Canadian Artificial Intelligence

Intelligence Artificielle au Canada

April/avril 1990 No. 23

An official publication of CSCSI, the Canadian Society for Computational Studies of Intelligence
Une publication officielle de la SCEIO, la Société canadienne pour l'étude de l'intelligence par ordinateur

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Application Development: Applicability of neural network technology is already widespread. The following list covers some of the areas where an application has already been fielded or is in development:

- *robotics (perception, control, action fusion, generation of actior sequence)*
- *artificial skin/muscle, vision and scene analysis*
- *character and object recognition*
- *process control (process monitoring, quality control, generation of flexible manufacturing schedule)*
- *expert systems (diagnosis, control expert system) and automated knowledge acquisition*
- *voice recognition*
- *signal processing (intelligen noise filtering, signal formatting)*
- *radar clutter elimination*
- *risk analysis for credit authorization*
- *prediction*
- *detection o explosives*
- *autonomous vehicles (sensory and control processes map generation, map interpretation, navigation and maneuvering)*
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Canadian Society for Computational Studies of Intelligence

Founded in 1973

CSCSI is the Canadian society for the promotion of interest and activity in artificial intelligence. It conducts workshops and fully refereed national conferences, publishes this magazine, sponsors the journal Computational Intelligence, and coordinates activities with related societies, government, and industry. To join CSCSI, use the membership form in this issue. Non-Canadian members are welcomed. CSCSI is affiliated with the Canadian Information Processing Society and International Joint Conferences on Artificial Intelligence, Inc.

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Membership form is on the last page. Please send subscriptions, memberships, and changes of address to:
CSCSI, c/o CIPS, 243 College Street, 5th floor
Toronto, Ontario, CANADA M5T 2Y1

Société canadienne pour l'étude de l'intelligence par ordinateur

Fondée en 1973

SCEIO est la Société canadienne encourageant l'intérêt et la recherche en intelligence artificielle. Elle organise des ateliers ainsi que des conférences nationales avec évaluation des articles soumis. Elle publie ce magazine, subventionne le journal Intelligence Informatique, et coordonne toute interaction avec des sociétés parallèles, le gouvernement, et l'industrie. Pour devenir membre de la SCEIO, veuillez utiliser le formulaire d'inscription de ce numéro. Les non-canadiens sont bienvenus. La SCEIO est affiliée à l'Association canadienne informatique, et aux International Joint Conferences on Artificial Intelligence, Inc.

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Intelligence Artificielle au Canada

Founded in 1974 as / Fondée en 1974 en tant que CSCSI/SCEIO Newsletter

Submissions:
Canadian Artificial Intelligence is published quarterly by CSCSI/SCEIO and is a benefit of membership in the society. *Canadian AI* solicits contributions in English or French on any matter related to artificial intelligence, including: articles of general interest; descriptions of current research and courses; reports of recent conferences and workshops; announcements of forthcoming activities; calls for papers; book reviews and books for review; announcements of new AI companies and products; opinions, counterpoints, polemic, controversy; abstracts of recent publications, theses, and technical reports; humour, cartoons, artwork; advertisements (rates upon request); anything else concerned with AI. Paper or electronic submissions are welcome. Electronic submissions are preferred and should be unformatted. Canadian AI is published in January, April, July, and October. Material for publication is due six weeks before the start of the month of publication.

Contributions :
L'Intelligence artificielle au Canada est publiée trimestriellement par la CSCSI/SCEIO, et est offerte gratuitement aux membres. L'*IA au Canada* encourage les contributions, en français ou en anglais, portant sur l'intelligence artificielle. Ceci comprend: des articles d'intérêt général; des descriptions de recherche courante et de cours; des rapports de conférences récentes et d'ateliers; l'annonce d'activités à venir, et des requêtes d'articles; des critiques de livres ainsi que des livres à critiquer; l'annonce de nouvelles compagnies en IA et de leurs produits; des opinions, des répliques, tout ce qui est polémique; des résumés de publication récentes, de thèses et de rapports; des trucs humoristiques ou artistiques, de bandes dessinées; des annonces (s'enquérir des frais); tout autre matériel touchant à l'IA. Contributions, sur papier ou par courrier électronique, sont bienvenues. Nous préférons le courrier électronique mais les soumissions ne doivent pas avoir un format. L'IA au Canada apparait en janvier, en avril, en juillet, et en octobre. Toute communication à publier doit nous parvenir au moins six semaines avant le début du mois de parution.

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Canadian Artificial Intelligence is published quarterly by the Canadian Society for Computational Studies of Intelligence (CSCSI).
Intelligence Artificielle au Canada est publiée trimestriellement par la Société canadienne pour l'étude de l'intelligence par ordinateur (SCEIO).
Second Class Mail Registration No. 7373

ISSN 0823-9339

COMMUNICATIONS
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Letter to the Editor:

Dear Colleague,

I would like to bring to your attention, and to the attention of your readers, a wonderful opportunity that currently exists to organize high-level international collaboration activities in the field of artificial intelligence applied to instruction. I am refering to NATO's Programme in Advanced Educational Technology, sponsored by its Scientific Affairs Division.

I have included below an outline of this programme. As one of the panel members of this NATO programme, I would be pleased to provide any further information and comment to anyone interested in it. Other members of the Canadian AI community that are familiar with this programme include Gordon McCalla, Marlene Jones, and Phil Winne.

The latter two are currently organizing an intensive 2-week summer institute in the area of AI and Education, to be held this July in Alberta. I am sure you will be reporting on this interesting event in a future issue of the magazine.

Cordially,

Philippe Duchastel
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ADVANCED EDUCATIONAL TECHNOLOGY RESEARCH WORKSHOPS AND SUMMER SCHOOLS

The Science Committee of NATO sponsors the organization of Advanced Research Workshops and Advanced Study Institutes (Summer Schools) on topics in the field of educational technology. The aim of this special programme is to stimulate international collaboration among established and younger scientists in this field of R&D.

Areas of interest (among others) include task analysis, simulation, modelling and diagnosis, tutorial strategies, intelligent tutoring and other interactive technologies, microworlds and interface design, and evaluative methodologies.

Workshops typically involve 20 to 40 experts in their field in a 2 to 5 day meeting with the aim of reviewing the state-of-the-art in the field and establishing collaborative links for future research. Study Institutes are 2-week summer schools where 12 to 15 leading scientists impart knowledge and experience to a group of 60 to 80 younger scientists with the aim of giving them a solid footing in the field. Both types of activity favour professional contact among scientists in the spirit of international co-operation in furthering promising areas of educational technology.

NATO does not organize these activities itself; rather, it sponsors them through funding. Scientists interested in organizing an Advanced Research Workshop or an Advanced Study Institute in their particular specialty should request an application form and information packet from the Scientific Affairs Division (Advanced Educational Technology), NATO, B-1110 Brussels, Belgium. Applications for more modest funding to enable international travel for collaborative research among scientists from different countries, and for research, study, and lecture visits abroad are also available.

News Release

NEW MEMBER APPOINTED TO THE NATURAL SCIENCES AND ENGINEERING RESEARCH COUNCIL

OTTAWA, November 17, 1989 — The Honourable William Winegard, Minister of State (Science and Technology), today announced the appointment of Dr. Andrée G. Roberge to the Natural Sciences and Engineering Research Council (NSERC), for a three-year term ending in 1992.

Director General of the Institute Armand Frappier, Dr. Roberge holds a doctorate in biochemistry from the Faculty of Medicine at Laval University. She brings to the Council her vast experience in teaching and research administration in the university milieu. Dr. Roberge has been a professor for several years in the Department of Human Nutrition of the Faculty of Agriculture and Food Science at Laval. She was also responsible for the department's laboratory of Neurochemistry and nutrition, and served as President of the university's Commission de la recherche.

Dr. Roberge is past President of the Association canadienne-française pour l'avancement des sciences (ACFAS) and a member of the Conceil de la science et de la technologie.

The Natural Sciences and Engineering Research Council is the largest grating agency supporting university research in Canada. NSERC offers numerous grant programs for university professors, as well as research scholarships and fellowships for the training of new scientists and engineers. NSERC also promotes co-operative research activities between Canadian universities and industries; its budget for the current year is $390 million.

News Release

INDUSTRY MINISTER SPEAKS IN LONDON

LONDON, Ontario, February 8, 1990 — "Fulfilling the government's goal of industrial excellence and competitiveness is the central mandate of Industry, Science and Technology Canada," said ISTC Minister Harvie Andre today addressing the London District Branch of the Canadian Manufacturers' Association.

Referring to the newly-created department which received Royal Assent last week as the "department of competitiveness," the Minister pointed out that its name accurately reflects the new emphasis on integrating science and technology policy with industrial policy.

The department is focusing on the formation of alliances between government, industry and the science and research communities as the way of the future if Canadian companies want to compete in rapidly expanding world markets.

Mr. Andre stressed the need for industrial users, especially small and medium-sized businesses, to forge technology alliances, strike partnerships and epuip themselves with knowledge and expertise to meet the challenges of globalization and the new industrial order.

Referring to the University of Western Ontario's participation in the federal government's quarter-billion-dollar Networks of Centres of Excellence program, the Minister said, "The University is plugged into work on strategic technologies which will have a direct industrial benefit. This is how we must conduct much of our science and research in the future if we are going to succeed."

The University of Western Ontario is involved in five networks, in field ranging from robotics and artificial intelligence systems, to biotechnology research for pest control.

Why Schank Changed His Focus

By Tracy McCurrach

In July of this year, Roger C. Schank left his position as director of Yale University's Artificial Intelligence project to head the newly established Institute for the Learning Sciences at Northwestern University. The Institute is a unique blend of academic and corporate interests. Its mission is to develop innovative ideas and computer implementations of those ideas in the areas of education and training. In a interview with Roger Schank, we asked why a noted researcher would leave the mainstream of the Artificial Intelligence field to strike out in this new direction.

Roger Schank does not perceive his move to Northwestern University and the development of the Institute as removing him from the mainstream of AI research. Says Schank, "I don't see this as being a wild career change. I am still working on the same things-learning, memory, reasoning, and understanding-that I have been for the past ten years."

In fact, the research being conducted at the Institute for the Learning Sciences focuses on the same questions that Schank and his associates have been studying for years. The Institute encompasses both basic and applied research activities, including a major focus on the application of AI to education.

Other key research areas include:

- Scientific problems of language, thought and memory.
- The construction of computer programs that reason, learn, conduct conversations, display characteristics of human memory, plan, and contain realistic models of the world.
- Understanding how children learn language, learn to think, plan and reason.
- The development of effective teaching methods.
- Computer vision.

- Models of emotion, human problem-solving, and decision-making.

The difference in the direction of Schank's work today lies in the goal of transferring AI technologies into the hands of people with specific, real-world problems. The application of his research and theories to the areas of corporate training and education provides an important grounding for the research. As Schank stated, "We are interested in learning, both human learning and computer leaning. We are researchers in human cognition. The most important part of AI is cognitive modeling. But now we will have a realistic use for our research, instead of just asking 'How do people learn', we are asking 'How do people learn x?'."

But why leave one university to form a new organization at another institution? Schank believes that move was necessary to create a new environment, an interdisciplinary institute that would redefine the approach to solving problems and transferring technology in an innovative manner. The Institute for the Learning Sciences is an organization that's neither purely university nor business. Schank intends to create a very intellectually exciting place to be. The Institute will pursue leading-edge research and offer academic programs that cut across established disciplines.

For example, the Institute coordinates a graduate program leading to a Ph.D. in any of three fields: Computer Science, Psychology, or Education. First year graduate students will follow a core curriculum designed by the Institute, which is independent of the particular Ph.D. they have decided to pursue. In general, three to six quarter courses will be taken in the second year. The majority of the second year and remainder of the graduate career are dedicated to research under the direction of the faculty of the Institute.

However, the Institute will not stop at the traditional boundaries of academia. The organization also includes professional programmers, as well as representatives of the corporations who are Partners in the Institute. By merging this "business" side of the Institute with the academic interests, software products that address current problem areas will be produced and implemented. In addition, some of the people involved with the progress will return to their sponsoring organizations when the products are complete, thus ensuring the transfer of technology and the ongoing development of the products.

In the long term, Schank intends to take these applications even further by using them as a catalyst for change in the public school systems. By developing, testing, implementing, and thus proving this ideas within the corporate training arena, Schank hopes to successfully apply and gain acceptance of his concepts in the schools.

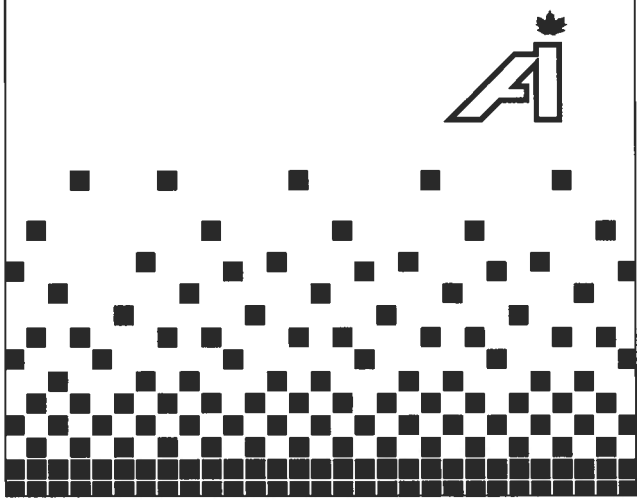
Has Roger Schank left the mainstream of AI? Few people would disagree that Schank has chosen an unconventional approach for creating his vision of the future. Then again, those who know Schank realize he has never been one to worry about convention. As Schank says, "A pure researcher need not be 'unsullied' by real world problems. The state of the schools today is a serious issue. So is tech transfer. Why shouldn't we take on these tasks?"

