Newsletter

Contents

Infonomics – the rules of the "e"?

By Rudolf Müller, International Institute of Infonomics, Heerlen, The Netherlands

In January 2000 a new research facility began its operations in Heerlen, near Maastricht, in the south of the Netherlands. At the beginning of the academic year 2000/2001 the business administration and economics faculty of the University of Maastricht began a study programme on Infonomics as part of their economics curriculum. Other faculties at the university, such as law and general sciences, are also planning similar specialisations in their curricula. In this report I would like to tell you what Infonomics is about and how it relates to research on computing. More detailed information on the International Institute of Infonomics can be obtained from its website (www.infonomics.nl). This article is based on texts co-authored by Jan Bierhoff, Rishab Ghosh, Huub Meijers, Luc Soete, Peter Tindemans, Rita Walczuch and myself.

The International Institute of Infonomics

We all see that digital information and communication technologies are revolutionising our societies at a remarkable speed. Individuals, organisations, industrial sectors and governments are confronted with

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Message from the Editors

This issue of the newsletter is somewhat late. We apologize, and hope that the wait will prove to have been worth it.

In this issue we have *two* feature articles: both on hot research topics related to e-commerce. Rudolf Müller writes on *"Infonomics – The rules of the "e"?"*. Infonomics is defined as the interdisciplinary science studying the digitization of society. With the remarkable pace with which information technologies are rapidly becoming an integral part of everyday life, and our economies, this article is quite timely. It describes a new research institute – the International Institute for Infonomics, the various functional areas of Infonomics, and where and how OR/CS methodologies and research opportunities arise. Kaushal Chari presents an enlightening article in "Intelligent Agents: Overview, Applications and Research Directions". Again with the widespread availability of computing power, and global networking via the Internet, the realm of software agents has become very important. Software agents are gradually coming in use by a larger population. For example, internet auction sites like e-Bay allow for proxy bidding via agents. This article provides an overview of software agents, and highlights a set of application domains and research opportunities that are likely to be of interest to the OR/MS professional.

This newsletter's "featured member" is Bruce Golden, former editor of the Journal on Computing. We don't want to spill the beans, so to speak, by providing any details here. We hope you will read and enjoy!

The debate on the online versus paper version of the newsletter seems over for now. At the recent INFORMS meeting at San Antonio the motion to abolish the paper version of the newsletter was defeated. For sometime the editors have been pointing out the benefits of an electronic only newsletter. However, on learning the outcome of the vote we decided to pat ourselves on the back. Our rationale? The quality of the newsletter must be reasonable, if the members decided that they like their paper copies of the newsletter!

We continue to solicit your contributions to the newsletter (articles, viewpoints, news, book announcements, volunteers as associate editors etc.). We hope to continue the flow of interesting articles we have had over the past few years. We also welcome any feedback, in person (at INFORMS conferences) or via e-mail. Till the next issue….

Session Chairs needed

People interesting in serving as session chairs for an ICS track at theHawaii international meeting should send email to Dave Woodruff at dlwoodruff@ucdavis.edu. The meeting is June 17-20, 2001 on the island of Maui.

Since INFORMS will no longer have a spring meeting, we are hoping to have a lot of ICS sponsored sessions at the fall meeting to be held in Miami, November 2001. If you can chair a session, please send email to Dave Woodruff, dlwoodruff@ucdavis.edu

fundamental transformations of the information environment in which they operate, interact and generate value. Our world will soon be more immediate, individual and interactive. The International Institute of Infonomics has been set up to adequately assess this phenomenon. Infonomics is defined as the interdisciplinary science studying the digitisation of society. The institute brings together insights from a variety of fields, ranging from anthropology, linguistics, law, to mathematics, computer and communication science, economics and business studies. With research and development as its core mandate, the institute also creates educational materials (courses, seminars, workshops) and offers expert advice.

The Infonomics Institute has been set up by the University of Maastricht, the polytechnic 'Hogeschool Zuid', and international institutes such as MERIT and the Maastricht McLuhan Institute. The Infonomics team is headed by director Luc Soete. The research work is conducted by the core research staff in cooperation with the Infonomics fellows who are based in the partner institutes. The institute is financed by contributions from the founding partners, national and regional authorities and, in its initial stage, has received a grant from the European Union regional development fund.

Research and development work is conducted in five units that each has a different focus but, at the project activities level, all collaborate closely. All units have organised their activities into a number of specific research tracks, each of which includes several projects.

The first unit (e-Basics) focuses on the basic concepts, the building blocks of information and communication and the society built around them. It studies Internet standardisation issues, principles governing information appropriation and exchange, as well as intercultural usage differences and philosophical aspects of human relations in digitally organised societies.

The second unit is called e-Behaviour. This research team concentrates on individuals and, more broadly, looks at interacting information agents, persons and machines. It deals with changing communication paradigms in a digital environment (e.g. personality and Internet usage), plus the characteristics of new information-sharing communities, and studies the specifics of gender and ethnicity.

The e-Organisation unit explores the impact of information and communication technologies on organisations and on the markets in which they operate. It focuses on the strategic choices that companies make regarding product innovation and novel coordination processes such as electronic trading. Experimental research and simulations are used to evaluate theoretical models in practical settings.

The e-Society unit concentrates on the institutions, mechanisms, legal procedures and human capital that underpin and move modern society. Projects range from the exploration of new democracy concepts, authors' rights in an online production context, to performance indicators for the knowledge-based economy. Impacts of e-commerce developments on our economies are also included.

The fifth unit is known as e-Content. Its research team applies all the phenomena studied in the other units to a variety of specific sectors of society. Via collaboration projects and contract research it develops an

understanding of the distinct features determining the change process to the networked society. Key sectors are multimedia, electronic publishing, digital government, and internet-based law enforcement.

Research in the e-Organisation unit

Headed by the author of this article, the e-Organisation unit studies changes in the design, production and distribution of products and services – including those consisting purely of information – under the impact of the "information paradigm". e-Organisation is divided into two sub-fields: firstly, the study of new forms of coordination, control and management of internal and external resources and operations; secondly, the transactions of a given organisation and the nature of the markets in which these transactions are carried out.

Fundamental transformations take place within organisations in both these areas. Management decisions are made in an information-rich environment, in which the selection and evaluation of information relevant to the decision-making process becomes critical. The flow of information is no longer determined by the structure of an organisation – the position of an organisational unit in a hierarchy no longer defines which information is available. Instead, ICT allows flexible terms of information sharing that enable or define new organisational structures, such as virtual companies and teams.

