selection Procedures in Simulation
SC06 Set-Based Design in Practice & Theory
SC07 Health Applications
SC08 Sales & Sales Performance Models
SC09 Model & Data Representation Issues in Neural Networks
SC10 Approximations in Decision Analysis Modeling
SC11 Leveraging Information in the Battlespace
SC12 Session 3
SC13 Multicriteria Decision Making
SC14 Constraint Programming & Optimization I
SC15 Global Supply Chain Management Challenges
SC16 Models for Modern Manufacturing III
SC17 Satellite Communications Applications
SC18 Positive Semidefinite Programming & its Applications
SC19 Production Scheduling
SC20 Optimization of Electricity Generation
SC21 New Topics in Project Scheduling
SC22 Models for Resource Evaluation, Remanufacturing & Recycling
SC23 Classification Methods
SC24 Mini-Tutorials: Finance & Financial Services
SC25 Transportation Applications III
SC26 Reliability Data Analysis
SC27 1998 Erlang Prize Recipients
SC28 Panel: The Impact of Information on Logistics
SC29 Retail Operations
SC30 Internet-Enabled Supply Chain Management
SC31 Location Models & Algorithms
SC32 Electronic Commerce Technology
SC33 Session Withdrawn - GE Corporate R&D Practitioner's Session
SC34 OR/MS in the News
SC35 Undergraduate OR/MS Project Showcase II

Sunday 14:15-15:45

SD03 Wireless Communications: Modeling & Analysis
SD04 Computational Mixed Integer Programming
SD06 Decisions & Communication in Product Innovation
SD07 Public Programs
SD08 Retailing & Distribution Models
SD09 New Techniques & Issues in Data Mining
SD10 Progress in Utility Theory
SD11 Models for Navy Personnel Management
SD12 Session 4
SD13 Group Decisions & Negotiation
SD14 Constraint Programming & Optimization II
SD15 Issues of Pricing, Costing & Inventory in Supply Chains
SD16 Modern Manufacturing in Practice
SD17 Theoretical Frameworks for Space Applications
SD18 Optimization Applications in Finance & Economics
SD19 Deterministic Machine Scheduling
SD20 Modeling Strategic Behavior in Competitive Electricity Markets
SD21 Project Management
SD22 Production Planning for Green Manufacturing

SD23 Panel: Publishing Outlets for Technology & Innovation Management Research
SD24 Panel: Teaching with Cases
SD25 Collaborative Decision Making in Air Traffic Management
SD26 Quality & Reliability
SD27 Control of Networks under Differentiated QoS
SD28 Logistics: Design Issues
SD29 Advances in Global Operations Management & Technology
SD30 Industry Applications of Supply Web Decision Systems
SD31 Facility Layout
SD32 Models of Electronic Market Microstructure
SD33 Supply Chain Optimization at Hunt Wesson, Inc.
SD34 Panel: Juggling Family & a Career in OR/MS
SD35 Computer-Aided Education in OR & Operations Management

Sunday 16:00-17:00

SP36 INFORMS/CIST Plenary

Sunday 17:00-18:00

ST05 Tutorial: Trends & Topics in Process Modeling & Simulation
ST08 Tutorial: Linear Programs, Integer Programs & Constraint Programming: Program ! = Program
ST15 Tutorial: Coordinating Production Distribution & Transportation Decisions in the Supply Chain
ST17 Tutorial: Semidefinite Programming for Combinatorial Optimization
ST18 Tutorial: Generating Experimental Data for Combinatorial Optimization Problems
ST19 Tutorial: Exploiting Operations Research Algorithms in Constraint-Based Scheduling I - Constraint Propagation
ST20 Tutorial: Semi-Infinite Programming
ST21 Tutorial: Resource-Constrained Project Scheduling - A Classification & Overview
ST23 Tutorial: Artificial Intelligence & Operations Research in Discrete Optimization Heuristics from the OR Perspective
ST29 Tutorial: NSF Funding Opportunities
ST30 Tutorial: The Economics of Design Quality Competition

