Newsletter

Contents

A DECADE AT DIMACS

By Barry A. Cipra

This article appeared in the April 1999 SIAM News (Volume 32 Number 3) and is reprinted here with permission of the author and SIAM News.

DIMACS, the Center for Discrete Mathematics and Theoretical Computer Science, is 1010 years old. That's base 2, of course. DIMACS recently celebrated its tenth anniversary, with a day-long program of talks and panel discussions at its Rutgers University headquarters. Talks sampled some of the research topics tackled at DIMACS over the last decade. The panel discussions considered the center's industrial and educational outreach programs.

Up and Running

DIMACS was founded in 1988 as a consortium of researchers from four institutions: Rutgers, Princeton University, AT&T Bell Laboratories, and Bellcore. It was one of the first 11 Science and Technology Centers funded by the National Science Foundation.

"We found out in December we were going to get the award, and NSF gave us the money in February [1989]," recalls DIMACS director Fred Roberts. "They gave us $10 million for five years, and we didn't even have a place to house this thing!"

The center opened shop in some trailers in a Rutgers parking lot. (It is now headquartered on the fourth floor of the CORE Building at Rutgers.) The original director was the late Daniel Gorenstein, who in the 1970s organized the world-wide effort that culminated in the proof of the "enormous theorem" classifying finite simple groups. "He was not a brilliant administrator," Felix Browder, a colleague of Gorenstein's at Rutgers, recalled in a lunchtime address, "but he *was* a brilliant leader. He knew how to get people to work together—even people who didn't like each other."

The Institute for Operations Research and the Management Sciences'
Computing Society Newsletter

.

Volume 20, Number 2, Fall 1999

ICS Officers

Chair
> Ramayya Krishnan (rk2x+@andrew.cmu.edu)
> Carnegie Mellon University
> Heinz School of Public Policy & Mgmt
> Pittsburgh, PA 15213
> (412) 268-2174

Chair-Elect
> Irvin Lustig (irv@cplex.com)
> ILOG, CPLEX Division
> 99 Braeburn Drive
> Princeton, NJ 08540
> (609) 497-0984

Secretary/Treasurer
> Bjarni Kristjannson (bjarni@maximal-usa.com)
> Maximal Software
> Arlington, VA 22201
> (703) 522-7900

Board of Directors
Bruce Golden (bgolden@rhsmith.umd.edu)
RH Smith School of Business
University of Maryland, Simpsonville, MD 21150
(301) 405-2232; term expires in 2001

Jeffery L. Kennington (jlk@seas.smu.edu)
Department of Computer Science and Engineering
Southern Methodist University, Dallas, TX 75275
(214) 768-3088; term expires in 2001

Manuel Laguna (Manuel.Laguna@colorado.edu)
Graduate School of Business
University of Colorado, Boulder, CO 80309-0419
(303) 492-6368; term Expires 2002

Erik Rolland (eric.rolland@ucr.edu)
Anderson Graduate School of Management
University of California - Riverside, Riverside CA 92521
(909) 787-3694; term Expires 2002

Matthew J. Saltzman (mjs@clemson.edu)
Department of Mathematical Sciences
Clemson University, Clemson, SC 29634
(864) 656-3185; term expires in 2000

Carol Tretkoff (tretkoff@ilog.com)
ILOG, Inc.
1080 Linda Vista Avenue, Mountain View, CA 94043
(650) 567-8157; term expires in 2000

Newsletter Staff

Co-Editors
> S. Raghavan (suraghav@rhsmith.umd.edu)
> Decision & Information Technologies Dept.
> Robert H. Smith School of Business
> University of Maryland
> College Park, MD 20742
> (301) 405-6139

> Tom Wiggen (wiggen@acm.org)
> Dept. of Computer Science
> University of North Dakota
> Grand Forks, ND 58202-9015
> (701) 777-3477

Views expressed herein do not constitute endorsement by INFORMS, the INFORMS Computing Society or the Newsletter editors.

Message from the Editors

We hope that you, the members of the INFORMS Computing Society, have enjoyed getting this newsletter. When we assumed our co-editor positions almost 2 years ago, we were warned that "this is about the only benefit that most of our members get for their $7 annual dues."

As you know, we rely on your submissions for the content of the newsletter. We extend our thanks to everyone who has contributed because the newletter could not exist without this member support. We will be pleased to print your articles of interest to our members. This month, we received permission to reprint an article by Barry Cipra that appeared in the April issue of SIAM News and we're using it as our feature article, but we'd rather print original stuff. Perhaps you can describe your ongoing research program, or your travel to conferences in exotic places in a future issue.

Due to the loss of an associate editor, our "member profile" series has temporarily come to an end. If you are interested in helping to revive this feature, or if you have another idea for a series of articles or recurring columns, contact S. Raghavan or Tom Wiggen and we will work something out.

Our News about Members section would be much lengthier if our members weren't so modest. Remember that we will consider printing almost anything that is fit to print about our members' activities. If you don't want to send news about yourself, you can still send news about others you know. We'll verify the truth of third person information, and will print it unless asked not to. You have just been nominated to be one of our reporters for the next issue. Send us your news!