The e-Organisation research unit studies these developments through an interdisciplinary approach. There is a mathematical and computer science component that looks at the algorithmic complexity of coordination

mechanisms. The correlation between choice of data and models and quality of decision is measured through evaluating the decision-making in companies with varying degrees of ICT infrastructures, with the eventual goal of making the value of information determinable. Organisation theory studies how organisational structures change along with changes in managing operations. Microeconomics and its offsprings, industrial organisation and experimental economic research, evaluate alternative models of electronic markets, considering both market efficiency and strategies of the participants.

e-Operations

Developments are accelerated enormously by the emergence of systems that create an almost total digital registration of all items, processes and transactions in an organisation, e.g. ERP systems. Electronic commerce applications add detailed information about customers and their preferences; electronic marketplaces integrate resource planning both up and down the supply chain. The advantages and opportunities are clear: organisations can increase flexibility, efficiency, client proximity, geographical reach, and customisation. For an organisation such as the Informs Computing Society this development provides a fertile soil with which to implement in the field both the models and tools that have been developed during our studies. But we also need to look closely at new applications and their requirements on computing in order to adjust these tools.

From a theoretical point of view, the availability of more information should improve decision-making, as decision models can take more parameters into account. However, as we all know, the complexity of such decision models usually increases exponentially with the inclusion of more parameters. The question therefore becomes one of determining which

data to use. Furthermore, lower communication costs and standardisation of interfaces can change the paradigms of managing resources. Instead of integrated, central planning based on complex decision models, one might choose autonomous modules that achieve a goal based on a simple, standardized coordination mechanism. The car industry demonstrates such simplification. Although CAD and CIM continue to improve machinery, the cars are built in increasingly simple ways; a small number of platforms with a small number of modules are being used to assemble a large variety of slightly different cars. This simplifies all phases of design, production and delivery, while increasing the variety for the customer. Also in manufacturing, planning of complex production schedules has widely been replaced by implementing just-in-time solutions, which accomplish self-adjusting dynamic systems. Multi-agent systems form the computer-science paradigm for this development, and the microeconomic theory of markets can provide the theoretical framework to design the coordination mechanisms. Research on e-Operations tries to shed some light on these interrelations between organisational structures, models of coordination, and the effective and efficient processing of information in their operations.

While organisations restructure their operations, the operational landscape is also changing. On one side we see concentrations of brand names, such as Daimler-Chrysler, while on the other side, the production itself is performed by loosely coupled networks of suppliers. What were formerly from-the-bottom-up producers – buying steel, plastics and other materials, and selling cars – now become intermediaries between customers who are interested in the final product (the car) and the virtual network of specialised suppliers of parts for that car. A brand's task is thus reduced to observing demand and translating it into signals to a network of suppliers who coordinate production. The coordination mechanisms in

these networks are mostly information-based. Technically they require the interoperation of information systems, and thus standardisation of information exchange. Conceptually, they raise the possibility of using ICT-based market mechanisms for their coordination, as can be seen by the development of electronic exchanges on the Internet in almost all sectors of manufacturing.

If the product itself is information, the structures and processes of its production become even more flexible. In the example of software services provided through the Internet by an Application Service Provider, data is transported as raw material to the software, as today raw materials for physical products are shipped to a production site. Take as a simple example an online newspaper, where a single copy on a Web server is enough to make it available worldwide, and where the Hyperlink paradigm of the Web can include links to just-in-time stock market figures. The customisation of information products may be further enriched by including the readers' personal data. In the newspaper example this could mean calculating the value of the readers' personal portfolio, and, to take the argument one step further, some advice on trading. This step naturally creates privacy problems and raises a variety of ethical issues which, while not themselves new, now acquire a new sense of urgency. From a computing perspective, it shows how specialised models from finance may suddenly become a commodity with a mass market.

e-Markets

The second topic addressed by the e-Organisation research unit is e-Markets, which concerns transactions, markets to handle transactions and the evolution of networks formed by these transactions.

The information paradigm changes the nature of transactions. The e-Markets study strives to understand the impact of these changes, and

whether the relative costs of transactions – and resulting limitations on their number in production chains – will diminish considerably when the transactions primarily involve the production and communication of information. e-Markets also addresses the possibility that there may be less need for stable partners in markets, if mutual trust can be replaced by online, information-based contractual relations. Will the number of parties involved in a production and consumption cycle then increase significantly? The consequent anonymity of relations, in turn, would only strengthen the dependency on contracts, and the volatile character of all sorts of economic, social and cultural relations among organisations and individuals in societies under the influence of the informational paradigm.

Markets, as a means of matching supply and demand, become more diversified and specialised, but at the same time more accessible, so that information on requirements and offers is more widely available. Rather simple mechanisms are currently used in electronic markets on the Internet, but B2B markets might soon ask for more complex mechanisms, such as multi-attribute, multi-item, and double or reverse auctions that capture more of the features of current offline purchasing situations. However, there is a trade-off between the benefits of a complex mechanism and the ability of human agents to interact with such a mechanism. Furthermore, more complex mechanisms require more complex algorithms for bidder assignment, as the example of a combinatorial auction shows. Since electronic markets are characterised by complex interrelations between computational complexity, strategic behaviour of participants, human or software agents and economic theory, the best approach should combine mathematics, economics and psychology in a normative, empirical and experimental manner.

Markets for information products, whether offline or online, add another level of complexity. If prices no longer reflect the costs of production, what type of value-based pricing should companies or organisations adopt to cover costs? Will information-product markets come to resemble the markets for collector's items, global niche markets created by a specialised clientele and a number of intermediaries? Is there a trade-off between the benefits of customisation and its accompanying diversification and market segmentation, and the benefits of the network effect of selling the same thing to many people? And finally, how can information products be bundled with scarce, physical resources and thus allow the producer to charge for access to the scarce part of this bundle?

Again, the impact of combining new ICT and markets will be a growth of opportunities, coupled with serious orientation, learning and validation problems for parties on both supply and demand sides. The increase in scope due to the worldwide reach of the medium may, at least partly, be offset by a fragmentation of once-homogeneous markets. Either way, the impact on the nature of competitive processes is likely to be profound, so that welfare consequences should be evaluated carefully.

Conclusions

The digital world will soon give our algorithms and models instant and easy access to enormous amounts of data . At the same time, digitisation changes the rules by which operations and markets are organised. Quite opposite trends are observable, as Internet communication encourages decentralisation of decision-making among autonomous agents, it also enables specialisation and concentration in the form of application services. Both developments can have an enormous impact on the field of computing. The e-Organisation unit of the International Institute of Infonomics studies these developments in an interdisciplinary environment.

Intelligent Agents: Overview, Applications and Research Directions

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1. Introduction

The last decade has seen significant advances in the areas of artificial intelligence, software engineering and networking technologies. These advances have contributed to the development of software agents. A large number of software agents have been deployed commercially or as research prototypes to support a variety of tasks that range from filtering, searching and classifying data to buying and selling over the Internet (Maes 1994, Maes et al. 1999; Jennings and Wooldridge 1998). The emergence of software agents has created exciting multi-disciplinary research opportunities that span such disciplines as computer science, management science, economics, psychology and information systems. This article presents a brief overview of software agents, agent applications, and emerging research opportunities in the realm of CS/OR interface. The aim of this article is not to provide an exhaustive overview, but rather to present a limited set of application domains and research opportunities that may be of interest to MS/OR professionals.