Monday 08:00-09:30

MA01 MHT as a Health Profession
MA03 Daniel H. Wagner Prize for Excellence in Operations Research Practice
MA05 Simulation I
MA06 Issues in New Product Development
MA07 GIS in Public Sectors
MA08 Manufacturing Simulation Applications
MA09 Web-Based AI
MA10 Risk & Risk-Value Models
MA11 Ground Attrition Modeling: Theory
MA12 US/Japan Collaborative Research on Intelligent Design & Manufacturing
MA13 Group Model Building for Decision & Design
MA14 Communications Network Problems & Discrete Programming
MA15 Issues in Supply Chain Management I
MA16 Models for Modern Manufacturing IV
MA17 Intelligent Systems for Spacecraft Operations
MA18 Recent Advances in the XPRESS-MP Optimization Software
MA19 Operational Methods in Semiconductor Manufacturing
MA20 Optimization Methods in the Power Industry
MA21 The Use of Information in Internet & Electronic Commerce
MA22 Reverse Logistics
MA23 The Product Architecture - Supply Chain Interface
MA24 Finance: Risk Management
MA25 Implementation Issues with Combined Travel Models
MA26 Multivariate Process Control, Monitoring & Feedback Adjustment
MA27 Reliability & Maintenance Models
MA28 Logistics: Supply Chain Issues
MA29 Call Center Operations Management
MA30 Supply Chain Planning & Scheduling in Practice
MA31 Facilities Planning & Design
MA32 Electronic Commerce
MA33 Data Mining in NCR Corporation
MA34 Rail Applications I: National Planning Models
MA35 Issues in Establishing & Maintaining an Academic Program in Supply Chain Management
MA37 Software Demonstration I

Monday 09:45-10:45

IP36 Plenary: Logistics Modeling - From the Classroom to the Boardroom

Monday 13:00-14:30

MC01 A Model Curriculum in MHT
MC03 Panel: Opportunities for Applied Operations Research Worldwide
MC04 Cone-Linear Optimization
MC05 Simulation II
MC06 Continuity, Change & the Product Development Process
MC07 Public Sector Productivity Assessment: Alternative Applications using DEA
MC08 Innovations in Strategic Global Supply Chain Analysis & Design
MC09 Java-Based Simulation Modeling
MC10 Identifying Roots: The Fundamental Ideas to Help People Make Better Decisions
MC11 Ground Attrition Modeling: Practice
MC12 Japan/US Collaborative Research on Genetic Algorithm-Based Intelligent Design
MC13 Procedural Approaches to Group Decision & Negotiation
MC14 Panel: Metaheuristics - Some New Directions
MC15 Managing Supply: Information & Coordination I
MC16 Aggregation & Disaggregation in Operations Research
MC17 Theory & Applications of Network Flows
MC18 IP, Theory, Algorithms & Applications
MC19 Scheduling I
MC20 Optimization in Energy Markets
MC21 Telecommunications Network Design I
MC22 Environmental Issues II
MC23 Technology Management in Rapidly Changing Environments
MC24 Finance: Theory
MC25 Routing & Scheduling
MC26 Model-Based Statistical Process Control & Diagnosis
MC27 Adaptive Stochastic Models
MC28 Logistics Applications I
MC29 Supply Chain Applications
MC30 Modeling & Analysis of Health Care Problems
MC31 Operations Management I
MC32 Applications of Data Envelopment Analysis
MC33 Monte Carlo Simulation Approaches to Complex Problems at Glaxo-Wellcome
MC34 Rail Applications II: Discussion of Line Capacity Modeling Issues
MC35 Education in OR
MC37 Software Demonstration II

Monday 14:45-15:45

MP36 MAS Plenary

Monday 16:00-17:30

MD01 Panel: A Model Curriculum in MHT I

MD03 International Challenge of Quality & Costs in Health Care Delivery
MD04 Optimization Techniques V
MD05 Simulation III
MD06 Panel: Discussion on Teaching Product Development
MD07 Models for Improving Library Operations
MD08 Business & Industry Applications
MD09 Dynamic, Distributed Modeling Architectures
MD10 New Developments in Modeling Risk & Uncertainty
MD11 Applications of OR in Weapon System Tests & Evaluations
MD12 Genetic Algorithms and Cellular Manufacturing
MD13 GDN Research in Context: The Context of Negotiation
MD14 Recent Algorithmic Results in Computational Optimization
MD15 Managing Supply: Information and Coordination II
MD16 Cellular Manufacturing
MD17 Network Applications
MD18 Integer Programming: Theory & Computations
MD19 Scheduling II
MD20 Market Power in Electricity Restructuring
MD21 Telecommunications Network Design - II
MD22 Analyzing Risk in Forest Investments
MD23 Managing Innovation in Health Care
MD24 Risk Analysis
MD25 Traffic Network Equilibrium
MD26 Multivariate Statistical Process Control and Diagnosis
MD27 Forecasting & Decision Making Over Time
MD28 Logistics Applications II
MD29 Cellular Manufacturing
MD30 Panel: Teaching International Operations
MD31 Operations Management II
MD32 Panel on DEA: Selling the Results to Management
MD33 Statistical Theory
MD34 Accounting
MD35 OR/MS in the Liberal Arts College
MD37 Software Demonstration III