At this time, there is an ICS newsletter question under investigation. *"Should we continue publishing this newsletter in a paper format or should we make a transition to an electronic-only newsletter?"* A big present concern to this society is the cost of printing and mailing the paper newsletter. At the May business meeting in Cincinnati, Harlan Crowder and Bjarni Kristjannson estimated that INFORMS charged us $1500 for printing a newsletter and the mailing cost was another $500. The low annual dues of our 600+ members don't go very far after we cover these expenses.

Many of you are aware that a small collection of previous issues is already available in PDF format on the web (http://www.und.nodak.edu/dept/csci/twiggen/ics/). These PDF documents can be viewed on-line with Adobe Acrobat Reader or printed with the identical appearance of your mailed copy of the newsletter. It's possible that we could use other formats, like HTML, that might work better for on-line reading. Your opinion in this matter is important.

Sanjay Saigal did an electronic survey of members to try to capture your sentiments. A report of Sanjay's results is printed in this newsletter. We hope that the responders to his survey represented a cross-section of the society's membership. There's a risk, however, that the on-line survey only reached the "on-line members" and might not have been a random sample. If you feel strongly about this question (one way or the other) and did not respond to Sanjay's survey, please make your opinion know by phoning or emailing our chair, Dr. Krishnan, or one of the co-editors. You'll find address and phone information inside the front cover of this newsletter.

A year or so ago, one of the special interest groups (SIG) of the Association of Computing Machinery (ACM) questioned the viability of its printed newsletter. One of the ICS co-editors corresponded with that ACM SIG editor after the same question arose for us. The reply said that this question "seems to have simply faded away." The paper issue is still in existence and on-line repositories of material don't seem to be taking over. A further exploration of the ACM SIG web sites showed that only one of those SIGs currently has an electonic-only newsletter. That is the KDD (knowledge discovery and data mining) SIG, a brand-new group whose newsletter is now at volume 1, number 1. The jury may still be out on the success of this electronic-only format.

We also noted that most ACM SIGs charge annual dues in the $30 range to support their newsletter and other operations. We have not yet heard any suggestions that ICS dues should be increased. The cost of a paper newsletter is a big issue, and we do need to address the problem at this time.

And here is one more reminder: **Don't forget about the 7th ICS conference in Cancun, Mexico next January!**

GeNIe: A Development Environment for Graphical Decision-Theoretic Models and SMILE☺: Structural Modeling, Inference, and Learning Engine

Marek J. Druzdzel

Decision Systems Laboratory

School of Information Sciences, Intelligent Systems Program, and Center for Biomedical Informatics

University of Pittsburgh, Pittsburgh, PA 15260

Phone: 412-624-9432, FAX: 412-624-2788

Email: marek@sis.pitt.edu, WWW: http://www.pitt.edu/~druzdzel

Abstract

SMILE© (Structural Modeling, Inference, and Learning Engine) is a fully portable library of C++ classes implementing graphical decision-theoretic methods, such as Bayesian networks and influence diagrams, directly amenable to inclusion in intelligent systems. Its Windows user interface, **GeNIe** is a versatile and user-friendly development environment for graphical decision-theoretic models. There is also an Active-X control version of **SMILE**©, called **SmileX**. All three modules, developed at the Decision Systems Laboratory, University of Pittsburgh, have been made available to the community in July 1998 (the download site is http://www2.sis.pitt.edu/~genie) and have over 1,600 users worldwide (as of October 1999). This short document summarizes the basic features of **GeNIe**, **SMILE**©, and **SmileX**.

Decision-theoretic systems

Decision-theoretic systems are increasingly applied in various domains because of their sound foundations, ability to combine existing data with expert knowledge, and intuitive framework of directed graphical models, such as Bayesian networks and influence diagrams. Some of the applications of decision-theoretic systems are: medical diagnosis and therapy planning, machine diagnosis, natural language processing, vision, robotics, planning, fraud detection, processing of military intelligence data in the context of battle damage assessment, and many others (March 1995 issue of *Communications of the ACM* lists several practical applications of Bayesian networks; others can be found in the proceedings of the Annual Conference on Uncertainty in Artificial Intelligence, available on-line at http://www2.sis.pitt.edu/~dsl/UAI/). Given the current interests in the application of decision-theoretic methods and the speed with which they are applied in practice, it can be expected that they will remain to be core modeling tools in intelligent systems.

Decision Systems Laboratory, GeNIe, SMILE©, and SmileX.