2. Overview of Software Agents

A software agent is a piece of software that acts on behalf of some entity and typically has intelligence embedded in it. This notion of agency whereby software agents act on behalf of some entity (i.e., users) is an important descriptor of software agents. Users of software agents include human users as well as other entities such as machines that are represented by software agents. Software agents shield their users from information as well as processing overloads. For example, agents such as the D-SIFTER filter can identify articles of interest for their users, thereby reducing information overload (Raje et al. 1998). Agents such as Open Sesame! automate many repetitive tasks in managing Macintosh desktops by observing their users (Caglayan et al. 1996), leading to a reduction in processing overloads for the user. Software agents have many features that enable them to be effective in various application domains. The following features can be found in software agents.

Application Specific Logic
Software agents encapsulate application specific logic that can range from being a set of AI-rules to specialized mathematical programming algorithms for executing tasks. The software agent framework is general enough to allow agents belonging to the same agent system to encapsulate different types of application specific logic.

Autonomy
Software agents can exhibit autonomous or semi-autonomous behaviors whereby software agents execute their assigned tasks with no or minimal human intervention. The autonomous behavior of agents enables them to be both proactive and reactive in their environment. This facilitates software agents to act as surrogates of their users.

Learning and Adaptation
Software agents can perceive the environment and adapt accordingly. Sophisticated learning algorithms such as those based on neural networks and case-based reasoning could be incorporated into software agents so as to enable them to learn from past experiences.

Mobility
Software agents can be mobile and can move from one computer to another at run-time carrying executable code as well as state information. The mobility feature allows software agents to process data at data locations. This is helpful in conserving bandwidth and in realizing better response times, especially when the computations are data intensive. The mobility feature also facilitates software agents to act as surrogates of users as mobile agents can monitor events at different locations of interest to the users.

Coordination with Other Agents
Agents can coordinate with other agents to facilitate distributed problem solving. Various coordina-

tion mechanisms such as those based on contract net protocol (Smith 1980), mediator architecture (Shen et al. 2000), blackboard architecture (Hayes-Roth 1985), and negotiations (Teich et al. 1999) could be used. The use of different coordination mechanisms is made possible in agents by the underlying asynchronous communications method used by agents. Asynchronous communications is very similar to E-mail communications.

Features of software agents such as proactive behavior, mobility and coordination with other agents distinguish them from other types of software such as expert systems. These differences make software agents attractive for many applications.

3. Agent Categories

Most software agents can be classified on the basis of their functions into the following categories.

Automation Assistants & Guides
Automation assistants assist their users in conducting various tasks with the goal of reducing information as well as processing overloads for their users. Typically, these agents learn user preferences and then take actions based on these preferences. Examples of automation assistants include Open Sesame! (Caglayan et al. 1996) -that automates many tasks for its user on a Macintosh desktop and Calendar Agent (Kozierok and Maes 1993) - that uses rules to generate meeting schedules for its user. Guides have a high level of embedded intelligence and guide their users in different task domains. Examples include Coach (Selker 1994) - an agent that creates personalized help for its user by watching user actions, Letizia (Lieberman 1995) - an agent that guides the user in web browsing by anticipating its user interests. Neural networks, case-based reasoning, and Bayesian approaches are common methods employed for agent learning.

Information Agents

Information agents' goals include gathering, classifying and filtering information over the Internet. These agents provide information for users or for the databases used by search engines. Some of these agents search the cyberspace to recommend items of interests to users based on user preferences and needs. A popular application of information agents is in buying and selling. Excite Product Finder

(formerly known as Jango) (www.jango.com), PDA@shop (Zacharia et al. 1998), BargainFinder (Krulwich 1996), Roboshopper (www.roboshopper.com), Bargain Dog (www.bargaindog.com), Fido (www.shopfido.com), Personalogic (www.personalogic.com), and BidFind (www.bidfind.com) are some examples of agent systems that search the Internet for the "best deals" on products and services of interest to users. Information agents that gather information for search engine databases are known as web crawlers. Web crawlers visit web sites and index documents that they encounter for search engine index databases.

Transaction Agents
Transaction agents assist their human users during online transactions. These agents can perform a variety of tasks that range from ordering items and making payments online to complex automated negotiations and bidding. Agents supporting automated negotiations or automated bidding typically encapsulate their human user preferences in the form of utility functions and then use various heuristics to automate transaction negotiations or bidding (in the case of auctions). Negotiation heuristics can be very simple as in the case of Kasbah (Chavez and Maes 1996), where predefined price decay /increase functions are used, to being complex where negotiation heuristics learn using Bayesian probability updates as in the Bazaar project (Zeng and Sycara 1996). A genetic algorithm approach has also been used for agent negotiations (Oliver 1996). Some other notable examples of transaction agents and systems include eMediator (Sandhom 1999), AuctionBot (Wurman et al. 1998), Bidmaker (www.egghead.com/helpinfo/auctions/bidmaker.htm) and T@T (Guttman and Maes 1998).

Monitoring &Control Agents
Monitoring agents monitor systems for certain events and then notify users about the occurrence of those events. Amazon.com's notification agent called Eyes monitors product databases at Amazon.com and notifies a customer if a certain product of interest to the customer is available. Bidwatch is a monitoring agent at the auction site Egghead.com that reports bid events during auctions to users (www.egghead.com/helpinfo/auctions/bidwatch.htm). The function of monitoring is often done in conjunction with the control function. In which case, agents not only monitor events but also take appropriate actions when certain

events occur. Common application domains for monitoring and control agents include network management (Seagate Software's AppControl agent), air-traffic management (OASIS system (Georgeff 1996)), and process control (ARCHON (Cockburn and Jennings 1996)).

4. Research Opportunities

The use of software agent framework offers many interesting research opportunities in various application domains and solution methodologies. Research opportunities in two application domains and two solution methodologies are presented below.

4.1 Solution Methodologies

Parallel Computations in OR
In the field of operations research, decomposition techniques are widely used to solve complex models. For instance, Benders' decomposition (Murty 1985) is used to solve mixed integer programming models by transforming them into a set of subproblems and a master problem. The agent framework can be applied to Benders' decomposition so as to facilitate parallel computations. The subproblems could be solved in parallel by incorporating the logic of each subproblem in a separate agent and then launching these agents on different machines. The choice of machines for executing agents would depend on CPU speeds, load balancing considerations as well as on the location of databases containing model data. The message passing asynchronous communications used by agents makes them ideally suited to support parallel computations. Furthermore, agents can retrieve model data from multiple databases and do the necessary data transformations needed for executing models with no or minimal human intervention.