Tuesday 08:00-09:30

TA01 Panel: A Model Curriculum in MHT II
TA03 Panel: Publishing Strategies for Research in Engineering & Technology Management
TA04 Recent Advances in Global Optimization
TA05 Neural Networks
TA06 New Product Design & Development
TA07 Applications to Housing Location & Regional Planning
TA08 Business Applications
TA09 Metaheuristics & Applications
TA10 Modeling & Assessment in Decision Analysis
TA11 Recent Advances in Military Modeling Applications
TA12 Cost/Performance Analysis
TA13 Panel: Supporting Teamwork in Higher Education
TA14 Mathematical Programming Applications
TA15 Economic Issues in Supply Chains
TA16 Tutorial: Genetic Algorithms & Their Application to Cellular Manufacturing
TA17 New Models for Economic Lot Sizing
TA18 Mixed Integer/Logical Programming
TA19 Production & Scheduling I
TA20 Constrained Optimization: Scheduling, Pricing & Dispatch in Deregulated Electricity Markets & Pricing in Deregulated Mar
TA21 Ring Network Design
TA22 Applications of MS/OR in Forestry & the Forest Industries
TA23 Information Technology Management within Operations
TA24 Service Industry Scheduling
TA25 Modeling & Optimization of Signalized Roadways
TA26 Measurement & Productivity Improvement
TA27 Applied Probability in Finance
TA28 Logistics Heuristics
TA29 Capacity & Technology Acquisition Models
TA30 Manufacturing Logistics Research I
TA31 Inventory Models I
TA32 Data Envelopment Analysis I
TA33 Forecasting
TA34 Analysis Forecast Research
TA35 The Use of Linked Spreadsheets in Teaching Production Planning & Inventory Control: For a Little More Swing
TA37 Software Demonstration IV

Tuesday 09:45-10:45

OP36 Omega Rho Distinguished Lecture Plenary

Tuesday 11:00-12:00

TT04 Tutorial: EMOSL - A New Paradigm for solving Hard Optimization Problems
TT05 Tutorial: Design & Analysis of Simulation Experiments
TT08 Tutorial: The OPL Optimization Programming Language
TT09 Tutorial: Genetic Algorithms & their Applications to Manufacturing
TT10 Tutorial: Preference Function Modeling - A New Methodology for Preference Measurement
TT13 Tutorial: Java - Introduction & OR Applications
TT14 Tutorial: Introduction of "Optimization" Modules in Simulation
TT17 Tutorial: Model Validation & Scenario Generation for Stochastic Programming Models
TT18 Tutorial: Fuzzy Dynamic Programming & its Variants
TT19 Tutorial: Exploiting Operations Research Algorithms in Constraint-Based Scheduling II - Search & Optimization
TT30 Tutorial: Retail Operations

Tuesday 13:00-14:30

TC01 Perspectives on MHT Education I
TC03 Engineering Valuation & Cost Analysis for Strategic Decision Making
TC04 Optimization of Risk & Reliability
TC05 Neural Network Applications
TC06 Marketing I
TC07 Third OR/MS Knowledge Bowl
TC08 Industry Applications I
TC09 Metaheuristics with Nontraditional Coding
TC10 Improving Resource Allocation & Capital Investment Decisions
TC11 No Title Supplied
TC12 Business Process Reengineering
TC13 Panel: GDN Research in Context - Human & Artificial Agents I
TC14 Computer Science/Applications
TC15 Enabling Distribution Technologies in Supply Chain Management
TC16 Cellular Manufacturing: Material Flow Considerations
TC17 New Bounding Techniques for the Traveling Salesman Problem
TC18 Cutting Plane & Column Generation Methods
TC19 Production & Scheduling II
TC20 Scheduling & Pricing in Deregulated Markets
TC21 Numerical Applied Probability Methods Applied to Telecommunications
TC22 OR/MS in Forestry: Wildlife Conservation
TC23 Innovation Networks
TC24 Service Industry Applications I
TC25 Dynamic Traffic Assignment I
TC26 Simulation-Based Objectives for Optimal Experimental Design
TC27 Stochastic Network Control I
TC28 Supply Chain Management I
TC29 The Use of Information in Managing Supply Chains

TC30 Manufacturing Logistics Research II
TC31 Inventory Models II
TC32 Data Envelopment Analysis II
TC33 Statistics: Goodness of Fit Tests
TC34 Managerial Accounting
TC35 Panel: Re-Inventing the Management Science Curriculum
TC37 Software Demonstration V

Tuesday 14:45-16:15

TD01 Perspectives on MHT Education II
TD04 Topics in Combinatorial Optimization
TD05 Applications of Neural Nets & Genetic Algorithms
TD06 Marketing II
TD07 Internet Applications: Technology I
TD08 Industry Applications II
TD09 Tabu Search Applications
TD10 Decision Analysis Involving Outcomes over Time & Environmental Risks
TD11 TRAC-White Sands Military Operations Research
TD12 Reengineering Applications
TD13 GDN Research in Context: Human & Artificial Agents II
TD14 Sports Scheduling
TD15 New Teaching Cases in Supply Chain Management
TD16 Cellular Manufacturing: AGV & Robotic Considerations
TD17 Stochastic Integer Programming
TD18 Solving Hard Combinatorial Optimization Problems
TD19 Flowshop Scheduling
TD20 Military Applications I
TD21 Applied Probability & Telecommunications
TD22 Wildlife Management & Conservation Biology
TD24 Service Industry Applications II
TD25 Dynamic Traffic Assignment II
TD26 Modeling Manufacturing Systems for Quality Improvement
TD27 Stochastic Network Control II
TD28 Supply Chain Management II
TD29 Service Operations
TD30 Supply Chain Models
TD31 Inventory Models III
TD32 Advances in Enterprise Integration
TD33 Reliability
TD34 FMS Performance Issues I
TD35 Education Issues
TD37 Software Demonstration VI