Reprinted courtesy
Institute for the Learning Sciences, Northwestern University

In the 2 years that Marlene Jones served as the senior editor of this magazine, she led a team of volunteers who solicited, edited, typeset, proofread, translated, invoiced, distributed, stuffed and generally did whatever was necessary to produce a consistently excellent magazine.

Thank you, Marlene

The new magazine team would like to thank you and Brian, Chris, Doug, Farran, Greg, Julia, Kar-Ling, Kevin, Lynn, Meg, Paul, Ruby, Saul and Sheila for your dedication and your efforts.



THIRD INTERNATIONAL SYMPOSIUM ON ARTIFICIAL INTELLIGENCE:

APPLICATIONS OF ENGINEERING DESIGN & MANUFACTURING IN INDUSTRIALIZED AND DEVELOPING COUNTRIES

October 22-26, 1990
ITESM, Mexico

The Third International Symposium on Artificial Intelligence will be held in Monterrey, N.L. Mexico on October 22-26, 1990. The symposium is sponsored by the ITESM (Instituto Technologico Y de Estudios Superiores de Monterrey) in Cooperation with the International Joint Converences on Artificial Intelligence Inc., The American Association for Artificial Intelligence, The Sociedad Mexicana de Inteligencia Artificial and IBM of Mexico.

Objectives:

- Promote the development and use of AI technology in the solution of real world problems in the application areas of engineering design & manufacturing.
- Analyze the state-of-the-art of AI technology in different countries and its potential use and transfer from universities and research institutions to industries for the solution of problems.
- Evaluate efforts made in the use of AI technology in all countries. Provide general guidelines for the use and spread of AI technology in all countries, and assess then in the next annual IASI meeting.

ISAI Format:

ISAI consists of a tutorial and a conference.
The tutorial is a set of seminars on relevant AI topics given in two days (Oct. 22-23). The conference is a set of lectures given during three days (Oct. 24-26). It consists of invited papers and selected papers from the "Call for Papers" invitation.

Areas of Application Include:

- Production Planning • Resource Management • Quality Management
- Automated Assembly • Machine Loads • Inventory Control • Computer Aided Product Design • Computer Aided Product Manufacturing • Human Resources Management
- Forecasting • Client/Customer Support • Process Control and ES • Automatic Process Inspection • Use of Industrial Robots • Market and Competition Analysis • Strategic Planning of Manufacturing • Technology Management and Social Impact of AI Technology in Industrial Environments

AI Techniques Include:

- Knowledge Acquisition and Representation • Natural Language processing
- Robotics • Speech Recognition • Computer Vision • Neural networks and Genetic Algorithms • Parallel Architectures • Automated Learning • Automated Reasoning
- Search and Problem Solving • Knowledge Engineering Tools and Methodologies
- Uncertainty Management and AI Programming Languages

Information

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Profile: Mark Fox – An Outstanding Canadian in the American AI Scene

by David Fisher

Né à Toronto, Mark Fox est un chercheur en IA qui a émigré aux États-Unis et a joué un rôle très important au niveau de l'implantation de l'IA dans ce pays. Il a été le directeur du laboratoire de recherche sur les systèmes intelligents de l'Institue de Robitique à l'Université Carnegie Mellon. Il est présentement à la tête du Centre pour les Systèmes intelligents de décision de fabrication intégrée qui comprend 60 membres du personnel employés à plein temps. M. Fox est considéré par plusieurs comme étant un meneur dans le domaine de la résolution de problèmes basés sur des contraintes. A travers son entrevue avec David Fisher, Mark nous fait réfléchir sur le passé et futur de l'IA.

Mark Fox is a Toronto born AI researcher who has migrated to the United States and has been one of the key players in establishing AI in that nation. He has been the head of the Intelligent Systems Laboratory of the Robotics Institute at Carnegie Mellon University, and currently heads the Centre for Integrated Manufacturing Decision systems, employing a full time staff of 60. Considered by many in his field as the leader in constraint based problem solving, Mark gives some exciting insights into the past and future of AI through this interview with David Fisher.

Canadian AI: You're a Canadian citizen that has spent most of your career developing AI in the United States. Why not Canada?

Mark: As you know, I did my undergraduate degree at the University of Toronto. At that time, there were only 4 good places in the world to do a graduate degree, three of them in the States and one in Edinborough, so I pursued my Ph.D. at Carnegie Mellon. By the time I had finished my degree, I had already secured a job there, and that momentum has kept me here ever since.

Is this still the case for those pursuing an AI education?

No. There are a number of excellent institutions now. University of Toronto and University of British Columbia are two good examples. The people involved in these programs are excellent. Canada has a number of the world's leading AI researchers, and that makes the nation as attractive as anywhere else.

AI was really hot five years ago. Some say it's dying. What's your opinion?

I think that is a complete misconception. There are a number of dimensions by which you can measure the success of AI. If you simply look at the number of new systems and the number of new people being educated in AI then we can say that were growing at a good rate. However, I lake to measure the growth by what I call the wave theory. I think there are five waves in AI. The first wave is signified by the creation of ideas, primarily in research organizations. This was marked by the creation of the Expert system, and it occurred in the early 70's. The second wave occurs when leading edge companies apply the technology, and that was people like Digital in the late 70's. The third wave occurs when small entrepreneurial companies spring up to make use of the technology on a cost effective basis, and that occurred in the early 80's with Expert system shell companies. The fourth wave occurs when large companies apply the technology into their product by providing AI resources to their normal development practices, and this is happening today. The final and fifth wave is when the technology is part of the product and it is so commonplace that it's not recognized as anything special. Rather, it's just another programming tool, no more exotic than programming in C. We are approaching the fifth wave, but it's not until AI becomes as commonplace as C that it will really be successful.

One thing people should be aware of is that you shouldn't judge the success of AI upon the success of AI companies. Past experience has shown that on the whole, technology based companies always remain small, and it's the application companies like Lotus, that get big. So, if you want to make a successful company you focus on providing the application regardless of the technology used, and if you can apply AI to the application, hopefully without it being visible, then you will have used AI successfully. That is to say that you can be a big software manufacturing company in which AI is a significant component, but you can't be a big AI company that manufactures software.

So how do large corporations implement AI, or is it too exotic for the typical systems department to handle?

David Fisher is a freelance writer from Calgary, Alberta.

Instead of having just a few AI guru's in your company you should teach all of your application builders a little bit about AI. If you don't make it a big deal, just make it another tool for the programmers to use, no mare exotic than database technology, then it will get applied in the right places. We have to diffuse the technology if it's going to be applied successfully.

However, traditionally you had to know LISP if you were going to do AI, and LISP is just too exotic for typical systems departments. LISP based systems are just not acceptable to mainstream programmers.

So how will we address this problem?

Well, we have to migrate to acceptable platforms, both in hardware and software. But regardless of the hardware, we have to use mainstream tools like C and C++. That is being done by a number of the Expert system shell companies.

What then does the future hold for LISP?

Well, accept for being an academic curiosity, LISP is dead. Except for LISP libraries that will run on C++, within 10 years, LISP will be gone. AI has got to come to the mainstream, not the other way around. Yes, we can now say it, LISP is Dead!

AI has got to come to the mainstream, not the other way around. Yes, we can now say it, LISP is Dead!

Government has played a major role in supporting AI. Is it still the major player, or is industry getting more involved?

Industry is getting more involved, but down here the military still plays a major role in the funding of our research.

What can be done to make AI more successful?

We need to do a lot more educating about AI. I don't think that there has been near enough books written about AI. I just wrote a book about the Myths of AI, and I an amazed at how many people have called me to say "I always thought those were the truths about AI". The problem is there are not a whole lot of people that can do the educating, so I think that can have got to do a lot more.

Tell us about what you're doing in AI.

I have two interests, one is manufacturing and engineering and the other is in research of constraint problem solving. In the manufacture, production, and distribution cycles of things and all of the issues involved in that process, I've been working on a number of areas such as mechanical design, alloy design, project management, factory scheduling, etc. As a result we have built systems to help solve problems in those areas.

From the research side, I have been looking at scheduling problems and design problems and how to satisfy all the constraints involved in those processes, and I'm happy to report that we are having great success in applying our algorithms to a number of similar problems. In fact, the results have been far better than we expected in terms of the application of the research.

You've been involved in robotics and its use of AI. Are there real applications for AI in robotics, an area that is still struggling itself to leave the research stages and find cost effective applications in industry?

Well typically, little work has been done in terms of the cognitive area of robotics. Robots these days aren't very smart. There's been work done on the perceptual and acting parts of robotics, but is has mostly been analytical in nature, where the approach is to do a lot of analysis on a lot of information rather than using reasoning to make decisions. There will have to be a lot more work done on applying artificial intelligence to robotics for the field to become more useful, and there are a number of projects such as the NASA projects that are addressing the need for the cognitive portion of robotics.

Tell us about some of the success stories of the Intelligent Systems Lab that you set up in the 80's.

We worked closely with industry to adapt our research to real applications, and a number of the prototype systems went into use by companies. Digital for example, use a machine configuration system that originated for our research there, as well as a truck scheduling system called National Dispatch. Westinghouse used a system to do steam turbine diagnostics based upon research we did for them. I think we were pretty successful in getting some real value out of our research.

What are you involved in now?

I currently head the Centre for Integrated Manufacturing Decision systems. It employs about 60 people in the work of applying decision making systems to the manufacturing industry. In just the one year we have been operating, we're tackling is the ability to coordinate the decision making of large corporations to optimize the use of the resources of that corporation. This issue effects all sizes of corporations, from small all the way to governmental size. I think this is one of the most exciting applications of AI.

There are rumours of a University of Toronto sabbatical.

Well, I have always had a desire to return to Toronto and establish some ties there, so I'm exploring the opportunities.

Will we see the same types of exciting activities here that have been occurring down there?

I think so. I'm committed to getting industry involvement in our research, and at the same time I'm a firm believer that

academia needs to be guided by industrial problems so that our research takes on real problems. That's where I think the best research comes from.

Will Mark Fox always be in AI? Is it big enough to consume all of your interests?

Absolutely! I can't imagine not doing AI. I don't know if people 10 years from now will say that what I'm doing is AI, but in my heart of hearts, I'll always be doing what I think is AI.

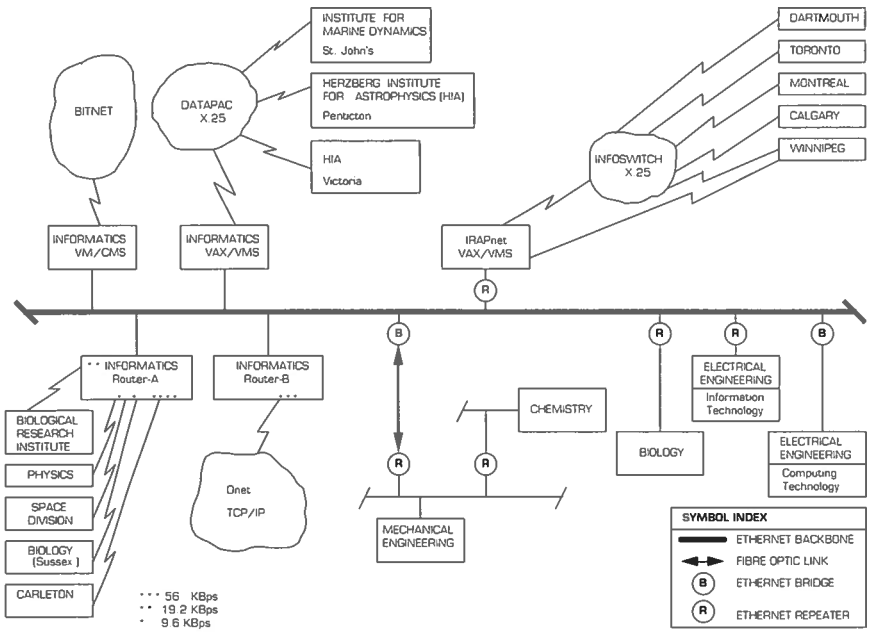
What prophetic statement could you make about the future of AI.

I think the future is very bright, and the challenge of managing large complex organizations is what will keep us going for decades to come, and I believe that AI is at the heart of it.

Networks for Artificial Intelligence at the National Research Council

by William H. Henneker

Laboratory for Intelligent Systems, Division of Electrical Engineering, National Research Council of Canada, Ottawa, K1A-0R8.



NRC LAN Network
Figure 1

Tel que discuté dans le numéra du mois de janvier 1988 de ce magazine, le focus du programme en intelligence artificielle appliquée du Conseil National de Recherche (CNR) est la Section de Technologie d'Information (STI). Cette section fait partie du laboratoire de recherche sur le systèmes intelligents à l'intérieur de la division d'ingénérie électrique.