The Decision Systems Laboratory at the University of Pittsburgh (http://www.sis.pitt.edu/~dsl) has been working in the domain of decision-theoretic decision support systems for almost six years. Our theoretical and technical contributions have found their way into a general-purpose decision modeling environment, **SMILE**© (**S**tructural **M**odeling, **I**nference, and **L**earning **E**ngine), its Active-X component, **SmileX**, and its Windows user interface, **GeNIe**. We have made all three programs available for non-commercial research, teaching, and personal use since July 1998 at the following address: http://www2.sis.pitt.edu/~genie and as of October 1999 have more than 1,600 users. Some of the applications, built by others using **GeNIe**, **SMILE**©, and **SmileX**, are: battle damage assessment (Rockwell International and U.S. Air Force Rome Laboratory), group decision support models for regional conflict detection (Decision Support Department, U.S. Naval War College), intelligent tutoring systems (Learning and Development Research Center, University of Pittsburgh), medical therapy planning (National University of Singapore), medical diagnosis (Medical Informatics Training Program, University of Pittsburgh;

Figure 1: A schematic view of the GeNIe window

Technical University of Bialystok, Poland). **GeNIe**, **SMILE**©, and **SmileX** have been also used in teaching decision-theoretic methods at several universities. In the development of **GeNIe** we stressed accessibility and friendliness of the user interface (see Figure 1 for a snapshot of the program interface). T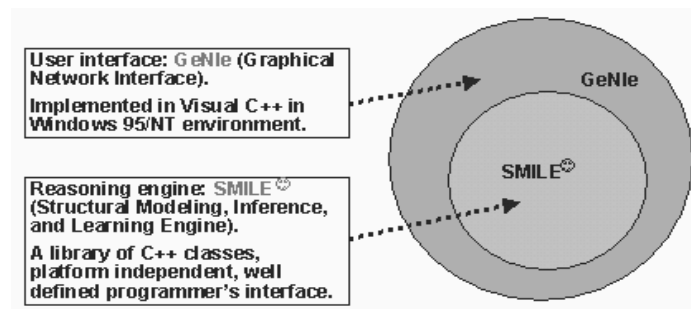he architecture of the system (Figure 2) is flexible: **SMILE**©, allows for building dedicated interfaces that will be focused on special user groups. One example is shown in Figure 3, a medical system for diagnosis of liver disorders developed at the Technical University of Bialystok. The specialized interface to **SMILE**© shows on the left hand side a list of risk factors and symptoms that a physician can enter and on the right hand side a list of possible disorders according to their likelihood as computed by the program.

Figure 2: The architecture of **GeNIe** and **SMILE**©

Some Features of **GeNIe**, **SMILE**©, and **SmileX**

GeNIe, **SMILE**©, and **SmileX** implement Bayesian networks and influence diagrams with, what we believe to be, a pleasant and reliable user interface both in terms of the development environment (**GeNIe**) and the programmer's interface to the library classes (**SMILE**© and **SmileX**). The modeling language includes hierarchical sub-models, Noisy-OR nodes, deterministic nodes, multiple decision nodes, multiple utility nodes, linearly additive multi-attribute utility nodes (we will have generalized MAU nodes in the future). The development environment includes a pleasant graphical interface with aid in model navigation, such as hierarchical sub-models, a Windows-style tree view, on-screen comments, and a comprehensive HTML-based help system, and many other useful features that one would want from a development environment for graphical models. The help system is fully integrated with the World Wide Web and has many useful links to web resources. We use **GeNIe** in teaching and the help system includes many useful documents and tutorials. We believe that it is basically a standalone guide to decision-theoretic modeling. **SMILE**© algorithms include relevance reasoning that includes designating nodes as targets, value of information computation, several Bayesian network algorithms to choose from. **GeNIe** is the Decision Systems Laboratory's research and teaching vehicle, so naturally it will evolve as time goes.

One feature that may contribute to sharing research and development results in the community is that **GeNIe** and **SMILE**© are able to read and write several popular Bayesian networks and influence diagrams file formats, including the most recent version of the Bayesian network interchange format. It can thus be used as a conversion program.

GeNIe runs on Windows 95/NT computers. **SMILE**© is a fully portable library of classes accessible from C++. **SmileX** is a Windows Active-X control that allows **SMILE**© to be used from any Windows programming environment, such as HTML pages, Excel spreadsheets, and Visual Basic programs.

Figure 3: A dedicated interface to a **SMILE**© model

Acknowledgments

DIMACS now has six institutional members; The NEC Research Institute came on board in 1998, and AT&T Bell Laboratories split into AT&T Labs—Research and Bell Labs, the research and development arm of Lucent Technologies, in 1996. Approximately 175 researchers at the six participating institutions are officially "permanent members" of DIMACS. The center also sponsors a dozen or more postdocs each year, with funding from various sources. "Some postdocs, for example, are shared with one of the institutional members or with the Institute for Advanced Study in Princeton.

DIMACS was envisioned as a focal point for research in the mathematics and computer science that underlie modern information technology. For the first few years, the center's programs concentrated on "traditional" areas of theoretical computer science and discrete mathematics. Two early successes, achieved during the center's Special Year on Discrete and Computational Geometry, were the discovery of a linear-time algorithm for triangulating polygons—a key computational step in many geometric problems—and the solution of the famous Gilbert-Pollak conjecture concerning the relation between minimal Steiner trees and minimal spanning tree (see *SIAM News*, January 1991). The triangulation algorithm was discovered by Bernard Chazelle, a computer scientist at Princeton University who recently completed a term as co-director of DIMACS; the Steiner-point problem was solved by permanent member Frank Hwang and DIMACS postdoc Ding Zhu Du, both then at Bell Labs. (Du is currently at the University of Minnesota; Hwang is at Chiaotung University in Taiwan)

Several other important developments had roots in early DIMACS programs. In particular, the Special Year on Complexity Theory of Interactive Computation, 1990-91, saw a major breakthrough in theoretical computer science: the discovery of deep connections between interactive algorithms, which can be construed as proof-checkers, and the difficulty of finding approximate answers to classically "hard" computational problems, beginning with the maximum-clique problem for graphs (see *SIAM News*, May 1992). Numerous people, many of them DIMACS members or visitors, contributed to the web of theorems.