Tuesday 16:30-18:00

TE01 Research Perspectives in MHT I
TE04 Global Optimization in Stochastic Programming
TE05 Information Systems I
TE06 Applications in the Automotive Industry
TE07 Internet Applications: Technology II
TE08 Airline Applications
TE09 Heuristic Programming
TE10 Structuring & Quantifying Values
TE11 Verification, Validation & Accreditation
TE12 Resource Allocation: Computers & Manufacturing
TE13 Strategic Planning
TE14 Baseball Strategy
TE15 Issues in Supply Chain Management II
TE16 Cellular Manufacturing: Teaching Cell Design
TE17 Models & Approximations in Stochastic Programming
TE18 Integer Programming
TE19 Project Scheduling
TE20 Economics
TE21 Telecommunications I
TE22 MS/OR in Forestry
TE23 Management of Technology: Customers & Strategy
TE24 Warranty & its Impact on the Manufacturer & Consumer
TE25 Traffic Simulation & Visualization Tools
TE26 Quality Management
TE27 Current Issues in Call Center Research
TE28 Operations Management III
TE29 An Introduction to SAP R/3
TE30 Product Line Planning Considering Manufacturing Effects
TE31 Queueing/Inventory
TE32 Next Generation Manufacturing
TE33 Logistics III
TE34 FMS Performance Issues II
TE35 Education: Pedagogical Techniques
TE37 Software Demonstration VII

Wednesday 08:00-09:30

WA01 Research Perspectives in MHT II
WA04 Networks & Graphs
WA05 Information Systems II
WA06 Manufacturing I
WA07 Internet Applications: Electronic Commerce
WA08 Railway Applications
WA09 Dynamic Programming
WA10 Decision Analysis II
WA11 Military Applications II
WA12 Global Manufacturing & Strategy
WA13 Organizational Theory I
WA14 Sports & Gaming Models in OR/MS I
WA15 Software Systems for Supply Chain Management
WA16 Cellular Manufacturing: Layout Issues
WA17 Multistage Stochastic Programming
WA18 Integer Programming Applications & Software
WA19 Single Machine Scheduling
WA20 Optimization Models in Transportation
WA21 Telecommunications II
WA22 Vehicle Routing I
WA23 Management of Technology: Models & Methods
WA24 Product Warranty Modeling & Analysis
WA25 Optimum Path Algorithms on Transportation Networks
WA26 Quality Control I
WA27 Applied Probability
WA29 Quantitative Models of Quality
WA30 Issues in Productivity & Inventory Control
WA31 Multiechelon Inventory Systems
WA32 Stochastic Processes
WA34 Flexible Manufacturing Systems
WA35 Models for Teaching Effectiveness in Technology & Innovation Management Courses - Some Experiences

Wednesday 09:45-11:15

WB01 Research Perspectives in MHT III
WB05 Information Systems III
WB06 Manufacturing II
WB07 Internet Applications: Case Studies
WB08 OR/MS in the Miami Valley
WB09 Decision Support Systems
WB10 Decision Analysis III
WB11 Military Applications III
WB12 Intelligent Manufacturing
WB13 Organizational Theory II
WB14 Sports & Gaming Models in OR/MS II
WB15 Applying Software Applications in Different Industries
WB16 Cellular Manufacturing: Design Considerations
WB17 Convex Programming
WB18 Nonlinear Programming
WB19 Lot Sizing
WB20 Traffic & Transportation Modeling
WB21 Telecommunications III
WB22 Vehicle Routing II
WB23 Management of Technology: Case Studies
WB24 The Warranty-Reliability-Quality-Nexus: Analytical Models & Applications

WB25 Online Methodologies for Real-Time Transportation Systems
WB26 Quality Control II
WB27 Queueing/Inventory II
WB29 Decision Models & Technologies for Supply Webs
WB30 Operations Research at Schlumberger
WB31 Planning Models
WB32 Intelligent Systems
WB35 Panel: Issues in Doctoral OR/MS Education - A Few Words from the Student Perspective

INDEXES

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Advanced Research in Enterprise Integration
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INFORMS MEETING CALENDAR

1999
July 26 – 28
1999 Applied Probability Conference
University of Ulm
General Chair: Uwe Jensen, University of Ulm, Dept. of Stochastics, D-89069 Ulm, Germany; jensen@mathematik.uni-ulm.de; 49 731 502-3530