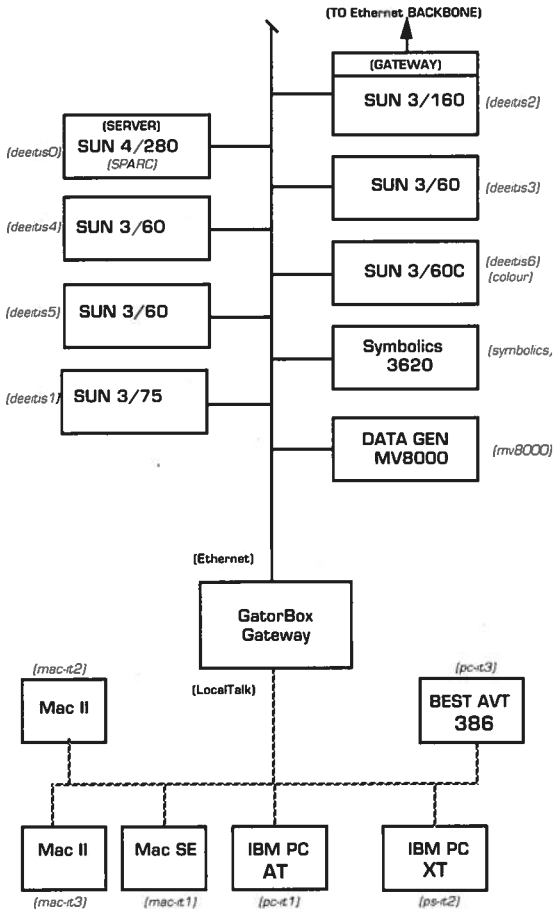
Ce programme est, entre autre, responsable de l'approvisionnement constant de ressources informatiques (logiciel et ordinateurs) n´´cessaires au bon déroulement d'une variété de projets impliquant la représentation, l'acquisition et l'application des connaissances. Ceci à créer, par le fait même, le besoin de développer un réseau local d'information (local area network LAN). Ce réseau est formé par l'interconnexion de stations de travail SUN, de microordinateurs Macintosh, d'ordinateurs personnel IBM, d'une machine LISP Symbloics 3620 et d'un supermini ordinateur Data General MV/8000.

The Information Technology Section (ITS) of the Laboratory for Intelligent Systems in the Division of Electrical Engineering is the focus for the National Research Council (NRC) programme in applied artificial intelligence discussed in the January 1988 issue of this magazine. An important supporting activity within this programme is the provision of the computing resources (both hardware and software) necessary to a variety of projects involving the representation, acquisition and application of knowledge. This has involved the development of a local area network (LAN) interconnecting SUN workstations, Macintosh microcomputers, IBM PCs, a symbolics 3620 LISP machine and a Data General MV/8000 supermini computer.

The ITS has experience with time-sharing systems that extends back to 1968 when one of the first PDP-10 computers (subsequently referred to as DECsystem-10) was purchased from Digital Equipment Corporation to be the centre of a network permitting remote collaborators to participate actively in the NRC's programme in computer-aided learning. In 1982, the DECsystem-10 was retired and a 32-bit supermini computer (MV/8000 of Data General) became the focus of the section's software development activities in computer-aided learning and computer-aided design/computer-aided manufacturing. In early 1986, the first SUN workstation - a SUN-3/75 - was purchased to support a collaborative project in intelligent computer-aided learning.

The Information Technology LAN is connected to an ethernet backbone cable maintained by the Division of Informatics and extending the breadth of the NRC's Montreal Read Campus in Ottawa. Connections to this backbone are

made by several divisions which operate multiple LANs local to their respective buildings. Figure 1. shows a schematic of this backbone and some connections via long-haul networks using the X.25 data communications standard to remote laboratories across Canada. IRAPnet is a network developed for the Industrial Research Assistance Program. Router-a implements data link and network layer protocols proprietary to Digital Equipment Corporation and supports DECnet communication over leased lines. When installed, router-b will support TCP/IP communication over leased lines and will be the Ottawa link to Onet (Ontario network, an ARPA Internet style network, linking various centres involved in the Information Technology Research Centres of Excellence programme).The VM/CMS machine operated by the Division of Informatics offers the principal electronic mail connection to the external world because of its access to the BITNET network. The diagram shows repeaters (R in a circle) permitting end-to-end communication on the ethernet to extend up to 1.5 kilometres and bridges (B in a circle) which filter out unwanted ethernet device addresses and help to reduce frame traffic along certain portions of the ethernet.



Information Technology LAN
Figure 2

The current workstation resources connected to the network are shown in figure 2. Each SUN workstation is licenced to operate version 4.0.1 of SUN's operating system. The software packages SUN Common Lisp (version 2.1.3), Quintus Prolog (version 2.4.2) and Inference Corporation's ART (version 3.1) form the basic toolkit from which AI applications are developed. GoodNeWS, obtained through a collaborative arrangement with the Turing Institute of Glasgow, United Kingdom, is an application built on top of NeWS (Network Extensible Window System) developed by SUN Microsystems. Laboratory personnel are exploring its use in constructing interfaces to expert systems applications developed using LISP and Prolog.

Support of network software based upon the application level protocols of remote login, file copy and electronic mail across the network has been a principal objective of this development. These applications form an integral part of the TCP/IP layered protocols implemented in SUN microsystems' version (BSD 4.3) of UNIX. SUN also provides network software based upon its application level file-sharing protocol called Network File System (NFS) permitting the user to access files on remote workstations as if those files resided on a local disk. Where possible, additional software and hardware have been acquired to allow the LISP machine, the IBM PCs, the Macintosh microcomputers and the MV/8000 to have this basic application functionality.

Each SUN workstation has a minimum of 8MBytes of main memory (most have 24MBytes) and a small local disk. The large main memories are particularly appropriate for AI applications using LISP, Prolog and LISP-based technologies such as ART (Automated Reasoning Tool). The disk capacity local to each workstation permits local paging and effectively frees the LAN from such activity. The installation procedure of ART suggests a disk-based virtual memory allocation (swap space) of at least 60 MBytes so the local disk space is particularly attractive for such applications. The newly-acquired SUN-4/280 fileserving workstation has approximately 1.8GBytes of disk space for user and third party application software and two dual density (6250/1600 bpi) magnetic tape drives. The SUN workstation subnetwork is closely-coupled in the sense that a user has access to all resources on the network independent of the particular host to which he/she is connected. On the other hand, there is limited duplication of network resources so that each SUN workstation may function in a minimal stand-alone configuration if file- or print- serving resources are unavailable or if the workstation must be transported to a remote site for a demonstration. The SUN 3/160 machine acts as a gateway to the NRC ethernet backbone and the GatorBox bridge acts as a LocalTalk/ethernet gateway allowing IBM-PCs, Macintosh and SUN workstations to form a distributed fileserving network operating under the TOPS software package.

The computing environment provided by this LAN is intended to be reasonably flexible and to support the workstation equipment of multiple vendors. This flexibility will be verified in the near future by the installation of a SUN-4/60 with 16 MBytes of memory, 208MBytes of local disk space and a colour monitor to support expert systems development for engine health monitoring. In the medium term future, there are tentative plans to install TCP/IP-based Digital Equipment Corporation workstations in support of real-time expert systems development.

This network is the principal computing resource of the programme in applied artificial intelligence at NRC. It is used primarily by NRC staff but is available to external collaborator in both government and the private sector who are participating with NRC in joint projects.

CALL FOR PAPERS

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Please indicate the area of submission as shown above, and submit by Sept. 1, 1990 three copies of a full paper (10-30 double spaced pages) to the Program Chair. Authors will be notified of the status of their manuscript by March 1, 1991. Final copies of papers will be due to the ACM Press for inclusion in the conference proceedings April 1, 1991.

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The proceedings will be published by ACM and will be available at the conference.
A few copies of the proceedings of earlier conferences are available
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BOOKS RECEIVED

Books listed below that are marked with a + will be reviewed in a future issue. Reviewers are still sought for those marked with a *.

Readers who wish to review books for *Canadian AI* should write, outlining their qualifications, to the book review editor, Graeme Hirst, Department of Computer Science, University of Toronto, Toronto, Canada M5S 1A4. Obviously, we cannot promise the availability of books in anyone's exact area of interest.

Authors and publishers who wish their books to be considered for review in *Canadian AI* should send a copy to the book review editor at the address above. All books received will be listed, but not all can be reviewed.

Computational linguistics: An international handbook on computer oriented language research and applications / Computerlinguistik: Ein internationales Handbuch zur computergestützten Sprachforschung und ihrer Anwendungen
Istvàn S. Bàtori, Winfried Lenders, and Wolfgang Putschke (editors)
Berlin: Walter de Gruyter, 1989, xxxiii+933 pp (Handbooks of linguistics and communication science 4 / Handbücher zur Sprach- und Kommunikationswissenschaft)
Hardbound, ISBN 3-11-009792-3, DM 728.-

+KARDIO: A study in deep and qualitative knowledge for expert systems
Ivan Bratko, Igor Mozetivc, and Nada Lavravc
Cambridge, MA: The MIT Press, 1989, xiv+260 pp
Hardbound, ISBN 0-262-02273-7, US$37.50

***Design problem solving: Knowledge structures and control strategies**
David C. Brown and B. Chandrasekaran
[Worcester Polytechnic Institute and The Ohio State University] London: Pitman and San Mateo, CA: Morgan Kaufmann Publishers, 1989, viii+199 pp (Research notes in artificial intelligence), Paperbound, ISBN 0-934613-07-9, US$24.95 (Distributed in Canada by John Wiley and Sons Canada Ltd)

A connectionist approach to word sense disambiguation
Garrison W. Cottrell
[University of California, San Diego]
London: Pitman and San Mateo, CA: Morgan Kaufmann Publishers, 1989, xi+220 pp (Research notes in artificial intelligence), Paperbound, ISBN 0-934613-61-3, US$24.95 (Distributed in Canada by John Wiley and Sons Canada Ltd).
Proceedings, Speech and natural language workshop
Defense Advanced Research Projects Agency
San Mateo, CA: Morgan Kaufmann Publishers, February 1989, vii+295 pp, Paperbound, ISBN 1-55860-073-6, US$35.00 (Distributed in Canada by John Wiley and Sons Canada Ltd)

+Distributed artificial intelligence II
Les Gasser and Michael N. Huhns (editors)
[University of Southern California and MCC]
London: Pitman and San Mateo, CA: Morgan Kaufmann Publishers, 1989, xv+519 pp (Research notes in artificial intelligence), Paperbound, ISBN 1-55860-092-2, US$29.95 (Distributed in Canada by John Wiley and Sons Canada Ltd)

***CONSAT: A system for constraint satisfaction**
Hans Werner Güsgen
[Gesellschaft für Mathematik und Dataverarbeitung]
London: Pitman and San Mateo, CA: Morgan Kaufmann Publishers, 1989, (Research notes in artificial intelligence) Paperbound, ISBN 1-55860-093-0, US$24.95 (Distributed in Canada by John Wiley and Sons Canada Ltd)

Geometric and solid modeling: An introduction
Christoph M. Hoffmann
[Purdue University]
San Mateo, CA: Morgan Kaufmann Publishers, 1989, xxi+338 pp (The Morgan Kaufmann series in computer graphics and geometric modeling), Hardbound, ISBN 1-55860-067-1, US$39.95 (Distributed in Canada by John Wiley and Sons Canada Ltd)

Generating natural language under pragmatic constraints
Eduard H. Hovy
[Information Sciences Institute, University of Southern California], Hillsdale, NJ: Lawrence Erlbaum Associates, 1988, xiii+214 pp, Hardbound, ISBN 0-8058-0248-7, $29.95; Paperbound, ISBN 0-8058-0249-5, $19.95

Neural net applications and products
Richard K. Miller, Terri C. Walker and Anne M. Ryan
Madison, GA: SEAI Technical Publications, 1990, 347 pp
Paperbound, ISBN 0-89671-107-2, US$395.00

***TREAT: A new and efficient match algorithm for AI production systems**
Daniel P. Miranker
[University of Texas at Austin]
London: Pitman and San Mateo, CA: Morgan Kaufmann Publishers, 1990, xiii+144 pp (Research notes in artificial intelligence) Paperbound, ISBN 0-934613-71-0, US$24.95 (Distributed in Canada by John Wiley and Sons Canada Ltd)

***A general explanation-based learning mechanism and its application to narrative understanding**
Raymond J. Mooney
[University of Illinois], London: Pitman and San Mateo, CA: Morgan Kaufmann Publishers, 1990, x+166 pp (Research notes in artificial intelligence) Paperbound, ISBN 1-55860-091-4, US$24.95 (Distributed in Canada by John Wiley and Sons Canada Ltd)

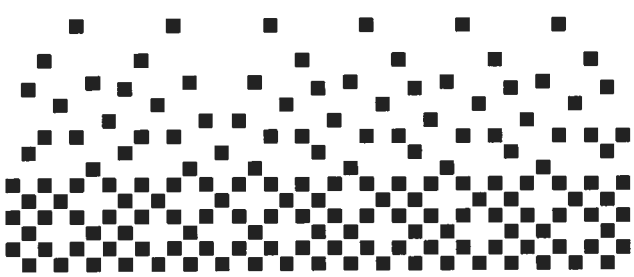
+Automated generation of model-based knowledge-acquisition tools
Mark A. Musen
[Stanford University]
London: Pitman and San Mateo, CA: Morgan Kaufmann Publishers, 1989, xviii+293 pp (Research notes in artificial intelligence) Paperbound, ISBN 1-55860-090-6, US$24.95 (Distributed in Canada by John Wiley and Sons Canada Ltd)

***The use of knowledge in analogy and induction**
Stuart J. Russell
[University of California, Berekely]
London: Pitman and San Mateo, CA: Morgan Kaufmann Publishers, 1989, x+164 pp (Research notes in artificial intelligence) Paperbound, ISBN 1-55860-089-2, US$24.95 (Distributed in Canada by John Wiley and Sons Canada Ltd)

An introduction to programming in Prolog
Patrick Saint-Dizier
[Université Paul Sabatier]
New York: Springer-Verlag, 1989, xi+184 pp
Paperbound, ISBN 0-387-97144-0 and 3-540-97144-0

Semantic structures: Advances in natural language processing
David Waltz (editor)
[Thinking Machines Corp and Brandeis University]
Hillsdale, NJ: Lawrence Erlbaum Associates, 1989, xxi+220 pp, Hardbound, ISBN 0-89859-817-6, $32.50

+Readings in qualitative reasoning about physical systems
Daniel S. Weld and Johan de Kleer (editors)
[University of Washington and Xerox Palo Alto Research Center], San Mateo, CA: Morgan Kaufmann Publishers, 1990, x+720 pp (The Morgan Kaufmann series in representation and reasoning), Paperbound, ISBN 1-55860-095-7, US$34.95 (Distributed in Canada by John Wiley and Sons Canada Ltd)



BOOK REVIEWS

L'intelligence artificielle et le langage
Volume 1: Représentations des connaissances
Volume 2: Processus de compréhension
Gérard Sabah [CNRS]
Paris: Hermes, Vol. 1: 1988, 352 pages, Vol 2: 1989, 411 pages (Langue, raisonnement, calcul)
Livre relié, Vol 1: ISBN 2-86601-134-1, Vol 2: ISBN 2-86601-187-2, FF240 chaque

Compte rendu par
Guy Lapalme, Université de Montréal
Ces deux volumes constituent sans contredit une synthése magistrale de l'ensemble des domaines du traitement de la langue naturelle.