Agents can also be used to support parallel computations in a decision support system (DSS) environment. In DSS, often multiple models are chained together to create composite models (Krishnan and Chari 2000). For those composite models where parallel computations are possible (Kottemann and Dolk 1992), agents could be used to solve models in parallel. To the author's knowledge, agent based approaches are not currently being used for parallel computations of OR algorithms. Adapting agent framework for parallel computations of OR algorithms and heuristics would be an interesting area

of research.

AI-OR Hybrid Solution Procedures
Agent framework is ideally suited to support hybrid AI-OR solution procedures for solving complex problems. Many NP-complete/NP-hard problems that cannot be exactly solved in reasonable time have been approximately solved using AI-OR based heuristic procedures. For example, an instance of the topological design of communications network problem with complex reliability constraints has been approximately solved in (Dutta and Mitra 1993) using a hybrid AI-OR iterative solution procedure based on a blackboard architecture. The agent framework can make the solution procedure in (Dutta and Mitra 1993) easier to implement. For instance, the solution procedure could be implemented using computational OR and AI agents whose executions are coordinated by a scheduling agent associated with the blackboard. The computational OR agents could solve the network capacity and flow assignment subproblems for a given topology and the AI-based agents could then, using various rules and reasoning mechanisms, modify the topology based on reliability considerations.

An AI-OR approach has been used in (Lee and Song 1995), where quantitative variables are handled by a linear programming formulation while qualitative variables are solved using a rule-based approach. In this case also, the agent framework can facilitate easy implementation of the solution procedure.

The KRAFT agent architecture (Preece et al. 1999) has been developed to support knowledge fusion, whereby knowledge from heterogeneous on-line sources are extracted and combined to support distributed problem solving. The current implementation of KRAFT combines constraints obtained from multiple sources to create a constraint satisfaction problem that is then solved. An interesting research problem is to extend the KRAFT system to enable the use of a variety of solution procedures including optimization techniques in distributed problem solving.

Application domains such as logistics, transportation, telecommunications and manufacturing could benefit from the use of hybrid AI-OR based approaches whereby computational OR agents along with agents that use production rules, genetic algorithms, neural networks and other AI approaches

interact and jointly solve complex problems. The interaction between OR agents and AI agents can be easily facilitated by the asynchronous communication mechanisms supported by agents.

4.2 Application Domains

Supply Chain Management
Agents can be used in managing supply chains leading to greater flexibility as well as reduction in costs and cycle time. Supply chains based on agents are viewed as networks of cooperating agents (Fox-et al. 1993). Fox et al. (1993) in their Integrated Supply Chain Management System (ISCM), organize supply chains around functional agents - that plan and control activities, and information agents - that facilitate information communication. Examples of functional agents include order acquisition agent, logistics agent, transportation agent, scheduling agent, resource agent, and dispatching agent. These agents coordinate with each other in processing orders using constraint satisfaction and optimization process. Swaminathan et al. (1996), also model supply chains use agents.

 Some other examples of agent systems in supply chains include MetaMorph II (Shen et al. 2000) and MAgNET systems (Dasgupta et al. 1999). In the MetaMorph II system, a hybrid agent-mediator architecture is used to link manufacturing systems with customers and suppliers in the supply chain. The goal of the MAgNET system is to support Internet-based supply chains using cooperating agents. MAgNET supports deep supply chains where a supplier in turn contacts its suppliers while bidding for orders. The evolution of electronic marketplaces on the Internet (Bakos 1998) is now leading supply chains to be organized around market places, thus providing suitable platforms for agents of suppliers and customers to interact and automate transactions.

Supply chains operate in dynamic environments where there are uncertainties in demands, order execution process, procurement and transportation. Although planning does help to deal with uncertainties, often deviations from plans are needed to cope up with contingencies that arise due to supplier not supplying parts on time, breakdown in the manufacturing process, transportation delays etc. In these cases, intelligent agents and electronic market places can both provide the needed flexibil-

ity in dynamic planning and execution of orders. In making multi-agent systems effective for supply chains, the following research areas need to be explored further. First, robust industrial-strength intelligent agent systems need to be developed to deal with contingencies and dynamic changes in plans and schedules. Second, coordination mechanisms based on agent cooperation and negotiations to deal with uncertainties in a dynamic supply chain environment need to be explored further.

Control Applications
Agent systems have been developed for various control applications related to manufacturing control, process control, air traffic management, and telecommunications. The agent system YAMS (Parunak 1987) is one of the earliest agent frameworks proposed for manufacturing. The YAMS agent framework views manufacturing organizations as a hierarchical collection of workcells that represent manufacturing operations, where agents represent individual workcells as well as a collection of workcells. Agents represent the capability of the entities they represent and have the ability to coordinate with other agents in determining the set of efficient schedules for production operations. All agents use contract net protocol (Smith 1980) for coordination. Thus complex scheduling problems that were solved using traditional optimization approaches can be solved in a distributed manner, and on a real-time basis using agents.

Another control application addressed by agents pertains to air traffic management. A multi-agent system known as OASIS (Georgeff 1996) has been tested for air traffic control at the Sydney airport. The OASIS system assigns an aircraft agent to every aircraft that approaches the airport for landing. Aircraft agents monitor various flight parameters of their assigned aircraft and interact with scheduling agents. The agents in OASIS collaborate to determine the optimal sequence in which various aircraft land on a runway, in real-time. The optimal schedule is based on minimizing delay or minimizing a combination of cost and delay.

Multi-agent technology has also been applied to telecommunication control applications. A market-based call routing approach using real bidding is proposed by Gibney et al. (1999). In the market-based call routing approach, agents are associated with links, paths and calls. A path agent buys link re-

sources from link agents to create a path. A path agent then sells path resources to call agents. An agent system based on the ant algorithm is used by Schoonderwoerd et al. (1999) for routing and balancing network load. Ant algorithms are based on the fact that ants deposit pheromone, a volatile substance as they travel on a path and the fact that ants select paths with the largest amount of pheromone. The use of agents for configuring permanent virtual circuits in ATM networks has been proposed by Boyer et al. (1999). Willmott et al. (1999) propose using agents to support quality of service during routing.

ARCHON (Cockburn and Jennings 1996) is a notable multi-agents platform for building agents for process control. ARCHON has been used in building agents for such applications as electricity distribution and supply (Cockburn et al. 1992), and cement kiln control (Stassinopoulos and Lembessis 1993). The examples on the control applications presented above are just few of the examples where agents systems have been used. Many more control applications could benefit by adapting the agent systems approach. Future research should explore this.

Conclusion

Software agent systems provide a novel approach for solving many complex problems involving search, control, and coordination. A variety of applications presented in this article support the above view. Many solution methods and application domains could benefit from adapting the agent systems approach.

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DIMACS Workshops

DIMACS Center
Rutgers University, Piscataway NJ, 08854-018
http://dimacs.rutgers.edu/Workshops/index.html

DIMACS Working Group Meeting on Policy Driven Decision Making and Dynamic Interoperability, December 8, 2000. Description: This workshop will explore previous work done by theoretical computer scientists in the area of policy driven decision-making and its potential application to solving problems associated with enabling dynamicinteroperability.