November 7 – 10
INFORMS Philadelphia Fall 1999
Philadelphia Marriott
General Chair: G. Anandalingam, University of Pennsylvania, Dept. of Systems Engineering & OPIM, Towne 295, Philadelphia, PA 19104-6315; anand@seas.upenn.edu; 215-898-8790

2000
January 5 – 7
INFORMS Computing Society
Westin Regina Cancun
Cancun, Mexico
General Co-Chairs: Manuel Laguna, University of Colorado, C 419, Boulder, CO 80309-0419; manuel.laguna@colorado.edu
Jose Luis Gonzalez-Velarde; lugonzal@campus.mty.itesm.mx

May 7 – 10
INFORMS Salt Lake City Spring 2000
Salt Palace Convention Center
Marriott & Wyndam Hotels
General Chair: William Giauque, Brigham Young University, 630 TNRB, Provo, UT 84602; william_giauque@byu.edu; 801-378-2409

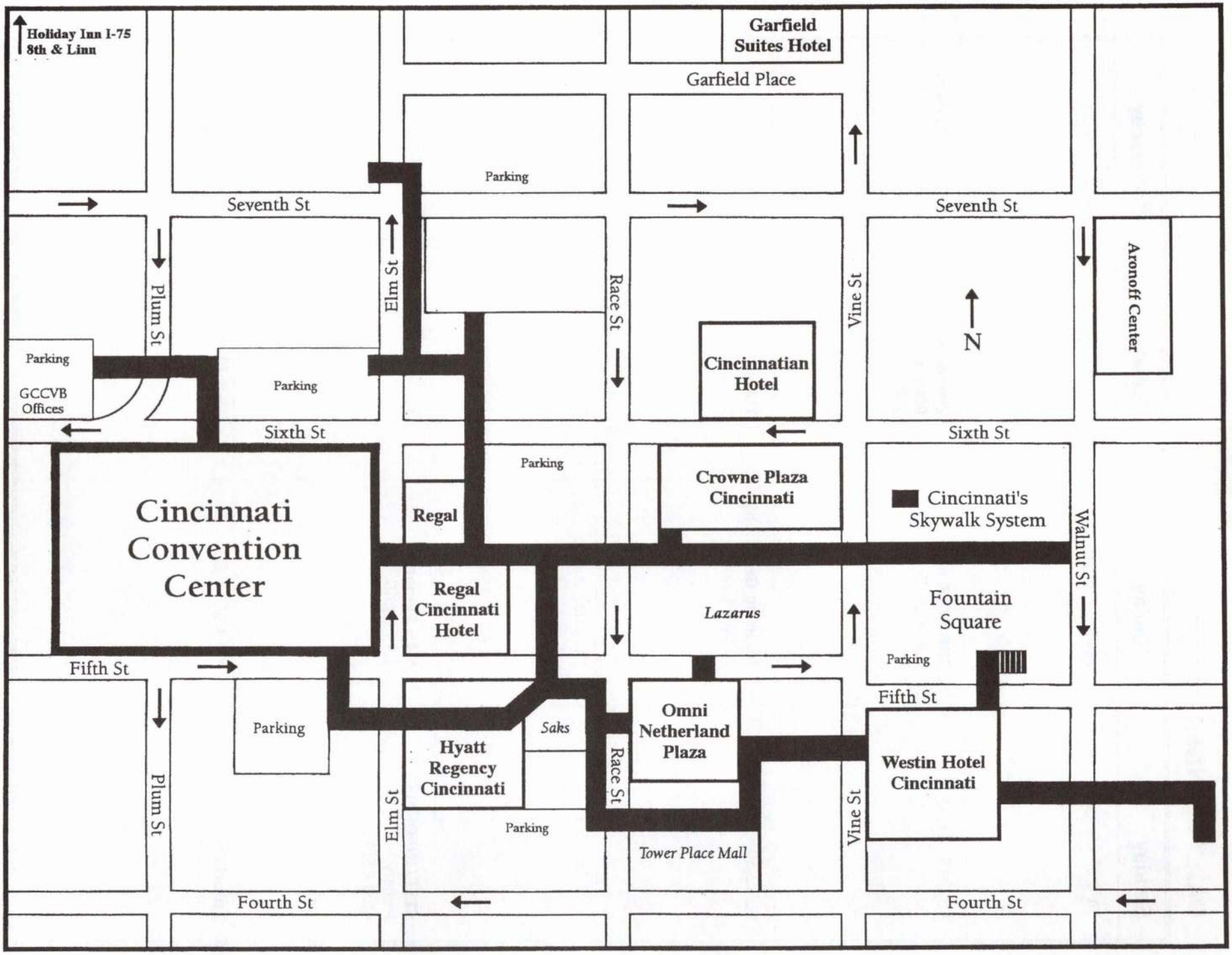
Summer 2000
INFORMS-KORMS International Korea
General Co-Chairs: Chaiho Kim, Santa Clara University, Leavey Sch. of Bus., Santa Clara, CA 95053; ckim@mailer.scu.edu; 408-554-6832
Dong-Wan Tcha, KAIST, Grad. Sch. of Mgmt., 207-43 Cheongryangri Dongdaemoon-Ku, Seoul 130-012, Korea; tchadw@hannbit.kaist.ac.kr; 82 2 958 3377