More recently, DIMACS has ventured into "nontraditional" areas of discrete mathematics and theoretical computer science. In 1994, the center initiated a Special Year on Mathematical Support for Molecular Biology, which as metamorphosed into a Special Half-Decade: The program is scheduled to run through 1999. Problems posed by biologists, ranging from the construction of phylogentic trees to the paradoxical persistence of deleterious genes, have proved to be fertile ground for mathematical analysis and computation.

The 1995-96 Special Year on Logic and Algorithms brought together experts from two disparate branches of theoretical computer science: finite model theory and computational complexity. Researchers made inroads in the field of computer-aided verification, the seemingly impossible task of ensuring that programs do what they were intended to do. (Much of the work focused on nailing down just how NP- or PSPACE-hard various verification problems are.) Participants in the two-year Focus on Discrete Probability (1996-98, co-sponsored by the Institute for Advanced Study) explored topics ranging from the probabilistic method in discrete mathematics to the combinatorial and computational implications of statistical physics. Probability theory is becoming increasingly prominent in computer science, especially as networks of independent, unpredictable, and sometimes faulty computers grow to a size that a physicist would consider to be at the "thermodynamic limit."

The center is currently running programs on networks, massive data sets, DNA computing, and large-scale discrete optimization. (Joan Feigenbaum, a permanent member of DIMACS at AT&T Labs-Research, will give an invited presentation on massive graphs at the 1999 SIAM Annual Meeting in Atlanta, May 12-15; see article beginning on page 1 in this issue.) Scheduled for 1999-2000 is a Special Year on Computational Intractability.

"One of the things that DIMACS is about," Roberts explains, is trying "to get different people with different backgrounds talking to each other. It's one of the beauties of this 'center mode' of operation, that you can run larger and more complex programs, and you can do things that aren't traditional."

Discrete Inquiries

Speakers at the DIMACS birthday bash touched on a few of the topics investigated by center researchers during the past decade, Richard Karp of the University of Washington surveyed some of the combinatorial optimization problems that have cropped up in the Human Genome project. The goal of the project is to sequence the roughly three billion base pairs of the human genome with an error rate of less than one mistake per 10,000 base pairs. The goal would be easy to achieve if an entire strand of DNA could simple be grabbed and "read" from one end to the other. Unfortunately, current technology makes that possibly only for strands about 500 base pairs long. Consequently, a key step in gene sequencing is

the construction of a "clone library" consisting of short, overlapping fragments of a long "target" strand. Finding the best way to construct and utilize such clone libraries is a serious, and clearly important, mathematical challenge.

Ricky Pollack of New York University described some similar challenges in computational algebraic geometry. The mathematical description of a robot and its environment often boils down to a system of polynomial equations and inequalities in several variables, the implied solutions being real numbers constituting what's called a semi-algebraic set. (If the system involves no inequalities, the "semi" is dropped.) The first problem is purely existential: Given a system of equations and inequalities, is the corresponding semi-algebraic set nonempty? When the answer is yes, a second problem is to characterize the connected components of the semi-algebraic set and establish an algorithmic "roadmap" that will find a path connecting any two points in the same component.

Jennifer Chayes, a mathematician at Microsoft Research, talked about the crossover of ideas from statistical physics to problems in graph theory and related areas. Physicists have long worked with a notion they call finite-size scaling, which enables them to infer details of phase transitions from the behavior of large but finite models. The insights from statistical physics help clarify—and extend—theorems about the properties of random graphs.

Other speakers included Pavel Pevzner of the University of Southern California, on combinatorial problems of gene rearrangements (it turns out that what distinguishes human from mouse, or cabbage from turnip, is not so much the genes themselves, as the order in which they appear in the genome); Moshe Vardi of Rice University, on new, model-theoretic approaches to the problem of verifying complex computer programs; and Laszlo Lovasz of Yale University, on methods for speeding up sampling by Markov chains.

Industry and Education

Panelists in a discussion of academic/industrial cooperation stressed the value of basic research, but pointed out that the uncertain payoffs and the time scales involved limit industry's commitment to investments without a clear-cut, immediate return. "We can't afford to do only basic research," says Alfred Aho, associate vice president for research at Bell Labs. In recent years, he adds, "getting results quickly to the marketplace has become dominant," especially in computing and telecommunication.

C. William Gear, president of NEC Research, warns against building academic plans based on industry as a primary source of funding for academic research. The knowledge that comes out of academic research is welcome—DIMACS is "an incredibly valuable resource," he says—but most of that knowledge is not directly useful to most companies. Instead, Gear sees taxes and tax incentives as the best bet for funding basic research. "Ultimately, it's going to be a part of the cost of doing business."

Universities do produce one "product" that industry can't do without, Gear points out: graduates. The most important role of the university is education," he says. DIMACS's educational role was the subject of a second panel discussion.