Le premier volume (représentations des connaissances) est dédié à la description des diverses connaissances nécessaires à un programme de compréhension du langage naturel; on y présente différents modéles linguistiques: grammaires formelles, grammaires de cas, grammaires systémiques et finalement les relations entre les grammaires et le lexique. On passe ensuite aux modes de représentations procédurales. Finalement, une troisiéme partie précise comment le contexte influe sur la compréhension d'un énoncé: on y voit les modes de représentation du contexte et leur application dans la gestion de dialogues.

On constate donc l'ampleur du programme que l'auteur s'est donné et dont il se tire honorablement. Chaque formalisme est présenté avec des exemples en français et avec un souci de synthése et de clarté exemplaires. Il a su trouver le juste niveau entre le survol rapide et une description trop fine des formalismes qui aurait allongé l'ouvrage déjà trés volumineux et qui aurait "caché la forêt derriére les arbres". Nous avons d'ailleurs fait l'expérience de lire des chapitres sur des domaines que nous connaissions déjà assez bien où nous avons constaté le bon niveau d'abstraction. Toutes les grandes idées y sont, en plus de références appropriées (chaque volume dispose d'une bibliographie de 20 pages). Sur des domaines qui ne nous étaient pas familiers, nous avons apprécié le grand souci pédagogique de l'auteur qui nous a donné le gout d'en savoir plus.

Le deuxiéme volume traite des mécanismes informatiques mis en jeu pour le traitement des langues. Il est divisé en trois parties: l'analyse des phrases où on retrouve l'analyse morphologique, l'analyse syntaxique avec les réseaux de transition, l'analyse dirigée par le lexique et les analyseurs déterministes. Il y a également un chapitre sur le traitement des "erreurs" pudiquement appelées "non-attendus". La deuxiéme partie traite de la structuration du discours au niveau des inférences, des références et de la modélisation des textes et des dialogues. La troisiéme partie présente les aspects de structure et de formes de surface dans le cadre de la génération.

Ici encore le domaine est trés vaste et l'auteur a dû choisir certaines approches quitte à en laisser tomber d'autres. D'ailleurs, il l'avoue lui-même (p. 14) "Nos sources essentielles se trouvent dans les travaux et les publications de notre équipe". C'est peut-être pourquoi on ne trouve aucune trace

de l'utilisation des grammaires logiques; elles sont esquissées aux pages 81-82 du volume 1 où on nous promet d'en avoir plus dans le volume 2 mais il n'y a plus aucune référence à ce formalisme pourtant maintenant trés utilisé dans le domaine. Ceci nous semble un oubli impardonnable surtout pour un auteur français. Par bonheur, cet oubli est maintenant comblé par les deux excellents volumes de A. Thayse et coll. "Approche logique de l'intelligence artificielle" Dunod, 1989.

Les chapitres de ce volume reflétent le même souci de clarté et de synthése que ceux du premier volume. La bilbiographie est également bien étoffée mais on y retrouve beaucoup de références ê des thése non publiées, des rapports de DEA, des stages de fin d'études; ces documents étant souvent assez difficiles d'accés, le lecteur risque de reste sur sa faim.

En résumé, ces deux volumes marquent sûrement une étape dans le domaine du traitement de la langue naturelle. Il n'existe ê notre connaissance aucun équivalent de ce texte en anglais (sauf peut-être le "premier" volume de Winograd) et il serait sûrement intéressant pour les anglophones de disposer d'une telle synthése dans le domaine. C'est un peu le "Handbook of AI" mais spécialisé pour le traitement de la langue naturelle, tout en étant beaucoup plus unifié car ces volumes ont été écrits par une seule personne.

Je recommande donc fortement ce texte ê toute personne intéressée par le traitement de la langue naturelle que ce soit pour s'initier au sujet ou pour appréhender un domaine connexe. Je félicite encore l'auteur pour cette somme de travail de synthése.

Guy Lapalme est professeur au Département d'informatique et de recherche opérationnelle de l'Université de Montréal. Il est co-auteur du livre *Prolog pour l'analyse automatique de la langue naturelle* publié chez Eyrolles. Il s'intéresse en particulier à la génération de texte et il est auteur d'une dizaine d'articles dans le domaine du traitement de la langue naturelle.

Knowledge-based programming
Enn Tyugu
[Institute of Cybernetics, Estonian Academy of Sciences, Tallinn, USSR]
Glasgow: Turing Institute Press and Addison-Wesley, 1987, xii+243 pp (Turing Institute Press knowledge engineering tutorial series)
Hardbound, ISBN 0-201-17815-X

Reviewed by
Gabriele Scheler
University of Heidelberg

Tyugu's book proposes a language for knowledge representation and provides a number of application examples as well as a sound theoretical background on logic, program synthesis, and semantics of programming languages. The language itself, UTOPIST, is classified as "object-oriented" on the back cover of the book, but the author himself describes it as a form of semantic network or set of frames. It is designed particularly for the representation of basic knowledge in mathematics and physics. The idea is that this knowledge is contained in special UTOPIST packages that a high-level programmer uses. The UTOPIST project has obviously been much inspired by Newell and Simon's GPS in the seventies, when the first version of UTOPIST was also created.

The book is divided into six chapters: Chapters 1 and 2 provide the theory underlying the UTOPIST language; chapter 3 contains a specification and some operational semantics of UTOPIST; chapters 4 to 6 give examples of applications: symbolic mathematics and physics (4), database management systems (5), stochastic modelling, optimization problems, and "simulation" (6). There are two appendices containing proofs concerning the intuitionistic logic used in the first chapter.

I liked the theoretical sections, because difficult subject matter (such as proof theory and program synthesis) was laid out clearly and comprehensibly. The theoretical definition of a conceptual model (essentially a procedural semantic network) I found also inspiring. Conceptual models are "procedural" graphs for the representation of a problem that are implemented in UTOPIST. The construction of an algorithm for the solution of the problem thus represented is performed by a program synthesis component that transforms the conceptual model (in the implemented form of a set of UTOPIST statements) into a logic representation, generating a proof tree, which is essentially used as the algorithm for program execution, certain improvements in efficiency notwithstanding.

There is a certain relation to logic programming and Prolog here, though the author's own work is apparently independent. The implementation of the conceptual graphs is not so ideally declarative. UTOPIST allows a number of "action" statements to be included in the problem description to guide the algorithm construction process.

Conceptual models

I found conceptual models an interesting alternative to existing knowledge representation schemes like KRL, FRL, KL-ONE, because of the emphasis on total modularity and on computability as the essential feature of a problem.

Tyugu defines computational models as "computational frames containing knowledge about computability" (p. 35). They contain only efficiently implementable relations, the relations that can be used for computations. A computational model is a set of variables (input variables, output variables) bound by an unambiguous (with respect to sequence) set of operators; that is, the operators applied to a set of input variables will produce the same set of output variables independent of the order in which they are applied. Tyugu calls these "partial relations". Simple computational models are equivalent to operator models, where each partial relation is a single operator. Partial relations are just a convenient shortcut.

Full computational models allow one to specify conditions on the applicability of operators. In addition to variables (nodes) and relations (edges) there are new nodes: control nodes and nodes representing a problem. There are three types of control node: concatenation, condition, and subproblem. With the subproblem node, any recursive function may be represented, which makes computational

models Turing-equivalent. Computational models can be represented as a set of axioms (logical representation). They can also be considered as a form of data-flow schema.

Programs built on simple computational models are sequences of operators, and it can be proven that any program constructed from a simple model is input-output equivalent to any other program constructed from the same model. Efficiency improvements concern elimination of redundant operators only. Programs thus constructed have linear time complexity, i.e. they are proportional in length to the size of the network.

Simple computational models are themselves partial relations, and are used as the building blocks of full computational models, especially in the implemented form of the programming language — the primitives of UTOPIST (simple computational models) are very fast. Every model *M* has at least one program, and every program for *M* produces the same values for output variables. This means that computational models define a correct and (if finite) finite method of computing. For any solvable problem there is a certain sequence of operations that can in principle be used as a program, efficiency considerations aside. There is an associated algorithm for checking whether a problem is solvable and for the building of a sequence of operators for a solvable problem for every computational model. Checking solvability on a arbitrary computational model (with subproblems) is a *P*-space complete problem and equivalent to theorem proving in intuitionistic propositional calculus.

The transformation of computational models into statements of the UTOPIST language as an abstract problem-solving and representation technique, and again the implementation of UTOPIST via transformation into logical axioms and program synthesis is not presented. It is simply stated that "computational models are transformed into programs via a correspondence to axioms and an application of the structural synthesis method, producing a set of executable operations and finally a program".

UTOPIST

The value of a programming language can only be judged by using it, and although Tyugu provides many examples, I cannot say much about the use of UTOPIST as a high-level programming language. I will try to explain the special features of UTOPIST and sketch some of its applications in the hope that a clear picture emerges.

UTOPIST in principle relies on a static problem description (in the nature of a computational model) and converts this into a set of instructions that are executed in order to compute certain results on certain input variables. But it also offers, and in many cases requires, a procedural element, namely "action" and "control" statements that allow an explicit flow control.

A UTOPIST program (program module) consists of four kinds of statement — a problem goal (output variables), a problem description (set of objects and relations), action statements, and control statements. Action statements and control statements are procedural statements, the former telling a program which steps to perform in order to solve a problem (splitting a problem into parts), the second for combining actions into larger parts of a program. A program module may be also seen as a kind of object (in the sense of object-oriented languages), containing a name, a set of relations describing the object, and possibly actions executed when the object is used in program. The attractiveness of the language is said to lie in the emphasis that is put on both modularity and a form of strict inheritance, which may be either "simple" (copy the relations of a problem statement) or with "amendments", i.e., variable bindings.

UTOPIST is designed as a user interface to the formal description of problems in the form of computational models. Syntactic sugaring can be used with macros.

In Tyugu's view, his form of knowledge representation has links to the evolution of "abstract data types" in programming as well as to frames encoded in semantic networks in "conceptual", AI-style approaches. Computational models are based on a generalization of the abstract data type, which makes it possible to construct functions automatically using structural synthesis of programs. UTOPIST is thus an attempt to combine a user-oriented form of problem specification with efficiency of implementation.

Applications

Approximately half of the book is devoted to examples and applications of the conceptual model approach. They comprise such matters as a language for differential equations (DIF), a database management system, and a specification of basic concepts of physics, with an extended discussion of electricity. I will present a single example, namely the representation of Coulomb's law:

```
let Coulomb's_law;
  (q1, q2: charge;
  F: force;
  epsilon: electrical_conductivity;
  r: distance:
  *Comment: r is distance between the electric charges q1
and q2
  F = q1 * q2 / (r * pi * epsilon * eps0 * r & 2); );
```

This piece of code allows the expression "Coulomb's law" to be meaningfully included into some other problem specification.

Conclusion

References are not always up-to-date with respect to international AI; for example, object-oriented languages and KL-ONE are not mentioned, but KRL and FRL are. There is also only a passing remark on logic programming and Prolog. This book is based on an earlier (1984) Russian version, and some of the selection of Soviet work cited is good and interesting to an international audience — for example, Apresyan and Narinianin on semantics of natural languages.

I think computational models are a significant contribution to the formal aspects of knowledge representation and deserve a wide audience. I am not so confident concerning the practical possibilities of UTOPIST as a programming language. The gap between a person's specification of a problem and the kind of statements UTOPIST accepts is very wide. It is not a language that helps in program analysis, but it is a fair achievement in converting the analysis of a problem into an executable program.