November 5 - 8, 2000
INFORMS San Antonio Fall 2000
General Chair: Way Kuo, Texas A&M University, College Station, TX 77843; way@acs.tamu.edu; 409-845-5535

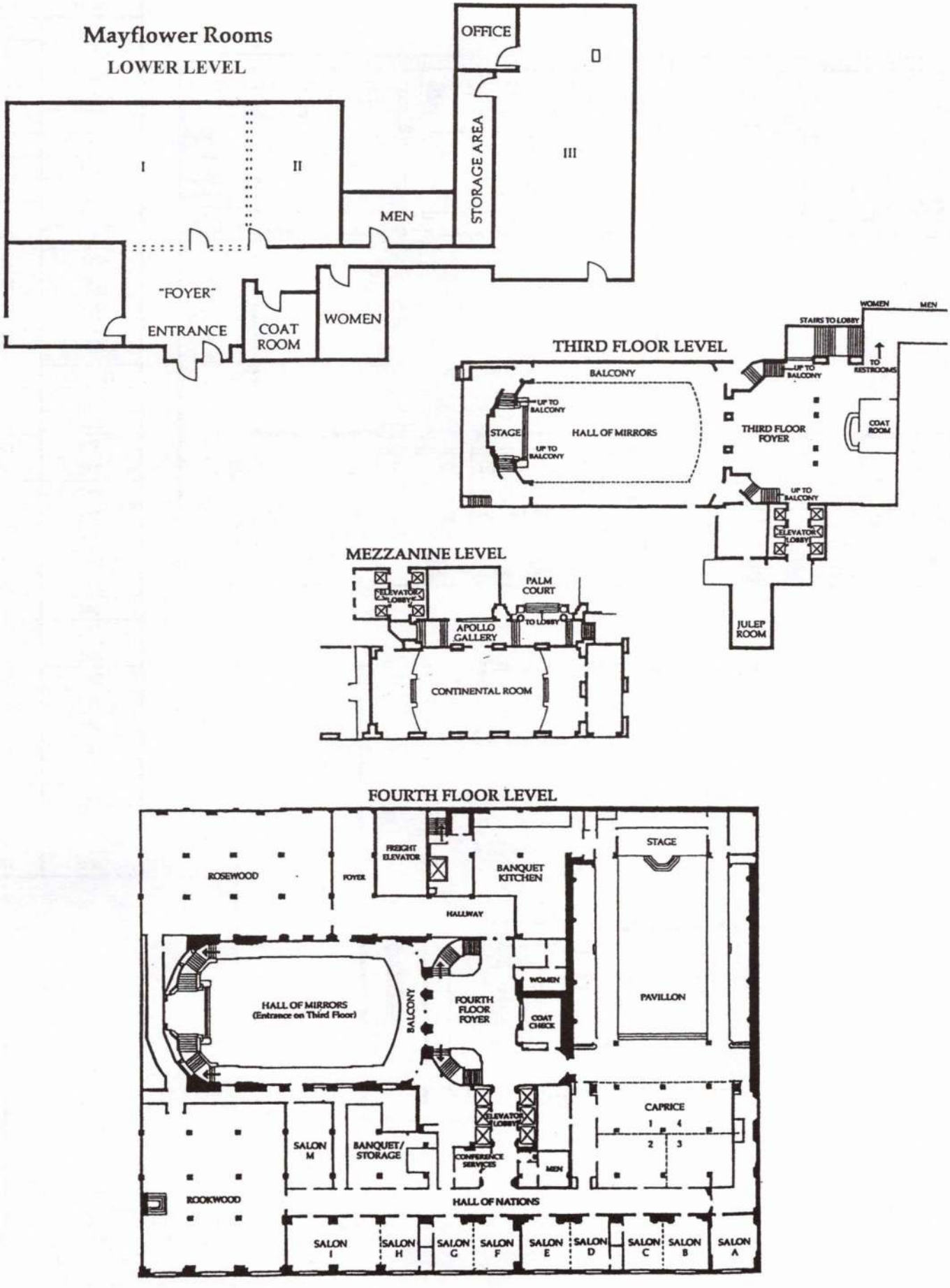
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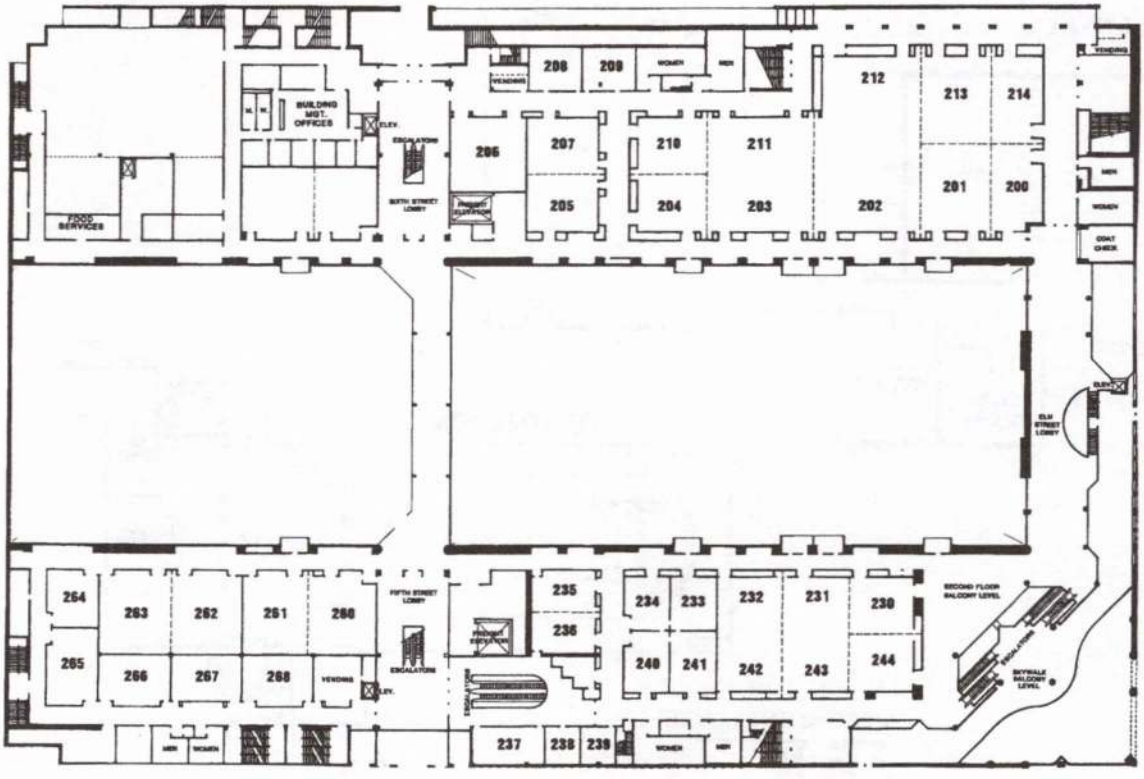
Sunday	Monday	Tuesday	Wednesday
SA 8:00 - 9:30	MA 8:00 - 9:30	TA 8:00 - 9:30	WA 8:00 - 9:30
SB 9:45 - 11:15	**INFORMS Plenary** 9:45 - 10:45	**Omega Rho Plenary** 9:45 - 10:45	WB 9:45 - 11:15am
SC 12:30 - 2:00	**Opening Ceremony** 11:00 - 12noon	**Tutorials** 11:00 - 12noon	
SD 2:15 - 3:45	MC 1:00 - 2:30	TC 1:00 - 2:30pm	
CIST/INFORMS Plenary 4:00 - 5:00	**MAS Plenary** 2:45 - 3:45	TD 2:45 - 4:15	
Tutorials 5:00 - 6:00	MD 4:00 - 5:30	TE 4:30 - 6:00	