"Discrete mathematics is accessible to a broader audience than traditional mathematics," says DIMACS associate director for education Joseph Rosenstein. The center runs numerous educational programs at levels from kindergarten to collegiate. The Leadership Program in Discrete Mathematics, for example, is a two-week summer program for K-8 teachers. The DIMACS Research and Education Institute (DREI) is a three-week program during which high school teachers interact with researchers; the topic scheduled for 1999 is graph theory and its applications to problems of society.

DIMACS also hosts a Young Scholars Program in Discrete Mathematics aimed at high school students, an NSF-funded Research Experiences for Undergraduates (REU) program, and a Reconnect Program designed for faculty at two- and four-year colleges. Panelist Margaret (Midge) Cozzens, vice chancellor for academic affairs at the University of Colorado at Denver, considers DIMACS an "exemplary model of the 'vertical' integration of research and education," bringing together people at very different levels.

Do Not Go Gentle Into That Good Night…

DIMACS's run as an NSF Science and Technology Center is winding down. That's built into the STC program. "NSF originally expected that after 11 years, the Science and Technology centers would be able to become self-sufficient, and so made these grants non-renewable," Roberts explains. DIMACS's STC status ends January 31, 2000.

Many of the STC's certainly will close down with the end of their NSF funding. Roberts observes. "DIMACS, HOWEVER, IS DIFFERENT. Rather than focus on the research of its local scientists, it views itself as a national resource and seeks to serve as a national and international community." The center has support from several sources, especially its member institutions. Plans for the next special year, slated to run through August 2000, "are very far along," he says. In fact, the center is currently developing plans that will carry its programs to the year 2005. Among the topics for future special years are the next-generation Internet; the interface among computer science, coding, and information theory; the analysis of algorithms, data analysis and learning; and applications of algebraic geometry.

We are looking for additional partner organizations and talking to various agencies and foundations about future support," Roberts says, "DIMACS is optimistic that it will have the resources to continue operating as a national resource in the years to come."

Maybe till it turns 1010 for real.

Message from the Chair

Ramayya Krishnan (rk2x@cmu.edu)
Carnegie Mellon University

Internet technologies are having a dramatic impact on our profession. Libraries of methods are being packaged into software components (see http://opsresearch.com/) thereby promoting reuse and reducing the barriers to the development of solutions that seek to embed or integrate our technologies Solvers are available on servers accessible over a variety of Internet Protocols (see the Optimization Technology Center at http://www-fp.mcs.anl.gov/otc/index.html). The Net has become the information resource of choice for many of us. How can ICS better serve its members in this dynamic and evolving environment? While the answers to this question are many (and I do hope to hear from you about your thoughts on this matter), I believe that a first step is to make the ICS web site the portal of choice to information at the OR/CS interface. To this end, I want to share with you some thoughts on ICS web strategy and actions that have been taken to date.

a. **New URL:** At the meeting in Philadelphia, we will make the new ICS URL www.informs.org/ics official. This URL has at least two important advantages. First, it is short and easy to remember. Second, it is redirected to the physical location of the ICS site. This enables us in the future to move the contents of the site to different servers and not have to publicize or learn a new URL.

b. **New Web Site:** A new web site has been developed. It will be launched at the Philadelphia meeting. Erik Rolland (erik.rolland@ucr.edu), a new board member, will serve as the ICS web master and also lead the charge on Web Strategy. I want to use this opportunity to thank Matt Saltzman who has served ICS as web master for several years. Matt will continue to be involved and maintain the ICS list Server. Please visit the new site and give us feedback. The only way to ensure that the ICS site meets your needs is to let us know what you like and do not like.

c. **The ICS Information Portal:** Our first initiative with the new web site will be the resource page. The page will initially serve as a gateway to FAQ's, resource pages, meetings, and online Internet Seminars related to technologies that are having a dramatic impact on our profession. In addition to these external resources, the site will feature the newsletter, and other member created content such as a technical report archive. Creating and maintaining a valuable portal is a challenge and we are fortunate to have Bob Fourer (4er@iems.nwu.edu) who has agreed to serve as the editor-in-chief of the portal.

I believe that we are just beginning to understand the role that the Web can play in the functioning of a society such as ours and I fully expect the site to evolve in new and interesting ways in the years to come. I want to conclude this short letter by drawing your attention to the excellent program of ICS sponsored sessions and tutorials at Philadelphia. The coverage of topics is broad and we have been fortunate to attract several renowned scholars from related fields to come and present at our meeting. Finally, I also want to use this occasion to urge you to come to Cancun. Check out the conference site at http://www-bus.colorado.edu/Faculty/Laguna/cancun2000.html. See you soon in Philadelphia.

Results of the e-mail newsletter poll

Information from Sanjay Saigal
ssaigal@ilog.com

During the ICS meeting at INFORMS Cincinnati in May, it was proposed that we do away with the paper version entirely, instead relying only on an electronic version. An on-line only newsletter option could save the society somewhere in the neighborhood of $1000 annually in printing and mailing costs.

Sanjay Saigal distributed an e-mail polling question to all members of the ICS mailing list on September 15th, 1999. The poll question was:

As an INFORMS Computing Society member, you receive a society newsletter in the mail.