DIMACS Workshop on Whole Genome Comparison, February 28 - March 2, 2001. Description: The goal of the workshop is to bring together biological and computational scientists at three levels: whole genome sequence comparison, including the implications for identification of protein coding and regulatory regions and the origin and role of non-coding DNA; whole genome map comparison, including the importance of spatial genomic organization and the role of duplications and rearrangements in genome evolution and structure; functional genomic comparison, comparison of comprehensive functional data sets such as the set of orthologs, protein folds, expression patterns, pathways of protein-protein interactions found in a given organism.

DIMACS Workshop on Resource Management and Scheduling in Next Generation Networks, March 26 - 27, 2001. Description: This workshop will focus on all optimization problems that will arise in new network settings. Specific topics include, but are not limited to: physical layer issues, network and transport layer issues, application layer issues.

DIMACS Workshop on Integration of Diverse Biological Data, June 21 - 22, 2001. Description: This workshop will focus on combinatorial algorithms and probabilistic models for the analysis and cross-annotation of biological data in diverse databases. We will consider high-dimensional combinatorial algorithms and probabilistic models central to DM for the analysis, clustering, and classification of complex data patterns that can be used to integrate diverse information from many sources.

Software Announcements

MProbe 3.2.2 is now available. Descriptions of new features, a technical paper, fully-functional demo copies, a student version and other information can be downloaded from http://ww.sce.carleton.ca/faculty/chinneck/mprobe.html.

ILOG CPLEX 7.0 includes ILOG Concert Technology, which provides a C++ modeling layer for linear and mixed integer programs, and a C++ interface for solving these problems. A full press release and additional information is available at http://www.ilog.com/corporate/releases/us/001011_concert.cfm

ConsultEze, from Yale Systems, Inc., generates billing statements and invoices on your letterhead for engineering, legal, CPA, and consulting projects using the client's own internal language. More information, including a free-trial offer, is available at www.yale-systems.com/xpagea.html

The Common Optimization INterface for Operations Research (COIN-OR or simply, COIN) is an initiative to spur the development of open source software for the operations research community. Currently the following repository of open source projects are available: **BCP**: a parallel branch-cut-price framework, **CGL**: a cut generation library, **DFO**: a package for solving general nonlinear optimization problems when derivatives are unavailable, **FAA**: fast approximate algorithms (such as the Volume Algorithm), and **OSI**: an open solver interface layer. Further information is available at www.coin-or.org.

XPRESS-MP Release 12 is now available. Full details of new features, student versions, and other information is available at www.dash.co.uk.

IBM Optimization Solutions and Library for Multi-platforms Version 2. Full product details and information on free academic licenses are available at http://ism.boulder.ibm.com/es/oslv2/features/welcome.htm.

Report on the INFORMS Journal on Computing

W. David Kelton, Editor-in-Chief

This year was the 12th volume for *JOC*, and all four issues have been processed on time. We published 388 pages in total, representing 25 papers. One of these papers is a memoriam piece to Carl Harris, written at my request by Saul Gass and Don Gross, and is appearing in the fourth (final, fall) issue of this year; it is immediately followed by a paper co-authored by Carl, which he submitted to me the day before he passed away. I have dedicated this issue to Carl.

During the first three quarters of the year, we received 64 new papers, accepted 20 papers, rejected 34 papers, and 3 papers have been withdrawn. There are currently 78 papers in process (under review or under revision). In addition to reporting these statistics to me quarterly, the Area Editors provided information about papers in process, and we have improved turnaround. For next year, we have nine accepted papers in the backlog, a couple of which are very long, so we have more than enough material for the first issue and a good start on the second issue. We need to keep pushing, however, on paper submission and turnaround. There are several special invited papers in the works, as well as three special issues.

JOC's web presence has been greatly expanded. The public site is now permanently hosted on an INFORMS server in Maryland, with the permanent URL http://joc.pubs.informs.org/. It includes general staff and sponsor information, detailed instructions for authors (with downloadable templates in several systems, including LaTeX and Word), editorial statements for each Area, lists of accepted papers, a page for permanent housing of Online Supplements to accepted papers, and (most exciting) an almost-complete compendium of tables of contents from 1997 back (INFORMS PubsOnLine has papers from 1998 forward) with links to full-text PDF files of the papers themselves. When complete, the entire history of *JOC* will be available online, either free at our site or by subscription to INFORMS PubsOnLine.

In addition to the public site, we composed an "Internal Procedures" site detailing the duties and procedures of Referees, Associate Editors, Area Editors, and the Editor-in-Chief.

A new e-commerce topic was created and merged in with the ongoing Telecommunications area, with Ramayya Krishnan joining Anant Balakrishnan as Area Co-Editor. The "Modeling: Methods & Analysis" and "Logic, Optimization, & Constraint Programming" Areas are new names (same Area Editors), with corresponding adjustment of scope. There has been considerable activity in the list of Associate Editors. Rotating out were Charles Blair, Lawrence Dowdy, Leslie Hall, Ramayya Krishnan (he became an Area Co-Editor), Melanie Lennard, Sudha Ram, Erik Rolland, Arie Segev, Douglas Shier, and Prasoon Tiwari. At the request of Area Editors, I have appointed Alexander Bockmayr, Alan Hevner, Betty Hickman, Akhil Kumar, Rudolf Müller, Rema Padman, Kirk Pruhs, and Alexander Tuzhilin as new Associate Editors. This is a net reduction of two Associate Editors, of which there are currently 33, all of whom are actively engaged. I've written formal letters to everyone leaving and joining. There will be a new Simulation Area Editor starting in 2001, as Mike Taaffe has decided to step out.

In mid year, we changed the referencing style, eliminating the numbering and coming into conformance with INFORMS standard style in support of efforts toward a merged database of references. Starting with next year, we will move to a new page style, similar to what has been in *Management Science* for several years, and is one to which INFORMS is moving overall, except with several changes to agree with LaTeX defaults. Also starting in 2001 we are changing to a different vendor for composition, and this vendor is evidently experienced and comfortable with taking LaTeX files rather than retyping everything from paper, as has been done up to now.

ICS ByLaws Amendments

The INFORMS Computing Society has proposed changes to its bylaws to reflect the fact that there will no longer be a Spring INFORMS meeting. The following Amendments to the ICS bylaws were presented and approved at the ICS Business Meeting in San Antonio on November 6, 2000.

Amendment 1:
Article IV, Section 2, is amended as follows:
A.   The terms of the Chair and Vice Chair are changed to two year terms.
B.   The term of the Secretary/Treasurer is changed to a two year term.
C.   The Secretary/Treasurer cannot serve more than two consecutive terms.

These changes will result in the following new text for Article IV, Section 2.