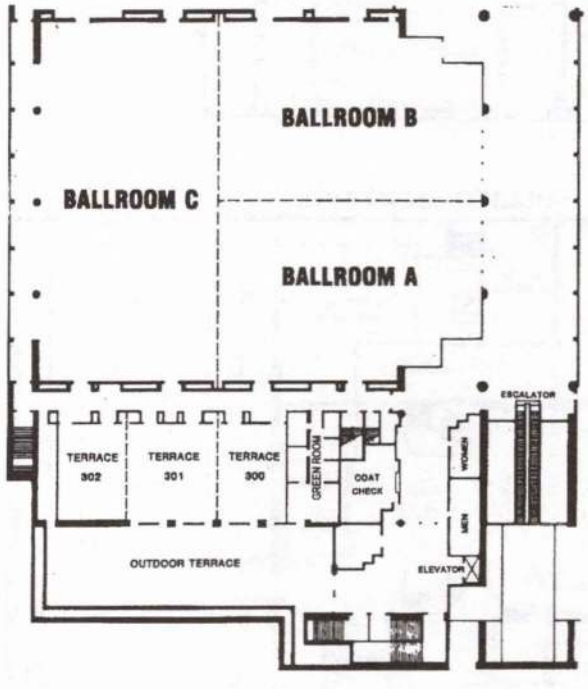

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Skywalk System
Cincinnati
Convention
Center
Regal
Walnut St
Regal
Cincinnati
Hotel
Lazarus
Fountain
Square
Parking
Fifth St
Fifth St
Parking
Saks
Omni
Netherland
Plaza
Hyatt
Regency
Cincinnati
Race St
Westin Hotel
Cincinnati
Vine St
Parking
Tower Place Mall
Fourth St
Fourth St