Gabriele Scheler's research concerns problems of disambiguation in natural language understanding. She has a special interest in Slavic languages and in AI in the Soviet Union.

Raisonnements sur des informations incomplétes en intelligence artificielle: Comparison de formailismes ê partir d'un exemple
Léa Sombé (pseud.)
Toulouse: Teknéa, 1989, 221 pages
Livre broché, ISBN 2-87717-010-1, FF150

Comprte rendu par
Jean-François Lamy
University of Toronto

Dans cet ouvrage, les neuf membres du groupe Léa Sombé se proposent de combler une lacune importante dans la littérature pédagogique en Intelligence Artificielle, ê savoir l'absence d'un comparaison oignée et ê jour des différentes techniques qui ont été proposées pour raisonner ê partir d'informations incomplétes. Ces techniques permettent ê un agent ne disposant pas d'informations complétes d'en arriver ê une conclusion, qui pourra éventuellement s'avérer fausse, sans pour autant que le systéme soit indisposé par cette incohérence, ce qui serait le cas en logique classique. On retrouve dans cette catégorie toute une gamme d'inférences du genre "si tout ce que je sais est que X est un oiseau, alors je suis prêt à croire que X vole" (méme si X est en fait une autruche) ou "tout oiseau qui n'est pas anormal vole", ou encore "typiquement, les oiseaux volent". L'exploration des nuances entre toutes ces formes d'énoncés est devenue un des sujets principaux des recherches récentes en représentation formelle des connaissances.

L'apport le plus important de ce livre est de présenter en un seul endroit une vingtaine d'approches différentes, et de les comparer sur le même exemple. On ne doit pas sous-estimer l'apport que cela représente, car chacune des approches a en général été concue pour exprimer correctement une nuance spécifique, et en conséquence, les exemples "classiques" utilisés pour illustrer une approche sont souvent inappliquables ê une autre approche. L'exemple choisi par Léa Sombé concerne les relations typiques entre les notions de jeunesse, de célibat, de concubinage et parentage, par exemple "les jeunes sont en général celibataires ou concubin". Cet exemple est utilisé pour examiner la vingtaine d'approches selon dix critéres. Il serait trop long de les énumérer ici, mais par exemple on se demandera si l'exemple a une seule traduction possible, si es disjonctions présentes dans l'exemple peuvent être exprimées, si certaines des relations de l'exemple peuvent êtres traduites, ou encore si en utilisant différentes parties de l'exemple on peut en arriver à des conclusions qui sont contradictoires. Ce dernier point est passablement important, car il souléve le probléme de choix d'une interprétation privilégiée, autre sujet de prédilection en représentation des connaissances.

Les approches examinées sont essentiellement de trois types: extensions aux logiques classiques, approches possibilistes ou probabilistes, et systémes de revision ou de maintient de la cohérence. Parmi les logiques non-classiques examinées on retrouvera la logique des défauts, plusieurs logiques modales (logique du concevable, auto-épistémique, du "tout-ce-que-crois") ou conditionnelles, et une étude de la circonscription. On traite également de logique floue, de logique possibiliste, de fonctions de croyance, et de probabilités conditionnelles et d'approches Bayésiennes. Finalement, la derniére partie du livre traite du *frame problem*, de raisonnement temporel, et de révision des connaissances.

La couverture est compléte et couvre des approches toutes récentes, et est raisonablement uniforme quant ê la profondeur de l'analyse technique. Le fait d'avoir été écrit par neuf chercheurs oeuvrant dans la plupart des domaines a sans doute été un net avantage. Les auteurs admettent cependant en conclusion que le dernier tiers du livre (qui traite de revision et de théories de raisonnement sur les actions) est nettement moins bien servi par l'exemple qui sert de trame au livre. En fait, si j'ai un reproche ê faire au livre, c'est justement que cette derniére section semble nettement plus décousue que le reste parce que l'exemple doit être étendu au point d'être méconnaissable afin de pouvoir inclure ce matériel. L'intention est louable (il y a effectivement de fort liens techniques avec certaines des sections précédentes), mais l'unité présente dans les deux premiéres parties fait défaut.

Par contre, je n'hésiterais pas ê recommender les deux premiers tiers du livre pour tout chercheur sérieux. Avec un apport complémentaire de mathématiques (notamment en logique modale) le livre pourrait servir de référence pour un cours avancé en représentation formelle des connaissances: la présentation assez succinte qui est faite de chaque approche n'est pas nécéssairement suffisante en elle-même, mais permet cependant de lire avec profit les articles originaux car l'exposition permet alors de se concentrer sur les aspects fondamentaux de l'approche. Le simple fait d'avoir une notation cohérente pour les exemples d'un bout ê l'autre du livre est en soi un bénéfice pour le lecteur.

En résumé, ce livre comble un vide important dans la littérature en I.A. (même en Anglais), et à ce titre mérite amplement une recommandation.

Jean-François Lamy est un candidat au doctorat à l'Université de Toronto, où il iest en congé de son poste de chargé d'enseignment à l'Université de Montréal.

Inside case-based reasoning
Christopher K. Riesbeck and Roger C. Schank
[Northwestern University]
Hillsdale, NJ: Lawrence Erlbaum Associates, 1989,
xxii+423 pp
Hardbound, ISBN 0-89859-767-6, us$34.50

Reviewed by
Janice Glasgow,
Queen's University

This book provides a comprehensive introduction to the area of *case-based reasoning*. Case-based reasoning is an alternative to rule-based reasoning in that it relies on past

experience rather than a set of rules. The authors suggest that case-based reasoning offers two main advantages over rule-based approaches: it supports knowledge transfer and explanation; and it provides case solutions to problems whose real-world domains are too complex to specify fully in terms of rules. An underlying theme of this book, which is common in most of Schank's publications, is the theory of understanding through explanation.

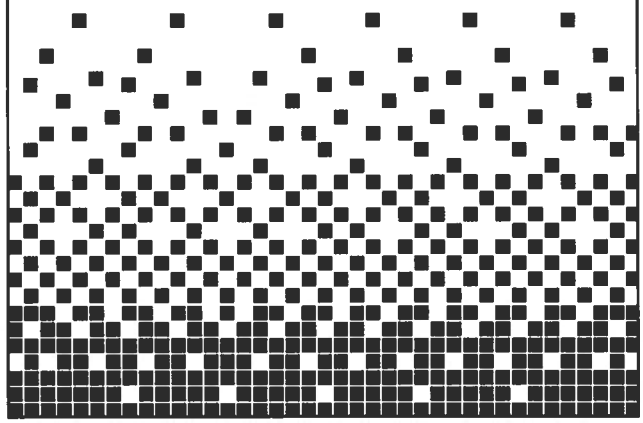
The book is aimed at an audience whose interests fringe on areas of cognitive science, but who are not necessarily knowledgeable in the technical aspects of artificial intelligence. Similar to a previous book by the same authors, *Inside computer understanding*, the approach to the subject supports the view that artificial intelligence is best understood through programming. Towards this understanding, the book includes Lisp programs that describe the concepts that are introduced.

Case-based reasoning is described in the book primarily in terms of applications. Four programs for case-based reasoning and their implementations are presented by the original authors of these systems. The first system presented, called Judge, is a program created by W.M. Bain to model the behaviour of judges who sentence criminals. Case-based reasoning was used in this project to examine sentencing as a representative example of legal reasoning. The program Chef, described by its implementer K.J. Hammond, is an instance of a case-based planner. Hammond points out that planning from cases relies on remembering and acting based on previous successes and failures. Chef is a case-based planner that works in the domain of Szechwan cooking; it creates new recipes based on old ones and requests for dishes with particular tastes or ingredients. A program for plan creation is presented by G.C. Collins. The focus of this research has been on debugging and repairing stored plans. To illustrate these concepts, Collins describes the program Coach which generates new football plays by improving old plays. Lastly, the subject of case-based parsing is described by C.E. Martin. Research in this area is aimed at recognizing which memory structures are most relevant to natural language understanding. As such, case-based parsing can be considered primarily as a recognition process.

As well as describing applications, the book briefly overviews issues related to memory-based learning and intelligence. In particular, it focuses on the concept that "intelligence is characterized by the abilty to get reminded".

Although the book is slightly disjointed, resulting from it being a collection of ideas written by several authors, it provides a readable introduction to the issues involved in case-based reasoning. A criticism may be that there is less theory than there are examples in the book; case-based reasoning appears to be a research field that is being defined in terms of cases!

Janice Glasgow is an associate professor at Queen's University. Her current research interests include reasoning about spatial imagery and modal logics. Dr. Glasgow is also involved with the Queen's University Nial project.



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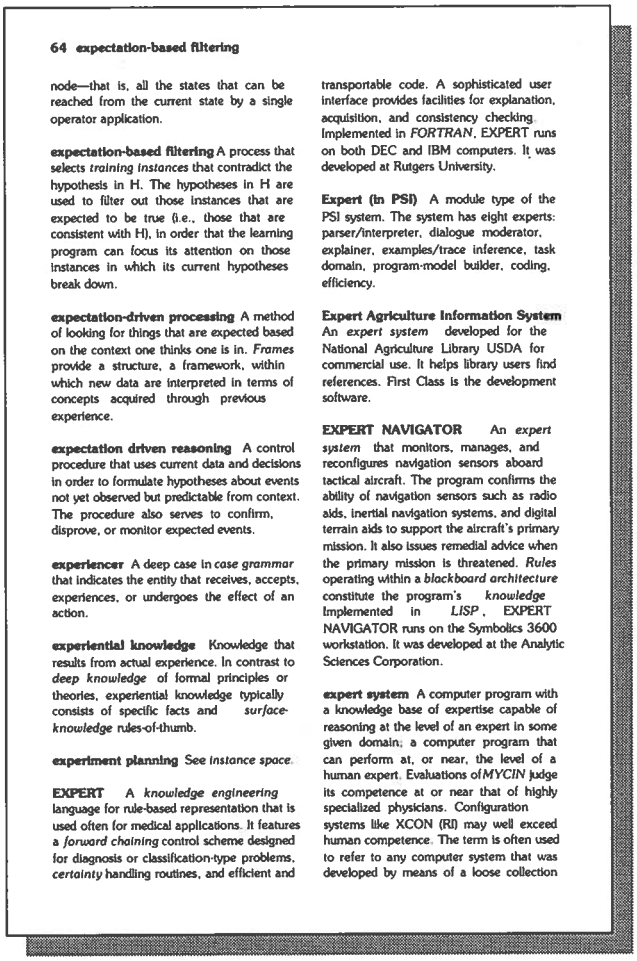


64 expectation-based filtering

node—that is, all the states that can be reached from the current state by a single operator application.

expectation-based filtering A process that selects *training instances* that contradict the hypothesis in H. The hypotheses in H are used to filter out those instances that are expected to be true (i.e., those that are consistent with H), in order that the learning program can focus its attention on those instances in which its current hypotheses break down.

expectation-driven processing A method of looking for things that are expected based on the context one thinks one is in. *Frames* provide a structure, a framework, within which new data are interpreted in terms of concepts acquired through previous experience.

expectation driven reasoning A control procedure that uses current data and decisions in order to formulate hypotheses about events not yet observed but predictable from context. The procedure also serves to confirm, disprove, or monitor expected events.

experiencer A deep case in *case grammar* that indicates the entity that receives, accepts, experiences, or undergoes the effect of an action.

experiential knowledge Knowledge that results from actual experience. In contrast to *deep knowledge* of formal principles or theories, experiential knowledge typically consists of specific facts and *surface-knowledge* rules-of-thumb.

experiment planning See *instance space*.

EXPERT A *knowledge engineering* language for rule-based representation that is used often for medical applications. It features a *forward chaining* control scheme designed for diagnosis or classification-type problems, *certainty* handling routines, and efficient and transportable code. A sophisticated user interface provides facilities for explanation, acquisition, and consistency checking. Implemented in *FORTRAN*, EXPERT runs on both DEC and IBM computers. It was developed at Rutgers University.

Expert (in PSI) A module type of the PSI system. The system has eight experts: parser/interpreter, dialogue moderator, explainer, examples/trace inference, task domain, program-model builder, coding, efficiency.

Expert Agriculture Information System An *expert system* developed for the National Agriculture Library USDA for commercial use. It helps library users find references. First Class is the development software.

EXPERT NAVIGATOR An *expert system* that monitors, manages, and reconfigures navigation sensors aboard tactical aircraft. The program confirms the ability of navigation sensors such as radio aids, inertial navigation systems, and digital terrain aids to support the aircraft's primary mission. It also issues remedial advice when the primary mission is threatened. *Rules* operating within a *blackboard architecture* constitute the program's *knowledge* Implemented in *LISP*, EXPERT NAVIGATOR runs on the Symbolics 3600 workstation. It was developed at the Analytic Sciences Corporation.

expert system A computer program with a knowledge base of expertise capable of reasoning at the level of an expert in some given domain; a computer program that can perform at, or near, the level of a human expert. Evaluations of *MYCIN* judge its competence at or near that of highly specialized physicians. Configuration systems like XCON (RI) may well exceed human competence. The term is often used to refer to any computer system that was developed by means of a loose collection

Sample page from Smith's dictionary

The Facts On File dictionary of artificial intelligence
Raoul Smith (editor) [Northeastern University]
New York: Facts On File, 1989, 211 pp
Hardbound, ISBN 0-8160-1595-3, $24.95
[cdn$32.95]

Smith's dictionary gives brief definitions over 2,000 terms in AI. A sample page is shown above. The dictionary is fairly comprehensive; most of the important AI terms I could think of were listed. (Among those missing were *determinism* and *non-determinism*.) The definitions are generally brief but clear — to someone who already has a good grounding in the relevant area of AI. Sometimes, they are too brief. For example, the original Marcus parser PARSIFAL is described simply as a natural language system, with no hint as to why it merits special attention (and there is no separate entry for Marcus parsers or deterministic parsing).