2.   Terms of Office. All terms begin at the conclusion of the fall ICS Business meeting. a) The terms of the Chair and Vice Chair are two years, and no person may serve as Vice Chair immediately after having served a full term as Chair. b) The term of the Secretary/Treasurer is two years, and no person may serve more than two consecutive terms. c) The term for ICS Board members other than the Chair, Vice Chair and Secretary/Treasurer is three years, and two of these members are elected each year. All offices and Board seats must be occupied by distinct persons, except that a Board member who is elected Vice Chair or Secretary/Treasurer may retain his/her seat on the Board.

Amendment 2:
A.   The Chair, Vice Chair, and Secretary/Treasurer whose terms began at the end of the Spring, 2000, ICS Business Meeting will have a term of 18 months, with a change in officers at the end of the Fall, 2001, ICS Business Meeting.
B.   The Secretary/Treasurer whose term began at the end of the Spring, 2000 ICS Business Meeting, can serve one additional term beginning at the end of the Fall, 2001, ICS Business Meeting, provided that Amendment 1 is approved by the membership.

The current bylaws can be found on the Web at: http://condor.ucr.edu/ics/bylaws_frame.html

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Report on the INFORMS Journal on Computing (continued from previous page)

Subscriptions are close to budget. Counting all 940 of the PubsOnLine suite subscribers, circulation is now 1772; without PubsOnLine it is down somewhat from last year, but much if not all of this decline is probably made up in the online subscriptions. We attracted 11 paying Institutional Sponsors, which is well over the budget. We have been careful to control costs, and so the budget is in the black.

For the coming year, I plan to continue to work on the inflow and turnaround of papers, and bring the special papers and issues to fruition. We are nearing completion of the web sites to a steady state of routine maintenance, and will finish the online back issue project. We will work with INFORMS to identify additional library subscriptions, and mount a grassroots campaign within those institutions. I hope that the new page style and composition vendor will result in better, faster, and cheaper production.

Respectfully submitted by W. David Kelton, Editor-in-Chief, October 27, 2000

Message from the Chair

In the beginning (or some time back before I knew the definition of "operations research"), there was The Institute for Management Science (TIMS) and there was the Operations Research of America (ORSA). Each year featured one TIMS/ORSA meeting and one ORSA/ TIMS meeting, and it was good. In the middle, the ORSA Computer Science Technical Section (CSTS) was formed, and CSTS contributed to the great success of these semiannual meetings, as well as organizing seven separate meetings with a focus on the Operations Research/Computer Science interface. In 1995, ORSA and TIMS merged to become INFORMS, and CSTS became the INFORMS Computing Society (ICS) in 1998, and this was excellent. Today, in the new millennium, ICS is faced with new challenges as INFORMS continues to restructure the format of its meetings.

As you are probably aware, INFORMS has eliminated the traditional spring annual meeting, and replaced it with the INFORMS Conference on Practice focused on the needs of practitioners. (More about this below) As a society, we will only be able to have our business meetings once per year each Fall. I have put together amendments to our bylaws that will allow us to change the term of office for the officers and allow these terms to begin at each Fall meeting. In addition, I am proposing that the term of office be extended to two years for each of our officers. This will make it easier to establish continuity over the long term for the society. We will also move the awarding of the ICS Prize to the Fall annual meeting.

For the Fall 2000 meeting in San Antonio, we have organized 18 sessions that include 4 tutorials. This includes 3 sessions dedicated to the memory of Carl Harris, one of the treasured members of ICS. For one of the tutorials, I have asked Janos Pinter, the winner of the 2000 ICS Prize, to give a tutorial related to his prize winning work. I would like to institute this as a new tradition for the future so that we can publicize the great work recognized by our society.

On May 20-22, 2001, the first INFORMS Conference on Practice, entitled "Optimizing the Extended Enterprise in the New Economy" will be held in San Diego. Along with ICS members Karla Hoffman and Harlan Crowder, I have had the pleasure of serving on the organizational meeting for the conference. While the INFORMS annual meetings allow anyone to present their research findings, the Practice Conference is inviting speakers to cover a wide range of topics related to the modern practice of Operations Research, with a special focus on new opportunities created by the growth of the Internet and the World Wide Web. The goal of the meeting is to provide attendees with information they can use in their daily jobs in the practice of Operations Research. I'm sure that everyone will be hearing more about some of the great speakers that have been lined up for this meeting.

I had offered to INFORMS the possibility of piggybacking the ICS Conference onto the INFORMS Practice Meeting so that our next ICS Conference would occur in May, 2002. Unfortunately, INFORMS is not able to commit to a location for that meeting with enough lead time to allow us to plan and advertise our meeting. We are discussing whether to still commit to the May, 2002, timeframe independent of the decision of INFORMS, or to do the next ICS Conference in January, 2003. The ICS Board solicits your input on this important issue. We are also looking for a volunteer interested in chairing the next ICS Conference.

Let me close with a belated note of thanks to Ramayya Krishnan for his service as ICS Chair, and to Bjarni Kristjansson for his 3 years of service as ICS Secretary/Treasurer.

Computationally yours,
  Irv Lustig
  ICS Chair

Minutes of the Business Meeting

of the INFORMS Computing Society

Salt Lake City, May 2000

Attendance

The meeting was well attended. The sign-in sheet recorded the following attendees: David Gay, David Kelton, David Woodruff, Dick Barr, Eli Olinich, Irv Lustig, John Chinneck, Karla Hoffman, Kevin Wood, Matthew Saltzman, Ramayya Krishnan, Sanjay Saigal, Robin Lougee-Heimer, Robert Vanderbei, János Pintér, Tedary Taura's, Bruce Golden, Prakash Mirchandani, Sheldon H. Jacobson, Mihai Auitescu, Anduj Lewanhwese, Dan Zhu, Mana A. Osono, Bjarni Halldorsson, Dave Morton, John Forrest, Harlan Crowder, Ariela Sofer, Trish Allewalt, Mary Steffens, Mark Webster, Bjarni Kristjansson.

Opening

Ramayya Krishnan opened the meeting, introduced the new slate of officers, and turned the meeting over to the new Chair, Irv Lustig.

ICS Officers 2000-2001

- *Chair*: Irv Lustig
- *Vice-Chair/Chair-Elect*: Dave Woodruff
- *Secretary/Treasurer*: John Chinneck
- *Newsletter editors*: Raghu Raghavan and Tom Wiggen

Board of Directors:
- Bruce Golden (-2001)
- Jeff Kennington (2001)
- Manuel Laguna (-2002)
- Eric Rolland (-2002)
- Sanjay Saigal (-2003)
- Hemant Bhargava (-2003)

Next ICS Meeting

The next ICS meeting will be held at the INFORMS meeting at San Antonio in the fall of 2000. Volunteers for session chairs are encouraged.

Next ICS Conference

The conference is traditionally held in January every 2 years. On this schedule, the next meeting would be held in January 2002. However, the INFORMS Practice Meeting will be held in May 2002. There are two options:

- Run our own ICS conference as usual in January 2002.
- Piggyback on the May 2002 Practice Meeting. We can then have INFORMS help with the logistics.