OMNI NETHERLAND MEETING ROOMS



CONVENTION CENTER MEETING ROOMS





Room	Track
200	1
201	2
202/212	3
203/211	4
204	5
205	6
206	7
207	8
208	9
209	10
210	11
213	12
214	13
230	14
231/243	15
232/242	16
233	17
234	18
235	19
236	20
237	21
238	22
239	23
240	24
241	25
244	26
260	27
261	28
262	29
263	30
264	31
265	32
266	33
267	34
268	35
Ballroom C	36
300	37

Cincinnati Master Track Schedule

		SA	SB	SC	SD	MA	MC	MD	TA	TC	TD	TE	WA	WB
Room	Track	8:00-9:30	9:45-11:15	12:30-2:00	2:15-3:45	8-9:30	1-2:30	4:00 - 5:30	8:00-9:30	1:00-2:30	2:45-4:15	4:30-6:00	8:00-9:30	9:45-11:15
200	1		Nicholson Prize			MHT as a Health Profession								
201	2													
202/212	3			IFORS		Wagner	CPMS/IFORS		Tech. Mgmt.	Engineering Cost				
203/211	4	DA	Optimization Tech.		IP		LP	Opt. Tech.	Global Optimization				N&G	
204	5	Simulation							Neural Networks			Information Systems		
205	6	New Product Development								Marketing		Auto Apps.	Manufacturing	
206	7	Health Care		Health Apps.	Public Programs					Knowledge Bowl	Internet Applications			
207	8	Marketing				Business & Industry Apps.			Bus. Apps.	Industry Applications		Air Apps.	RR Apps.	Miami Valley
208	9	Knowledge Discovery & Data Mining					Java in OR		Metaheuristics			Heur. Prog.	DP	DSS
209	10	Decision Analysis												
210	11	Military Applications												
213	12	Engineering Cost							Cost Perf.	Bus. Proc. Reeng.	Reeng. App.	Resource	Global	Intell. Mfg.
214	13	MCDM			Group Decisions & Negotiations							Strag. Plng.	Organizational Theory	
230	14	Computer Science									Sports & Games in OR/MS			
231/243	15	Supply Chain Management												
232/242	16	Modern Manufacturing					Agg/Disag.	Cellular Manufacturing						
233	17	Space Applications of OR					Optimization: Network Flows				Optimization: Stochastic Prog.			Convex Prog
234	18	Optimization: Linear Programming					Optimization: Integer Programming							NLP
235	19	Supply Chain	Scheduling						Production & Scheduling		Flowshop	Proj. Sched.	Sing. Mach.	Lotsizing
236	20	ENRE: Energy									Military Apps.	Economics	Opt. Mod.	T&T
237	21	Project Management				Telecommunications								
238	22	Expert Syst.	Environ. I	Green Manufacturing			Environ. II	ENRE: Forestry					Vehicle Routing	
239	23	Artificial Intelligence				Technology Management						Management of Technology		
240	24	Financial Services				Finances		Risk	Service	Service Applications		Warranty Related Issues		
241	25	Transportation												
244	26	Quality, Statistics & Reliability										Quality Mgt.	Quality Control	
260	27	Applied Probability												Queueing
261	28	Logistics										Op. Mgmt.		
262	29	Manufacturing & Service Operations Management												
263	30	Manufacturing & Service Operations Management												
264	31	Location			Facility	Operations Mgmt.			Inventory Models			Queue/Inv.	Multiech.	Plan. Models
265	32	Telecommunications & Electronic Commerce					Data Envelopment Analysis				Enterprise Integration		Stoc. Proc.	Intell. Syst.
266	33	Synth. Opt.	Nontrad. OR	Novel Applications of Statistics				Stat. Theory	Forecast	Statistics: GoF	Reliability	Logistics		
267	34	Optimization Tech.		OR/MS News	Women	RASIG		Acct.	Accounting, Auditing & Tax		Flexible Manufacturing Systems			
268	35		Education											
Ballroom C	36													
300	37					Software Demonstrations								

Sunday: CIST Plenary 4:00-5:00, Tutorials 5:00-6:00, Monday: INFORMS Plenary 9:45-10:45, Opening Ceremony 11:00-noon, MAS Plenary 2:45-3:45, Tuesday: Omega Rho Plenary 9:45-10:45, Tutorials 11:00-noon

THE FUTURE OF OPTIMIZATION APPLICATION DEVELOPMENT IS HERE



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