Many entries, however, are of questionable utility, with perhaps one in every six of them being the names of particular AI systems, most of them obscure. Certainly, any such book needs to mention STRIPS and MYCIN and ELIZA, names often used in the AI literature in a manner that assumes the reader's familiarity with them. But the same cannot be said of most of the systems that are included here.

The dictionary is limited, in that, while not pretending to be an encyclopedia of artificial intelligence like Shapiro's (1987), it contains no names or references for anyone who needs to look further. Often, one may as well go straight to Shapiro.—*G.H.*

Shapiro, Stuart C (editor) *Encyclopedia of artificial intelligence.* NY: John Wiley, 1987.

Expert systems 1990: An assessment of technology and applications
Terri C. Walker and Richard K. Miller
Madison, GA: SEAI Technical Publications, 1990, 372 pp
Paperbound, ISBN 0-89671-108-0, US$375.00

There's no need to write your own expert system. Over 1500 already available are catalogued here by application area, from Aerospace to Welding.

WORLD WATCH

1.0 Theoretical Aspects

1981 Safe path network: a new approach to path-planning.
Bao Tsingpin, Lin Xueyin (Dept. of Comput. Sci. & Techno., Tsinghua Univ., Beijing, China).
Proceedings of the 1988 IEEE International Conference on Systems, Man, and Cybernetics (IEEE Cat. No.88Ch256-9), Beijing and Shenyang, China, 8-12 Aug. 1988 (Beijing, China: Int. Acad. Publishers 1988, p.917-21 vol.2

The authors describe a novel method for solving the path-planning problem in two dimensions. The method generates a network called the safe path network (SPN) for a known polygonal environment. The nodes of the SPN are the minimal safe areas in which a moving object can turn around without collision. The arcs of the network are connections between these nodes with information for the safe navigation of the object along either a straight or a curved path. Once the SPN is established the path-planning problem, taking account of the shape and orientation of a moving object, becomes a network-search problem. The method can solve many difficult path-planning problems with reduced computational complexity. (6 refs.)

1982 A three dimensional fuzzy intelligent controller.
Li Shiyong, Hu Hengzhang, Sheng Andong (Dept. of Control Eng., Harbin Inst. of Techno., China).
Proceedings of the 1988 IEEE International Conference on Systems, Man, and Cybernetics
(IEEE Cat. No.88CH2556-9), Beijing and Shenyang, China, 8-12 Aug. 1988 (Beijing, China: Int. Acad. Publishers 1988), p.1060 vol.2

A three-dimensional fuzzy intelligent controller (FIC) that combines a three-dimensional fuzzy controller with a human controller is proposed. Simulation results indicate that the performance index of the FIC is better than that of a general fuzzy controller or of a conventional PID (proportional-integral-derivative) controller. The FIC is less sensitive to noise and changing parameters. The control algorithm is relatively simple and easy to implement in real time, using a microcomputer. This controller has been applied in a paper-making control system, with good results. (9 refs.)

1986 An expert system project in the accelerator domain.
E. Malandain, P.Skarek (CERN, Geneva, Switzerland).
Expert Systems, Theory and Applications.
IASTED International Conference, Geneva, Switzerland, 16-18 June 1987 (Anaheim, CA, USA: ACTA Press 1987), p.100-5

The CERN PS complex, comprising particle accelerators, storage rings and beam transfer lines is controlled through a large computer network of about 20 minicomputers and 150 microcomputers interfaced by CAMAC to the components of the accelerators. There are about 4000 electronic interface modules installed and the application programs represent 150 man-years of software. This complex and changing system puts a heavy load on the maintenance and fault finding team. Therefore, modern methods are tried out to cope with the problem. The diagnosis prototypes and the pilot cover a small but representative area of hardware and software problems. The aim is knowledge representations suited for extensions to other tasks like beam setup; installation help and operation planning. It is based on deep knowledge about the structure and function of the components of the control system and includes a simulation model and heuristic rules. Some sub-projects are discussed: automatically generating a frame-structured knowledge base from information in existing databases; interfacing the expert system online to existing software on the conceptual level, in an object-oriented fashion. The expert system will probably run on a LISP machine linked via Ethernet to the NORSKDATA computer control network and to an IBM main-frame as ORACLE host. (12 refs.)

2213 Programming in possibilistic logic.
I.P.Orci (Umea Univ., Sweden). Int. J. Expert Syst. Res. Appl.
(USA), vol.2, no.1, p.79-96 (1989).

Mathematical modeling of uncertainty is a central issue in artificial intelligence in general, and in designing intelligent knowledge systems in particular. Computational methods for reasoning with inexact and vague knowledge are therefore of importance both from a theoretical and a practical point of view. A new programming language, PROLOG/P, based on possibilistic, instead of standard, first-order logic, is presented. The theoretical basis of possibilistic logic and its procedural interpretation and the main features of PROLOG/P supporting possibilistic reasoning are described. (27 refs.)

2219 Neural networks for artificial intelligence?
R.M. Debenham, S.C.J. Garth (Dept. of Eng., Cambridge Univ., UK). IEE Colloquium on 'Current Issues in Neural Network Research' (Digest No.83), London, UK, 18 May 1989 (London, UK: IEE 1989), p.6/1-4

In recent years there has been a lot of research into artifical neural networks, which offer a number of potential advantages over conventional artifical intelligence methods. Neural networks can easily be trained, they fail 'gracefully' and they are more amenable to implementation in VLSI. On the other hand, they suffer from a number of limitations which must be overcome if they are ever to be of widespread use: their capacity for generalization if often poor; training time increases rapidly with the size of the network and it is often difficult to understand the resulting encoding of data. The authors suggest some possible directions for future research to overcome these problems, and present the results of some experiments which show that training time may be reduced by structuring the training of such networks.
(3 refs.)

2221 Formal logics for commonsense reasoning.
P.Besnard (Inst. de Recherche en Inf. et Syst. Aleatoires, Rennes, France). Ann. Telecommun. (France), vol.44, no.5-6, p.242-50 (May-June 1989). In French.

The subfield of artificial intelligence devoted to the formalization of reasoning is presented through a review of significant works aiming at modelling commonsense reasoning by means of a formal logic. All the formalisms investigated in the text are founded upon classical logic, which, unlike them, formalize a monotonic form of reasoning. Supposition-based logic, default logic, autoepistemic logic, circumscription are given an introductive account as instances of the nonmonotonic logics approach to the formalization of commonsense reasoning. (15 refs.)

2224 An optimistic rule for accumulation of evidence.
P. Lingras, S.K.M.Wong (Dept. of Comput. Sci., Regina Univ., Sask., Canada).
Methodologies for Intelligent Systems, 3.
Proceedings of the Third International Symposium, Turin, Italy, 12-15 Oct. 1988 (New York, NY, USA: North-Holland 1988), p.60-9

Dempster-Shafer's theory of evidence (A. Dempster, 1967, G. Shafer, 1976) provides an attractive method for calculating the degrees of belief based on imprecise and incomplete information. The belief functions and Dempster's rule of combination in this theory represent the pessimistic view in decision making. The optimistic view, on the other hand, is represented by credibility functions (also known as upper probabilities) which are the dualities of belief functions. The authors propose a new rule of combination for constructing credibility functions consistent with the accumulation of knowledge. This rule, called optimistic rule of combination, is the duality of Dempster's rule and corresponds to the

disjunction of evidence. The optimistic rule of combination can be useful for dealing with bodies of evidence which disagree with (sometimes even contradict) each other. Such an apparent contradiction may be a result of incomplete information and cannot be ruled out in practice. (8 refs.)

2462 A system and control theoretic perspective on artificial intelligence planning systems.
K.M.Passino, P.J. Antsaklis (Dept. of Electr. & Comput. Eng., Notre Dame Univ., IN, USA). Appl. Artif. Intell. (USA), vol.3, no.1, p.1-32 (1989).

In an artificial intelligence (AI) planning system, the planner generates a sequence of actions to solve a problem. Similarly, the controller in a control system produces inputs to a dynamical system to solve a problem, namely the problem of changing a system's behavior into a desirable one. A mathematical theory of AI planning systems that operate in uncertain, dynamic, and time-critical environments is not nearly as well developed as the mathematical theory of systems and control. In this paper relationships and a detailed analogy between AI planning and control system architectures and concepts are developed and discussed. These results are fundamental to the development of a mathematical theory for the modeling, analysis, and design of AI planning systems for real-time environments. (65 refs.)

2470 From 3D line segments to objects and spaces.
P.Grossmann (GEC Hirst Res. Centre, Wembley, UK).
Proceedings CVPR '89 IEEE Computer Society Conference on Computer Vision and Pattern Recognition (Cat. No.89Ch2752-4), San Diego, CA, USA, 4-8 June 1989 (Washington, DC, USA: IEEE Comput. Soc. Press 1989), p.216-21

An intermediate representation of stereo image data in terms of 3D line segments is used to extract visible surfaces and their parameters. Methods and algorithms for recovering planar, cylindrical, conical, and spherical surfaces are described, and some test results are presented.
The essence of the approach is testing of small sets of 3D line segments for compatibility with a particular type. Maximal sets of segments of supporting different surface are then identified. Some of the algorithms involve a novel use of the dual space representation. In the domain of polyhedral scenes initially restricted to blocklike objects and spaces, the planar surfaces are combined, using connectivity, to create 3D boxes, that correspond either to simple (i.e. convex) objects or spaces, or to convex parts, which are further combined to create composite objects and spaces. (21 refs.)

2477 A unifying algorithm/architecture for artifical neural networks.
S.Y.Kung (Dept. of Electr. Eng., Princeton Univ., NJ, USA), J.N.Hwang. ICASSP-89: 1989 International Conference on Acoustics, Speech and Signal Processing (IEEE Cat. No.89CH2673-2), Glasgow, UK, 23-26 May 1989 (New York, NY, USA: IEEE 1989), p.2505-8 vol.4

A generic iterative model is presented for a wide variety of artificial neural networks (ANNs): single-layer feedback networks, multilayer feed-forward networks, hierarchical competitive networks, and hidden Markov models. Unifying mathematical formulations are provided for both the retrieving and learning phases of ANNs. Based on the unifying mathematical formulation, a programmable universal ring systolic array is derived for both phases. It maximizes the strength of VLSI in terms of intensive and pipelined computing and yet circumvents the limitation on communication. Hardware implementation for the processing units based on CORDIC techniques is discussed. (16 refs.)

2.0 Systems and Techniques

2024 The RESCU club: practical experience building a real-time expert system.
R.Leitch (Dept. of Electr. & Electron. Eng., Heriot-Watt Univ., Edinburgh, UK), R.Kraft.
Proceedings of the 1988 IEEE International Conference on Systems, Man, and Cybernetics (IEEE Cat. No.88CH2556-9), Beijing and Shenyang, China, 8-12 Aug. 1988 (Beijing, China: Int. Acad. Publishers 1988), p.1166-9 vol.2

RESCU (Real-time Expert System Club of Users) is the first of the community clubs set up to promote advanced information technology within the UK. It consists of 23 industrial companies and three universities interested in the application of knowledge-based system (KBS) techniques to real-time process control. The main objective of the club is to increase awareness of KBS technology and to demonstrate the viability of these techniques on a practical real-time application. The authors describe the RESCU demonstrator project, intended to study the possibility of assisting operators with quality control in a chemical batch process plant. The project was developed as a demonstration of the expert system approach and to gain practical experience with an operational expert system. Some aspects of the knowledge acquisition undertaken for the expert system are covered. The basic structure of the knowledge base is described, and some features within it are discussed. Problems encountered during the project are highlighted. (6 refs.)

2031 A microcomputer-based menu-driven system.
D.L.Hudson (California Univ., San Francisco, CA, USA), M.E.Cohen.
Proceedings of the ISMM International Symposium. Software and Hardware Applications of Microcomputers, Fort Collins, CO, USA, 4-6 Feb. 1987 (Anaheim, CA, USA: ACTA Press 1987), p.11-15

EMERGE is a rule-based medical expert system designed to run on a microcomputer, and to provide rapid decision making capabilities for the emergency room environment. The EMERGE rule base is organized in a hierarchical manner, to facilitate rapid focus of attention. EMERGE was originally designed with two user interfaces: a question mode and a data-driven mode. During testing, it was determined that a

third menu-driven interface was desirable to accommodate the wishes of the end users, who were medical personnel with little computer experience. The menu-driven interface was added, along with a menu generation facility which permits menus to be produced automaticaly for new rule bases when the application area is changed. EMERGE is written in standard Pascal making it machine-independent. At the present time, it is implemented on the Apple II series of micro-computers and the IBM PC series of microcomputers, along with the VAX 11/750 minicomputers, and the CYBER 720 mainframe. (20 refs.)