In either case, we need someone to chair the conference. Volunteers are sought.

INFORMS Historical Notes

INFORMS wants to publish a volume with historical notes, and the societies are being asked to contribute. Contributors, especially those with a long history in operations research, are sought.

Bylaw Changes

A number of changes to the ICS bylaws are necessitated by the change in the INFORMS meeting policies (the spring general INFORMS meeting is being eliminated in favor of a practitioner's meeting; the general meeting will be held in the fall). Specific items needing change are:

- ICS Prize is awarded at the spring meeting.
- All terms of office begin at the conclusion of the spring ICS Business Meeting.
- The Chair shall also take nominations from the floor during the ICS fall Business Meeting.
- ICS shall hold a Business Meeting during each regularly scheduled national INFORMS meeting.

Proposals to address this problem include:

- Move the elections and awarding of the prize to the fall INFORMS meeting (next prize would then be awarded in the fall of 2001).
- Change the term of office of the chair and vice-chair/chair-elect to be two years.
- Change the term of office of secretary-treasurer to be two years, with a maximum of four years.
- Transition to take place as follows:
    - Lustig's term as chair ends in fall 2001 (18-month term).
    - Woodruff takes over as chair at meeting in fall 2001 and continues until fall 2003 (2 year term).

We will vote on these proposals at the fall 2000 meeting in San Antonio as per our current bylaws.

Secretary/Treasurer's Report

Bjarni Kristjansson submitted the minutes from the Philadelphia 1999 meeting, which were made available as a handout and then approved simultaneously. Bjarni also presented a status report on the current ICS finances:

REVENUES	2000	1999
Dues	2055	2903
Meeting	2260	
Other	0	599
TOTAL	*4315*	*3502*

EXPENSES	2000	1999
Newsletter	0	3173
Nat. Meeting	0	351
Ballot	57	0
Marketing	0	0
Award	0	1116
Admin.	500	25
TOTAL	*557*	*4665*

Balance as at 3/31/2000: $17,622

ICS Prize

Dick Barr, Chair of the ICS Prize committee, presented a plaque and cheque to János Pintér for his book entitled *Global Optimization in Action*. The prize is for the best English-language paper or book on the OR/CS interface. The committee members were Dick Barr, Dave Woodruff, and Bob Vanderbei.

ICS Newsletter Report

Co-editors are Raghu Raghavan, University of Maryland, College Park, MD and Tom Wiggen, University of North Dakota, Grand Forks, ND.

INFORMS Journal on Computing

David Kelton, JoC Editor-in-Chief reported on activities at the Journal. Highlights:

- A Carl Harris tribute and paper is being planned.
- Some changes in Areas:
    - Former Telecommunications area expanded to *Telecommunications and*

Electronic Commerce with Anant Balakrishnan and Ramayya Krishnan as Co-Editors

- o Former Logic Modeling and Computation area renamed *Logic, Optimization and Constraint Programming* by Area Editor John Hooker.
- o Former Modeling Languages and Methods area renamed *Modeling: Methods and Analysis* by Area Editor John Chinneck

- Advisory Board changes: Dick Larson stepped down, Bruce Golden appointed.

- Associate Editor changes: Kirk Pruhs, Alan Hevner newly appointed. Stepping down: Lawrence Dowdy, Leslie Hall, Charles Blair, Ramayya Krishnan, Melanie Lenard, Erik Rolland, Douglas Shier, Prasoon Tiwari.

- Institutional Sponsors:
  - o New: Andersen Consulting, IBM Watson Research Center, Palisade Corporation, Systemflow Simulations, Sabre Inc., University of Cincinnati.
  - o Continuing: ARKI Consulting, FedEx, GTE Labs, ILOG, ICS, Paragon, and perhaps others.
  - o Revenue is above INFORMS budget amount.

- New web site is up at http://www.informs.org/Pubs/JOC. Address may be changed soon. Includes information for authors, editors, advisory board, sponsors, and subscribers. Separate site for internal procedures. Coming soon: scanned back issues, online appendix

for published papers, lists of accepted papers.

- Vital Statistics:
  - o Things on schedule for first two issues of 2000.
  - o 12 papers in accepted queue, 84 papers in progress.
  - o Editorial board is working to shorten review times.
  - o Various special issues, clusters, and invited papers are in development.
  - o No reliable data from INFORMS on circulation or budget at this time.

Announcements

Karla Hoffman reported that Carl Harris passed away unexpectedly. She is working towards some relevant memorials for Carl, including a scholarship at George Mason University (donor cards available from Karla), and a "Carl Harris" track at INFORMS meeting.

Bob Fourer (4er@iems.nwu.edu) is putting together an ICS web page and asked everyone to email him any ICS-related links that would be appropriate for the page.

Matt Saltzman reported that volunteers are wanted for work on the INFORMS Online (IOL) pages.

Leon Lasdon reported that the INFORMS International Meeting in June 2001 will be held in Hawaii, and is looking for persons interested in organizing sessions for that meeting.

ICS Member Profile: Bruce Golden

Dr. Bruce Golden has been a member of the INFORMS Computing Society and its predecessor, the Computer Science Technical Section, for more than 20 years. He has served on its Board for two terms. As an undergraduate at the University of Pennsylvania, he majored in mathematics. He took his first course in computer programming as a freshman.

In searching for a class project, he came upon Buffon's needle experiment. Several hundred years ago, Buffon determined that the probability that a thin needle of length , thrown at random, will cross one of the parallel horizontal lines (d units apart) in a ruled (rectangular) board is given by . "For my project, I applied Monte Carlo simulation to approximate and was terribly excited with the reasonably accurate estimate that resulted." When Bruce learned that Monte Carlo simulation was a sub-field of operations research, he began looking into OR course offerings at Penn. He took several of these at Wharton, in his senior year.

After graduating from Penn in 1972, Bruce began graduate work at M.I.T. He wrote his masters thesis and doctoral dissertation under the direction of Tom Magnanti. "Tom was a young and relatively unknown Assistant Professor at the time (with a full head of black hair), and he spent a lot of time with his graduate students." Bruce worked on developing and coding fast algorithms for transportation science applications such as multicommodity flow and vehicle routing.

In 1976, Bruce received his Ph.D. and began at the University of Maryland as an Assistant Professor in the School of Business. He chaired the Department of Management Science and Statistics from 1980 to 1996. In the 1970s and 1980s, his research continued to focus on transportation science as well as heuristic search. In the 1990s, Bruce was drawn to emerging computational technologies such as neural networks, genetic algorithms, and data mining. "These new areas are generating quite a stir in the engineering and computer science research communities. It is exciting to approach these areas from an OR viewpoint and contribute to their widespread acceptance and application." Some of Bruce's recent projects include predicting the success of initial public offerings (IPOs) using neural networks, identifying investment opportunities in international telecommunications markets using regression models, and using genetic algorithms

and data mining to build accurate decision trees (using a massive, real-life marketing data set).