Please email me and let me know which you prefer - staying with the mailed paper newsletter, or going to an on-line only format.

On October 1, his results were as follows:

Reply	Paper	Online	Other	
Day 1	6	17	0	
Day 2	10	52	1	
Day 3	4	7	0	
Day 4	1	6	0	
Later	4	5	0	
TOTAL	25	87	1	113

The numbers show that e-voting members have an overwhelming preference for an online newsletter. Sanjay made the following observations:

1. Many of the folks voting for the on-line option want to get an email notification when the newsletter becomes available. Also note that many of these voters actually prefer the paper version - they just think that the production/mailing cost does not justify continuing with it.

2. Supporters of the status quo, i.e., paper, are quite vehement in their views. Many assert that they are simply flooded with on-line information and that the chances of their reading a paper version are much higher. Since the newsletter is one of the few (the only?) benefits of being an ICS member, replacing it with an online world-accessible version would devalue membership.

3. One responder said he was ambivalent, seeing good points in both options. I've placed him under "other".

New Tools for Aiding Decisions and Collecting Opinions on the Web

Raimo P. Hämäläinen (raimo@hut.fi)
Systems Analysis Laboratory (http://www.sal.hut.fi),
Helsinki University of Technology, P.O. Box 1100, FIN-02015 HUT, Finland

Emerging information technologies and computer networks such as the Internet enable new powerful ways to implement Group Decision Support Systems (GDSS) and Negotiation Support Systems (NSS). We believe that it is crucial to the adoption of DSS and NSS in real life cases, that software is easily available and accessible for study and experimentation. Placing a general purpose DSS or NSS on the WWW is an important step in this direction. Here we describe web based tools developed in the Systems Analysis Laboratory. Being located on the Internet these tools can be accessed from everywhere in the world. This opens up a completely new era and dimension in decision support.

Web-HIPRE Web-HIPRE is a Java applet for multiple criteria decision analysis based on the well-known decision support software HIPRE 3+. Web-HIPRE provides a common platform for individual and group decision support. Web-HIPRE supports several weighting methods including AHP, SMART, SWING, SMARTER and value functions. Information resources on the WWW can be utilized in Web-HIPRE by linking elements of the hierarchy to other web pages. These pages can contain any kind of information such as graphics, sound or video describing the criteria or alternatives. This additional information can improve the quality of decision support dramatically. Web-HIPRE can be used to support global distributed group decision making by creating a group model, where each decision maker is graphically represented by an element in the group hierarchy. Such an element actually presents the whole hierarchy of an individual decision maker. The composite group priorities are generated as a weighted sum of the individual priorities for the alternatives, which are obtained from the individual models via the Internet. Web-HIRPE can also be installed in an independent computer and run locally or via a local area network (LAN).

Joint Gains Joint Gains is a negotiation support system based on the Method of Improving Directions that is applicable in multi-party negotiations over multiple continuous issues. In a mediation session joint gains are searched starting from an initial point, e.g., a previously made agreement. Each iteration in the mediation process aims at producing a jointly preferred alternative to the current one. At the beginning the initial point is considered as the current alternative. Based on local preference information collected from the participants, a mediator software component guides the participants gradually towards a Pareto-optimal agreement. Alternatives can be represented to the participants in terms of decision variable values and criteria function values. Criteria functions are mappings from decision variable space to some meaningful criteria values. In general, all kinds of calculations and visualizations that can be derived from the decision variable values, can be used as additional decision aid.

Opinions-Online Opinions-Online lets you generate a private and customized site for interactive, web based group decision making, voting and surveys. There are different ways to collect and view the results of the group online as the data is collected. You can create a traditional questionnaire and view the results sorted by any combination of the fields. Additionally you can elicit preferences by a number of different voting schemes and / or prioritization by multiattribute rating. The users can be asked to rank, choose the best or worst or acceptable alternatives. The alternatives and the site itself can be linked to homepages. The design process is very easy to perform and the questionnaire will be available at once.

References to the tools

Hämäläinen, R.P. and Mustajoki, J., "Web-HIPRE - Global Decision Support", 1998. www.hipre.hut.fi (Slide presentation at www.sal.hut.fi/Publications/ppt-files/Web-HIPRE/)

Kettunen, E., Hämäläinen, R.P. and Jäälinoja, H., "Joint Gains - Negotiation Support in the Internet", 1999. www.jointgains.hut.fi

Hämäläinen, R.P. and Kalenius, R., "OPINIONS-Online - Platform for Global Participation, Voting, Surveys, and Group Decisions", 1999, www.opinions-online.com or www.opinion.hut.fi.

Computational Probability

edited by Winfried K. Grassmann
Dept. of Computer Science,
University of Saskatchewan,
Saskatoon, Canada
INTERNATIONAL SERIES IN OPERATIONS RESEARCH AND MANAGEMENT SCIENCE Volume 24
Kluwer Academic Publishers

Great advances have been made in recent years in the field of computational probability. In particular, the state of the art - as it relates to queuing systems, stochastic Petri-nets and systems dealing with reliability - has benefited significantly from these advances. The objective of this book is to make these topics accessible to researchers, graduate students, and practitioners. Great care was taken to make the exposition as clear as possible. Every line in the book has been evaluated, and changes have been made whenever it was felt that the initial exposition was not clear enough for the intended readership.