2032 Search management in a personal computer based diagnostic expert system using Prolog.
A.F.Bergman, K.L.Kiser (Dept. of Comput. Sci., Wyoming Univ., Laramie, WY, USA).
Proceedings of the ISMM International Symposium. Software and Hardware Applications of Microcomputers, Fort Collins, CO, USA, 4-6 Feb. 1987 (Anaheim, CA, USA: ACTA Press 1987), p.78-83

Personal computers are delivering greater power. Therefore, domains traditionally reserved for larger computers are migrating to smaller machines. One such domain is the expert systems field of artificial intelligence. Building expert systems for personal computers requires careful management of resources. Several techniques are available to the knowledge programmer for controlling search time and space in rule based systems. Some techniques are language dependent, others have wider applications; Prolog exemplifies both cases. As several techniques are explored in detail, numerous examples are presented. (21 refs).

2241 Expert systems in the United Kingdom: an evaluation of development methodologies.
M.O'Neill, A.Morris (Dept. of Libr. & Inf. Studies, Loughborough Univ., UK).
Expert Syst. (UK), vol.6, no.2, p.90-9 (April 1989).

The paper discusses the results of a survey of ES producers conducted between October 1987 and June 1988 as part of a British Library Research and Development Department funded project. The survey aimed to establish the nature and scope of ES projects in Britain, the skills and methodologies used in their development and the background and experience of the personnel employed to develop them. A major part of the survey focused on the human input and organizational impact of ESs and the paper summarises the findings of the survey with particular reference to these issues. It includes details of the organizational background of those working in the area; a review of the nature, number and scope of ES projects in Britain; consultation procedures with both users and experts; the knowledge engineering task and methodologies currently used in undertaking it; the skills and attributes of the knowledge engineer; issues of updating and extending ECs; and hopes, projections and expectations for the future. (10 refs.)

2246 Object-oriented knowledge frameworks.
B.W.R. Forde, A.D. Russell, S.F. Steimer (Dept. of Civil Eng., British Columbia Univ., Vancouver, BC, Canada). Eng. Comput. (USA), vol.5, no.2, p.79-89 (Spring 1989).

Introduces a strategy for the construction of object-oriented knowledge frameworks. Global control programs, which are traditionally used for manipulating structured representations, have been replaced by domain-specific resources. This new approach offers increased efficiency and simplified development of knowledge-based expert systems for problem domains that deal with a variety of complex structured information. A theoretical foundation is laid for the representation of knowledge, starting with the adoption of a simple scheme for structuring stereotupical information. Data and method abstraction is achieved by installing knowledge frames into part of an object-oriented class system that supports procedural attachment and object communication. This allows frame specialization using domain-specific resources and subsequent construction of modular systems with these specialist frames. Editors are introduced for the alteration of data primitives used in declarative representation. Algorithms, which operate on these data primitives, are given for frame instantiation, data access, and user-directed inference. Examples from structural engineering are used throughout the paper to illustrate the practical application of object-oriented knowledge frameworks. (17 refs.)

2253 An analysis of the distinction between deep and shallow expert systems.
P.D.Karp, D.C.Wilkins (Stanford Univ., CA, USA). Int. J. Expert Syst. Res. Appl. (USA), vol.2, no.1, p.1-32 (1989).

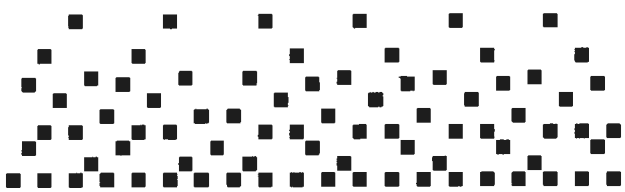
The first generation of expert systeems (e.g. MYCIN, DENDRAL, R1) is often characterized as only using shallow methods of representation and inference, such as the use of production rules to encode empirical knowledge. First-generation expert systems are often dismissed on the grounds that shallow methods have inherent and fatal shortcomings which prevent them from achieving problem solving behaviors that expert should possess. Examples of such desirable behaviors include graceful performance degradation, the handling of novel problems, and the ability of the expert system to detect its problem-solving limits. This article analyzes the relationship between the techniques used to build expert systems and the behaviors they exhibit to show that there is not sufficient evidence to link the behavioral shortcomings of first-generation expert systems to the shallow methods of representation and inference they employ. There is only evidence that the shortcomings are a consequence of a general lack of knowledge. Moreover, the article shows that the first generation of expert systems employ both shallow methods and most of the so-called deep methods. It shows that deeper methods augment but do not replace shallow reasoning methods; most expert systems should possess both. (45 refs.)

2291 Contribution to the achievement of a syntax in knowledge engineering.
J. Legrand (LIST, Univ. Pierre et Marie Curie, Paris, France). Expert Systems, Theory and Applications, IASTED International Conference, Geneva, Switzerland, 16-18 June 1987 (Anaheim, CA, USA: ACTA Press 1987), p.45-9

After briefly discussing the lack of theory in knowledge engineering, the article stresses the need for basic definitions in that field. It focuses on structured expert systems which use categories of abstract types to embody a part of the knowledge. Following an abstraction process, from real systems to abstract systems, the article exposes algebraic formalisms to give a general frame for knowledge representation. It leads to a formal definition for the notion of attribute. a classification of attributes is tried and the notion of induced attributes is introduced. By using these results and system analysis a classification of classes is tried. Then the notion of link is studied and it is shown they have also to be classified. The given examples show how a rigorous syntax allows an increasing mastership on knowledge representation. (33 refs.)

2483 Patterns of inductive reasoning in a parallel expert system.
W. Siler, D. Tucker (Carraway Methodist Med. Center, Birmingham, AL, USA). Int. J. Man-Mach. Stud. (UK), vol.30, no.1, p.113-20 (Jan. 1989).
[received: 24 Jul 1989]

The general characteristics of an expert system shell which fires rules in parallel rather than sequentially are briefly reviewed. Particular reference is made to the management of uncertainty, ambiguities and contradictions and truth maintenance through fuzzy systems theory. Within this context, the overall organization of parallel expert system programs is discussed. The basic element of such programs is the rule block, a collection of concurrently fireable rules which are fired effectively in parallel. The rules in such a block may be fired once, or fired repetitively until no more rule instances are fireable. Each rule block firing then constitutes a completely non-procedural step. However, the firing order of rule blocks tends to be procedurally controlled. In the simplest case, the rule blocks are fired sequentially in order; in more complex cases, a flow chart may be used to describe the flow of control among rule blocks, with conditional firing of certain rule blocks. In a blackboard system programs written in procedural languages may be called within the non-procedural rule blocks to execute tasks for which an expert system is unsuitable, such as number crunching or searching large external files. (7 refs.)



2490 Knowledge acquisition for expert system development.
A.M.Spangler, C.D.Ray, K.Hamaker (Texas A&M Univ., College Station, TX, USA). Comput. Electron. Agric. (Netherlands), vol.4, no.21, p.23-32 (July 1989).

The recent proliferation of expert system development projects has focused the attention of the AI community on the problem of knowledge acquisition. Traditional programming skills possessed by the majority of knowledge engineers are found to be of little use when faced with the problem of extracting potential knowledge base information from a human expert. This paper deals with those topics and situations which have so often been described as the 'bottleneck' of expert system development. The concepts of expert and expertise are explored; the paradox of expertise is examined. Those interviewing methods found to be most effective for knowledge acquisition are discussed. A broad gamut of knowledge acquisition considerations are covered in detail including knowledge base structure, coversion of knowledge into rules, and refinement of the knowledge base. (25 refs.)

2507 The pragmatic application of the KADS methodology.
F.R.Hickman (Knowledge-Based Syst. Centre, Touche Ross Manage. Consultants, London, UK). Fifth International Expert Systems Conference, London, UK, 6-8 June 1989 (Oxford, UK: Learned Inf. 1989), p.55-65

KADS is a methodology for building commerical knowledge-based systems (KBS). It has been developed under the aegis of the ESPRIT programme, the first project starting in 1983. Since its inception KADS was not meant to be a prescription for system development, in recognition of the many serious technical problems that would need to be overcome if it were so. However, such has been the progress within the current project, that it is now confident that KADS offers a set of methods and techniques, encapsulated within a theoretical framework, that will enable competent knowledge engineers and systems analysts to build quality knowledge-based systems with a degree of confidence that matches conventional systems development. In this sense KADS is truly a methodology. The paper presents the main ideas contained within it. (10 refs.)

2508 Applying quality assurance to expert systems.
G. Born (SD-Scicon, Camberley, UK). Fifth International Expert Systems Conference, London, UK, 6-8 June 1989 (Oxford, UK: Learned Inf. 1989), p.67-74

A working group of the Computing Services Association, under the chairmanship of the author, has recently published a set of guidelines for quality assurance of expert systems. The paper summarises the guidelines. Emphasis is placed on the prototyping cycle and means for controlling the process. Documentation and change control are discussed in detail. The paper concludes with a description of checklists for prototyping and the use of prototyping in systems development.

3.0 Applications

2053 ESMAN: an expert system for manufacturing site selection.
Sunduck Suh (Dept. of Urban & Regional Planning, Illinois Univ., Urbana-Champaign, IL, USA),
Moonja Park Kim, T.J. Kim.
Comput. Environ. Urban Syst. (UK), vol.12, no.4, p.239-52 (1988). [received: 15 May 1989]

Describes the design of an expert system for site selection, particularly for manufacturing establishments funded by foreign investors. A prototype expert system. ESMAN: an expert system for manufacturing site selection, is developed using Personal Consultant Plus. It is demonstrated that not only can the knowledge and expertise of an urban and regional planner be codified in a system that can advise less experienced planners, but also that such a system can become an educational tood that benefits urban and regional planning students. (14 refs.)

2066 Artificial intelligence and expert systems: financial applications and progress.
P.R. Berger (Syst. Designers plc, Cheadle, UK). KBS 87 Knowledge Based Systems. Proceedings of the International Conference, London, UK, 23-25 June 1987 (London, UK: Online Publications 1987), p.245-55

The increased role of AI and expert systems in the financial 'domain' is discussed and the reasons for the increased interest and involvement in AI by financial institutions identified. The level of activity and the progress made is reviewed on a worldwide basis with particular emphasis on the key players in the US, UK and Europe. The paper includes a comprehensive listing of the financial AI applications being investigated, designed, developed and implemented in insurance, banking, dealing, financial services and other financial markets.

2087 An indepth study of an expert system that helps evaluate graduate study programs, and a statistical summary of 25 little expert systems.
Y. Shen, A.T. Bahill (Syst. & Ind. Eng., Arizona Univ., Tucson, AZ, USA).
Proceedings of the 1988 IEEE International Conference on Systems, Man, and Cybernetics
(IEEE Cat. No.88CH2556-9), Beijing and Shenyang, China, 8-12 Aug. 1988 (Beijing, China: Int. Acad. Publishers 1988), p.949-51 vol.2

The authors present a large expert system, Advice, that has been built to help evaluate the study plans of systems and industrial enginerring graduate students. They explain system requirements, program architecture, technical characteristics, and system evaluation, Advice has four components: a knowledge base; a backward chaining inference engine, M.1; a database, dBASE II; and a external interface file. A novel feature of Advice is its use of a voice synthesizer that talks to the user. External functions allow M.1 to communicate with this voice synthesizer as well as with dBASE II files, where the attributes of each course are stored. Verification and validation are performed to ensure the accuracy and reliability of the system. Advice has time for both the students and the professors and has provided more accurate and more comprehensive advice for the students. The authors also present a statistical analysis of 25 small expert systems that were written by undergraduate and graduate students in systems and industrial Engineering at the University of Arizona in partial fulfilment of the requirements of a one semester course in expert systems. From this analysis it is concluded that novice knowledge engineers require three to four hours for each kilobyte of knowledge base.

2092 A program for oriented treatment of essential hypertension.
V.Moreno (Seccion de Farmacologia Clinica, Fac. de Medicina, Univ. Autonoma de Barcelona, Spain),
M.Farre, P.Salwa.
Comput. Methods Programs Biomed. (Netherlands), vol.29, no.2, p.89-94 (June 1989).

Treatment of essential hypertension is often a complex task and needs appropriate methodology. A newly developed computer program can help physicians to choose the best pharmacological approach to the treatment of essential hypertension. Based on an oriented clinical history, the program asks the user to give the physiological, pathological and pharmacological antecedents of the patient to be treated. Taking into account these characteristics, 19 antihypertensive drugs are ordered according to their indications and contraindications in the patient. Diet advice based on body-weight and the patient's habits are considered as well. The program is designed to explain why decisions are made, so it can be useful in teaching medical students or postgraduates. (11 refs).

2101 Computer localization of brain lesions.
G.F.Tremblay (Children's Mercy Hospital, Kansas City, MO, USA),
C.F.Lam.
Proceedings of the 1988 IEEE International Conference on Systems, Man, and Cybernetics
(IEEE Cat. No.88CH2556-9), Beijing and Shenyang, China, 8-12 Aug. 1988 (Beijing, China: Int. Acad. Publishers 1988), p.1111-12 vol.2

The authors describe the use of a primitive instancing scheme based on geometrical solids to represent typical anatomical components of the nervous system. When the representation is used by a clustering algorithm, neurological lesions can be localized. The system's chief advantages are that it provides a concise way of representing the complex anatomy of the nervous system, and it permits a spatial reasoning problem, that of localization, to be solved computationally. The system's ability to localize multiple simultaneous lesions confers an additional advantage over previous programs for computer-assisted localization in neurology. (8 refs.)