Bruce is an affiliate professor in the University of Maryland's Department of Civil Engineering and a member of the Applied Mathematics Program. In 1994, he received the Thomas L. Saaty Prize for Applied Advances in the Mathematical and Management Sciences. In 1996, he was selected as one of the inaugural group of University of Maryland Distinguished Faculty Research Fellows. In 1998, he received a Lilly-Center for Teaching Excellence Teaching Fellowship and was appointed to the France-Merrick Chair of Management Science. Most recently, in 2000, he received a Distinguished Scholar-Teacher Award. "It is sometimes hard for me to believe that this is my twenty-fifth year at the University of Maryland. I think I enjoy being a professor as much now as when I first began. I am certainly a better teacher than when I began. In addition, I think some of my most exciting research is my recent research."

In addition to his own scholarly research, Bruce has served on numerous editorial boards over the years. In particular, he served as Editor-in-Chief of the <u>INFORMS Journal on Computing</u> from 1992 through 1999. "The experience was enormously rewarding. I was able to encourage and showcase research articles in the interface of OR and CS. I also helped the journal mature from a start-up to a widely-recognized, economically viable publication."

Bruce has been an Area Editor of <u>Operations Research</u> and a Departmental Editor of <u>Management Science</u>. He has been the Editor for Management Sciences of the <u>American Journal of Mathematical and Management Sciences</u> since the late 1980s. He became an Editor-in-Chief of <u>Networks</u> in mid-1999.

Bruce enjoys juggling editorial work with his research and teaching responsibilities. One of his secrets is his somewhat unusual schedule. He works in his home office until 5 a.m. and then sleeps until after noon (when he can). Although he clearly enjoys the academic lifestyle, he has extensive "real-world" OR experience also.

In 1980, he and several colleagues founded a consulting/software firm specializing in vehicle routing and logistics applications in Columbia, Maryland. They grew the firm to a point where it had major clients and installations in the newspaper, utility, sanitation, and small package delivery industries.

As President, he sold the firm to a large civil engineering company in 1998. "There is no doubt that I am a more effective business school teacher as a result of this entrepreneurial experience."

In terms of the future, Bruce looks forward to many more years of productive, academic life. "I also expect to remain an active member of the ICS for years to come. I have been to each and every one of the seven INFORMS Computing Society Conferences and I hope to extend my streak."

News about Members

Lawrence M. Seiford is the new Chairman of Industrial and Operations Engineering at the University of Michigan—Ann Arbor. He assumed this position in September after spending the past 3 years at the National Science Foundation as Program Director of Operations Research and Production Systems. In addition, in November he will travel to Marseille to receive the degree Docteur Honoris Causa from the National Ministry of Education of France in a special recognition ceremony at the Universite de la Mediterranee, Aix-Marseille II.

Anna Nagurney was awarded a Distinguished Chaired Fulbright Professorship in the Social and Economic Sciences for the University of Innsbruck, Austria. She will in Innsbruck during the spring and summer of 2002.

Bruce L. Golden, France-Merrick Chair in management science at the University of Maryland, and **Douglas R. Shier**, professor of mathematical sciences at Clemson University, are the new editors-in-chief of the journal Networks. They encourage ICS members to submit relevant articles to the journal, especially those that highlight the operations research/computer science interface. Information about the journal can be found at http://www.interscience.wiley.com/jpages/0028-3045/

Hemant K. Bhargava has joined the The Smeal College of Business, Pennsylvania State University, as Professor of Management Science and Information Systems. He was a Visiting Professor of Information Systems at Carnegie Mellon University from January 1999 to June 2000, and prior to that, taught at the Naval Postgraduate School since December 1989. More information about him and the MSIS department is available at http://www.smeal.psu.edu/msis/faculty.html

Janos Pinter's LGO modeling and solver system was reviewed in the October 2000 issue of OR/MS Today. To Janos's knowledge, this is the first such review ever on global optimization software.

Upcoming Meetings

SODA (Symposium on Discrete Algorithms) Washington, DC, January 7-9, 2001, http://www.siam.org/meetings/da01

15th Belgian Conference on Quantitative Methods and Decision Making Antwerp, Belgium, January 29-30, 2001, http://tew.ruca.ua.ac.be/orbel/

Brazilian Symposium on Graphs, Algorithms, and Combinatorics Fortaleza, Brazil, March 12-19, 2001, http://www.lia.ufc.br/symp2001/

ARACNE Spring School on Approximation Algorithms for Scheduling and Telecommunications Kiel, Germany, March 26-30, 2001**,** http://www.dia.unisa.it/aracne.dir

First SIAM International Conference on Data Mining Chicago, IL, USA, April 5-7, 2001, http://www.siam.org/meetings/sdm01/

CP-AI-OR 2001 Third International Workshop on the Integration of AI and OR Techniques Ashford, Kent, UK, April 8-10, 2001, http://www.icparc.ic.ac.uk/cpAIOR01/

CORS Annual Conference jointly with Optimization Days Quebec City, Canada, May 7-9, 2001, http://www.fsa.ulaval.ca/scro-jopt

Intelligent Systems Design and Applications (ISDA 2001) San Francisco CA, May 28-30, 2001, http://www.gscit.monash.edu.au/conferences/isda2001/

INFORMS International 2001 Hawaii, Maui, HI, USA, June 17-20, 2001, http://www.informs.org/Conf/Hawaii2001

EURO XVIII Conference, Erasmus Univ., Rotterdam, July 9-11, 2001, http://www.euro2001.org/

INFORMS 2001, Miami, Florida, November 4-7, 2001, http://www.informs.org/Conf/Miami2001

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János D. Pintér wins ICS prize

The Year 2000 recipient of the INFORMS Computing Society Prize for Research Excellence in the Interface Between Operations Research and Computer Science is: János D. Pintér for his book:

Global Optimization in Action, Continuous and Lipschitz Optimization: Algorithms, Implementations and Applications, Kluwer Academic Publishers (1996)

This book is an excellent practical and academic reference on global optimization, with a unified perspective on the theoretical, computational, and modeling aspects of this important and computationally challenging area. This field is concerned with continuous optimization problems in which the objective function or constraint set may be nonconvex. Such problems often have multiple local optima and identification of the global best solution(s) can be exceptionally difficult. The book surveys global-optimization problem classes, summarizes various solution approaches (including the author's own contributions), describes a software system for a broad class of these problems, and details the modeling and solution of many significant real-life applications. The development and implementation of computationally effective algorithms is at the interface of operations research and computer science, and this work shows that a wide variety of global-optimization problems arising in practice can be successfully addressed. (Award inscription)

ICS Prize Committee: Richard S. Barr (chair), John Hooker, Robert Vanderbei, David Woodruff

Editor's note: INFORMS has adopted 'Global Optimization in Action' for recommendation to its membership, at a reduced price of US $ 70.00.