The work of major research scholars in this field comprises the individual chapters of Computational Probability. The first chapter describes, in nonmathematical terms, the challenges in computational probability. Chapter 2 describes the methodologies available for obtaining the transition matrices for Markov chains, with particular emphasis on stochastic Petri-nets. Chapter 3 discusses how to find transient probabilities and transient rewards for these Markov chains. The next two chapters indicate how to find steady-state probabilities for Markov chains with a finite number of states. Both direct and iterative methods are described in Chapter 4. Chapter 5 dicuss automata and their use. Chapters 6 and 7 deal with infinite-state Markov chains, which occur frequently in queueing, because there are times one does not want to set a bound for all queues. Chapter 8 deals with transforms, in particular Laplace transforms. The work of Ward Whitt and his collaborators, who have recently developed a number of numerical methods for Laplace transform inversions, is emphasized in this chapter. Finally, if one wants to optimize a system, one way to do the optimization is through Markov decision making, described in Chapter 9. Markov modeling has found applications in many areas, three of which are described in detail: Chapter 10 analyzes discrete-time queues, Chapter 11 describes networks of queues, and Chapter 12 deals with reliability theory.

Contents and Contributors: Preface. 1. Computational Probability: Challenges and Limitations; W.K. Grassmann. 2. Tools for Formulating Markov Models; G. Ciardo. 3. Transient Solutions for Markov Chains; E. de Souza e Silva, H.R. Gail. 4. Numerical Methods for Computing Stationary Distributions of Finite Irreducible Markov Chains; W.J. Stewart. 5. Stochastic Automata Networks; B. Plateau, W.J. Steward. 6. Matrix Analytic Methods; W.K. Grassmann, D.A. Stanford. 7. Use of Characteristic Roots for Solving Infinite State Markov Chains; H.R. Gail, et al. 8. An Introduction to Numerical Transform Inversion and Its Application to Probability Models; J. Abate, et al. 9. Optimal Control of Markov Chains; S. Stidham, Jr. 10. On Numerical Computations of Some Discrete-Time Queues; M.L. Chaudhry. 11. The Product Form Tool for Queueing Networks; N.M. van Dijk, W.K. Grassmann. 12. Techniques for System Dependability Evaluation; J.K. Muppala, et al. Index.

Computing Tools for Modeling, Optimization and Simulation

Interfaces in Computer Science and Operations Research
Edited by **Manuel Laguna,** University of Colorado
and **José Luis González Velarde,** ITESM Campus Monterrey, México
Published by Kluwer Academic Publishers, Boston/Dordrecht/London

Table of Contents: 1 Multi-Start and Strategic Oscillation Methods – Principles to Exploit Adaptive Memory; Fred Glover. **2** Building a High-quality Decision Tree with a Genetic Algorithm; Zhiwei Fu, Bruce L. Golden, Shreevardhan Lele, S. Raghavan and Edward A. Wasil. **3** Sequential Testing of Series-Parallel Systems of Small Depth; Endre Boros and Tonguc Unluyurt. **4** Conveying Problem Structure from an Algebraic Modeling Language to Optimization Algorithms; Robert Fourer and David M. Gay. **5** Solving General Ring Network Design Problems by Meta-Heuristics; Andreas Fink, Gabriele Schneidereit and Stefan Voß. **6** Lagrangean/Surrogate Heuristics for p-Median Problems; Edson L. F. Senne and Luiz A. N. Lorena. **7** An Introduction to Ant Systems; Éric D. Taillard. **8** Extremal Energy Models and Global Optimization; János D. Pintér. **9** A Simulation-Based Policy Iteration Algorithm for Average Cost Unichain Markov Decision Processes; Ying He, Michael C. Fu and Steven I. Marcus. **10** Knowledge Management and its Impact on Decision Support; Richard T. Herschel, Hamid R. Nemati and David M. Steiger. **11** Heuristics for Minimum Cost Steady-State Gas Transmission Networks; Seongbae Kim, Roger Z. Ríos-Mercado and E. Andrew Boyd. **12** Assigning Proctors to Exams with Scatter Search; Rafael Martí, Helena Lourenço and Manuel Laguna. **13** Multi-Attribute

Evaluation of Software Maintainability; Nadine Meskens and Florence Lebon. **14** Explicit-Constraint Branching for Solving Mixed-Integer Programs; Jeffrey A. Appleget and R. Kevin Wood. **15** An Object-Oriented Graphical Modeler for Optimal Production Planning in a Refinery; Murat Draman, I. Kuban Altinel, Nijaz Bajgoric, Ali Tamer Ünal and Burak Birgören. **16** Optimization of Water Distribution Systems by a Tabu Search Metaheuristic; A. Fanni, S. Liberatore, G.M. Sechi, M. Soro and P. Zuddas. **17** Scatter Search to Generate Diverse MIP Solutions; Fred Glover, Arne L¢kketangen and David L. Woodruff.

News about Members

Richard Caron (rcaron@uwindsor.ca) has accepted a six month position as Executive Dean of the College of Engineering and Science at the University of Windsor, beginning August 1, 1999. On January 1, 2000 Attahiru Alfa will join the University of Windsor as Associate Vice-President, Research.

Winfried Grassmann (grassman@cs.usask.ca), Department of Computer Science, is the recipient of this years Merit Award of the Canadian Operational Research Society (CORS). This award is given to an individual CORS member in recognition of his or her career accomplishments and contributions to operational research. The award was presented at the 41st National Conference of the Canadian Operational Research Society in Windsor, June 7-9, 1999.

Harlan Crowder, immediate past chair of ICS, is currently featured in the Career Proliles section of the INFORMS web site. Check out his advice to OR practitioners and new OR graduates at the url *http://www.informs.org/Profiles/crowder.html*

Fred Glover is the founding research director of the Hearin Center for Applied Enterprise Science at the University of Mississippi School of Business Admininstration. The center will match student-faculty teams with corporate clients.

Upcoming Meetings

INFORMS Fall 1999 Meeting, Philadelphia PA, November 7-10, 1999. Contact Chair G. Anandalingam (anand@seas.upenn.edu). URL = *http://www.informs.org/Conf/Philadelphia99*

Winter Simulation Conference (WSC '99), Phoenix, AZ, December 5-8, 1999. Theme: A Bridge to the Future. URL = *http://www.wintersim.org*

DIMACS Workshop on Discrete Mathematical Problems and Medical Applications, DIMACS Center, Rutgers University, Piscataway NJ, December 8 - 10, 1999. Organizer: Ding-Zhu Du (dzd@cs.umn.edu). URL = *http://dimacs.rutgers.edu/Workshops/index.html*

INFORMS Computing Society 7th Biennial Conference, Cancun Mexico, January 5-7, 2000. Chairs: Manuel Laguna and Jose Luis Gonzalez-Velarde. URL = *http://bus.colorado.edu/Faculty/Laguna/cancun2000.html*.

INFORMS Spring 2000 Meeting, Salt Lake City, Utah. Contact William Giauque (william_giauque@byu.edu).

Data Processing on the web: A look into the Future, DIMACS Center, Rutgers University, Piscataway NJ, March 6-7, 2000. Organizers: Mary Fernandez (mff@research.att.com), S.Muthukrishnan (muthu@research.att.com). Dan Suciu (suciu@research.att.com). URL = *http://dimacs.rutgers.edu/Workshops/index.html*

DIMACS Workshop on Cryptography and Intractability, DIMACS Center, Rutgers University, Piscataway NJ, March 20 - 22, 2000. Organizer: Moni Naor, Weizmann Institute of Science (naor@wisdom.weizmann.ac.il). URL = *http://dimacs.rutgers.edu/Workshops/index.html*

Management of Digital Intellectual Property, DIMACS Center, Rutgers University, Piscataway NJ, April 17 - 18, 2000. Organizers: Joan Feigenbaum (jf@research.att.com); Dan Boneh (dabo@theory.stanford.edu); R. Venkatesan (venkie@microsoft.com). URL = *http://dimacs.rutgers.edu/Workshops/index.html*

CORS 2000, Edmonton, Alberta, May 29-31, 2000. Theme: Energy, Environment, and Natural Resources. Contact: erhan.erkut@ualberta.ca or visit URL = *http://www.bus.ualberta.ca/eerkut/CORS2000/*

INFORMS/KORS, Seoul, South Korea, Summer 2000.

17th International Symposium on Mathematical Programming, Georgia Institute of Technology Atlanta, Georgia, USA, August 7-11, 2000. URL=*http://www.isye.gatech.edu/ismp2000/*

informs *Institute for Operations Research and the Management Sciences*

901 Elkridge Landing Road, Suite 400
Linthicum, MD 21090-2909

Seventh INFORMS Computing Society Conference

OR and Computing Tools for the New Millennium
January 5-7, 2000
Cancún, México

Computer science and operations research share an important part of their history. Their interface is responsible for advances that could have not been achieved in isolation. The first six INFORMS Computing Society (ICS) conferences witnessed fascinating developments in the computer science/operations research interface. We would like to take this opportunity to invite you to the seventh ICS conference, which has the goal of bringing together researchers and practitioners in Operations Research, Computer Science, Management Science, Artificial Intelligence, and other related fields.

The edited volume for the conference has been completed and the table of contents is available in the conference web page. The book consists of 17 chapters covering a wide variety of topics including metaheuristic optimization, knowledge management, software maintainability and object-oriented modeling. Conference participants will receive a copy of this edited volume in Cancún.

We would like to remind you that **November 30, 1999** is the pre-registration deadline. Register on or before this deadline and save some money!

We hope to continue the tradition of excellence established in previous ICS conferences, for which we need to count with your support and participation. For additional information, including tours and FAQ, please visit the conference web site at http://bus.colorado.edu/Faculty/Laguna/cancun2000.html

Manuel Laguna   José Luis González Velarde
General Co-Chair   General Co-Chair
University of Colorado   ITESM Campus Monterrey, México
Manuel.Laguna@Colorado.Edu   lugonzal@campus.mty.itesm.mx