2104 An expert system for the control of depth of anaesthesia.
D.A. Linkens, S.G. Greenhow (Dept. of Control Eng., Sheffield Univ., UK), A.J.Asbury.
Expert Systems in Medicine 4 (papers in summary form only received), London, UK, 17-18 March 1987 (London, UK: British Med. Inf. Soc. 1987), 6 pp. vol.1

Describes an expert system which will help advise an anaesthetist as to whether the current depth of anaesthesia is correct and suggest any measures necessary to regain the desired state. This is carries out in a real time situation. The run time system is extremely easy to use and understand, and it is also as unobtrusive as possible. (2 refs.)

2113 An expert system for searching in full-text.
S. Gauch, J.B. Smith (Dept. of Comput. Sci., North Carolina Univ., Chapel Hill, NC, USA). Inf. Process. Manage. (UK), vol.25, no.3, p.253-63 (1989).

Expert system technology is applied to the task of searching online full-test documents. The authors are developing an intelligent search intermediary to help end-users locate relevant passages in large full-text databases. The expert system automatically reformulates contextual Boolean queries to improve search results and presents retrieved passages in decreasing order of estimated relevance. It differs from other intelligent database functions in two ways: it works with semantically unprocessed text and the expert system contains a knowledge base of search strategies independent of any particular content domain. The goals for this project are to demonstrate the feasibility of the approach and to evaluate the effectiveness of the system through a controlled experiment. While this work has limited objectives, the system and techniques are general and can be extended to large, real-world databases. (18 refs.)

2138 Expert systems for configuration at Digital: XCON and beyond.
V.E. Barker, D.E. O'Connor, J. Bachant (Digital Equipment Corp., Maynard, MA, USA), E.Soloway. Commun. ACM (USA), vol.32, no.3, p.298-317 (March 1989).

The XCON configuration system at Digital Equipment Corporation was the first expert system in daily production use in industry. It is the cornerstone of Digital's knowledge network vision: a number of expert systems embedded in both the company's order process cycle and its new product introduction cycle. Digital is continuing to extend the knowledge network, as well as using expert systems technology in many additional aspects of the company's business. In fact, XCON is only one of several expert systems dealing with hardware and software configuration which are in use or under development at Digital. The configuration systems 'family' includes four expert systems in production use. Several additional configuration expert systems are in the research, advanced development, or prototype stage of development. The development of these expert systems has spanned nearly 10 year; Digital's Configuration Systems Development Group (CSDG) has thereby gained considerable understanding of all phases of the life-cycle of production quality expert systems: design, development, production, and ongoing support. The authors highlight some of the key lessons they have learned. (13 refs.)

2141 A framework for opportunistic problem solving [chemical engineering].
K.M.Lien (Dept. of Chem. Eng., Norwegian Inst. of Technol., Trondheim, Norway). Comput. Chem. Eng. (UK), vol.13, no.4-5, p.331-42 (April-May 1989). (CHEMDATA 88. XIX Congress: the Use of Computers in Chemical Engineering, Gothenburg, Sweden, 13-15 June 1988).

The organization of problem solving computer programs is discussed. An opportunistic control architecture inspired by the Blackboard Model is described. The author addresses the control issue of how to organize a computer program consisting of independent 'knowledge pieces' so that they together are capable of problem solving. A very important characteristic of human problem solving is awareness of the solution process, and it is postulated that an 'expert program' should have this same ability to monitor the problem solving process and control it in a flexible manner. A computer program attempting to emulate such a 'global awareness' of the solution process has been developed and is presented. The program is implemented on top of the development system Knowledge Craft (H.P. Nii, 1986), as a set of CRL schemata (frames), a set of functions (Common Lisp) and an OPS production (rule). Domain problem solving (solving the 'problem proper') and control problem solving (deciding what to do next in the problem solving process) is separated into distinct sets of problem solving operators. This framework is applicable to chemical engineering processes. (10 refs.)

2146 An expert system for an automated assembly line design.
H.Osaki, Y.Kajihara (Fac. of Eng., Okayama Univ., Japan). Robot (Japan), no.67, p.74-9 (March 1989). In Japanese.

An expert system is proposed for the construction and the scheduling of an automated flexible assembly line. It selects suitable robot hands and arms based on the features of product component parts, determines the robot motion considering various conflicts, estimates the assembly time in a workstation, assigns a criterion for the product input order and for the product dispatching at each workstation, and designs the assembly line by simulation. (5 refs.)

2160 Artificial intelligence applications in the nuclear industry: an international view.
D.Majumdar (USDOE, Idaho Falls, ID, USA). Nucl. En. Des. (Netherlands), vol.113, no.2, p.181-93 (April 1989). (ANS Topical Meeting on Artificial Intelligence and Other Innovative Computer Applications in the Nuclear Industry, Snowbird, UT, USA, 31 Aug.-2 Sept. 1987).

The possibility that artificial intelligence (AI) techniques could be useful to the nuclear industry was realized only a few years ago. Proprietary needs have sometimes kept people from reporting on the progress of AI applications in the nuclear industry. Consequently, some duplicate work is being performed by several groups in different countries. Nevertheless, sharing the knowledge gained from the experience in several countries is still fruitful; success in one country may benefit another. With this view in mind, the author has gathered to the best of his knowledge, what is going on in different countries in the world. (65 refs.)

2162 Alarm filtering and presentation.
M.A. Bray (EG&G Idaho Inc., Idaho Falls, ID, USA).
Nucl. Eng. Des. (Netherlands), vol.113, no.2, p.211-18 (April 1989). (ANS Topical Meeting on Artificial Intelligence and Other

Innovative Computer Applications in the Nuclear Industry, Snowbird, UT, USA, 31 Aug.-2 Sept. 1987).
The author discusses alarm filtering and presentation in the control rooms of nuclear and other process control plants. Alarm generation and presentation is widely recognized as a general process control problem. Alarm systems often fail to provide meaningful alarms to operators. Alarm generation and presentation is an area in which computer aiding is feasible and provides clear benefits. Therefore, researchers have developed several computerized alarm filtering and presentation approaches. Approaches to improving the alarm situation and installation issues of alarm system improvements are discussed. The impact of aritifical intelligence (AI) technology on alarm system improvements is assessed. (22 refs.)

2166 Artificial intelligence applications in accident management.
D.G.Cain (EPRI, Palo Alto, CA, USA).] Nucl. Eng. Des. (Netherlands), vol.113, no.2, p.251-7 (April 1989). (ANS Topical Meeting on Artificial Intelligence and Other Innovative Computer Applications in the Nuclear Industry, Snowbird, UT, USA, 31 Aug.-2 Sept. 1987).

The problems associated with military C^3I and nuclear power plant accident management are starting to be addressed by researchers who are drawing from advances in artificial intelligence (AI) computer technologies. The central focus of this work, is an attempt to invert the information profile: instead of providing more and more information to decision makers at faster and faster rates, AI methods are being investigated for the purposes of analyzing, digesting, and compiling information to support key decision making tasks. This reorientation from divergent to convergent information handling for improved accident management is the primary driving force for investigations in the use of AI. (16 refs.)

2194 Conflict resolution of rules assigning values to virtual attributes.
Y.E. Ioannidis (Dept. of Comput. Sci., Wisconsin Univ., Madison, WI, USA), T.K.Sellis. SIGMOD Rec. (USA), vol.18, no.2, p.205-14 (June 1989).
(1989 ACM SIGMOD International Conference on Management of Data, Portland, OR, USA, 31 May-2 June 1989).

In the majority of research work done on logic programming and deductive databases, it is assumed that the set of rules defined by the user is consistent, i.e. that no contradictory facts can be inferred by the rules. The authors address the problem of resolving conflicts of rules that assign values to virtual attributes. They devise a general framework for the study of the problem, and propose an approach that subsumes all previously suggested solutions. Moreover, it suggests several additional solutions, which very often capture the semantics of the data more accurately than the known approaches. They also address the issue of how to index rules so that conflicts are resolved efficiently, i.e. only one of the applicable rules is processed at query time. (15 refs.)

2315 The DHSS retirement pension forecast and advice system: an update.
S.Spirgel-Sinclair.
KBS in Government 88. Proceedings of the Second European Conference, London, UK, 1 June 1988 (Pinner, UK: Blenheim Online 1988), p.89-106

At the 1987 KBS in Government conference, the project managers of the DHSS RPFA project presented details of a project that had just commenced to replace the existing manual retirement pension forecast and advice service with a sophisticated expert system-based application. The resulting system became operational in April 1988 and, judging by the public response to the advice they have been given, can already be deemed to be a success. A further project is now under way to integrate the stand-alone system with the central mainframes that hold applicant's National Insurance contribution data. The paper recaps the history of the project, describes the RPFA application in detail, and relates some important lessons learned about implementing an expert system. (3 refs.)

2327 Knowledge-based instructional gaming: GEO.
P.Duchastel (Laval Univ., Que., Canada).
J. Educ. Technol. Syst. (USA), vol.17, no.3, p.189-203 (1988-1989). [received: 16 May 1989]

Games have a fascination for people which make them ideal vehicles for instruction of an informal nature. Described is an instructional game (GEO) in which the user learns elements of Canadian geography as she chases a spy around the country. The game utilizes artificial intelligence approaches to represent and put to use various types of knowledge (knowledge of geography, of tutoring, and of the student). Experience in designing and refining the game is discussed, as well as prospects for extending this approach to other learning situations. (15 refs.)

2328 KBS resource scheduling for a local authority.
G. Foster. KBS in Government 88. Proceedings of the Second European Conference, London, UK, 1 June 1988 (Pinner, UK: Blenheim Online 1988), p.141-50

The paper describes the development of a knowledge based scheduling system for school timetabling, focusing upon the cost and timescale benefits of the particular development methodology used. The system features both advisory and automatic modes of operation, together with adjustable resource smoothing options, and has demonstrated a 15-fold improvement in the time required to produce high quality timetables for large secondary schools. The user acceptance of the system has been very favourable and the techniques used should be directly applicable to other resource scheduling applications.

2354 An expert system for interpretation and diagnosis of ECG signals.
J.P. Ledos, X.Colas Des Francs, A.Strauss (CITI2 et Service Inf. Med., Paris Univ., France),
P. Le Beux, B. Auvert, D. Fontaine.
Expert Systems and Decision Support in Medicine. 33rd Annual Meeting of the GMDS EFMI Special Topic Meeting. Peter L. Reichertz Memorial Conference, Hannover, West Germany, 26-29 Sept. 1988 (Berlin, West Germany: Springer-Verlag 1988), p.191-5

Describes an expert system for ECG analysis. The first version using the expert system generator SUPER was developed at the University of Compiegne, France (Fontaine 1985, Le Beux 1986) and a new version has been implemented in Turbo-Prolog. This system is able to generate interpretation and diagnosis of ECG signals by using a knowledge base instead of having an algorithmic approach. This system includes a three stage expert system: the real time acquisition is followed by the initialization of signal parameters which are then used as initial facts for the interpretation expert system. (7 refs.)

2366 Five PC-based expert systems for business reference: an evaluation [library automation].
R.G. Vedder, M.G. Fortin, S.A. Lemmermann (North Texas Univ., Denton, TX, USA), R.N.Johnson.
Inf. Technol. Libr. (USA), vol.8, no.1, p.42-54 (March 1989).

Many libraries are beginning to utilize expert system shells to provide simple directional sources or sophisticated reference service. The authors examine five different PC-based shells used by teams of graduate students with knowledge engineering experience to build a prototype application. The examination demonstrates the strengths and weaknesses of a product for developing expert systems. The expert-system building tools are all commercial shell products and are: EXSYS, 1st-CLASS, GURU, Personal Consultant Easy, and Personal Consultant Plus. Each project team was assigned one package to build a prototype for assisting patrons with basic business-reference questions. The evaluation design and performance criteria for the shells are presented. (7 refs.)

2377 BLADES: an artificial intelligence approach to analog circuit design.
F.El-Turky (AT&T Bell Lab., Naperville, IL, USA),
E.E.Perry. IEEE Trans. Comput.-Aided Des. Integr. Circuits Syst. (USA), vol.8, no.6, p.680-92 (June 1989).

An expert-systems-based automated design approach for analog circuits is presented. The approach uses both formal and intuitive knowledge in the design process. a prototype design environment, BLADES, which uses a divide and conquer solution strategy, has been successfully implemented and is currently capable of designing a wide range of subcircuit functional blocks as well as a limited class of integrated bipolar operational amplifiers. BLADES is believed to be the first successful design expert system in the analog design domain. It uses different levels of abstraction depending on the complexity of the design task under consideration. The importance of the abstraction level lies in the fact that once design primitives are defined, the problem of extracting the knowledge (design rules) become less complex. Two design examples are given to demonstrate the viability and versatility of the knowledge-based design technique as an analog design tool. None of the circuits designed and tested using BLADES were unstable. (39 refs.)

2403 STEELEX: a coupled expert system for integrated design of steel structures.
Y.Paek, H.Adeli (Dept. of Civil Eng., Ohio State Univ., Columbus, OH, USA). Eng. Appl. Artif. Intell. (UK), vol.1, no.3, p.170-80 (Sept. 1988).
[received: 06 Jun 1989]

Presents STEELEX, prototype knowledge-based expert system for integrated design of building structures consisting of moment-resisting steel frames. STEELEX is a coupled system in which AI symbolic processing is combined with conventional numerical processing. STEELEX produces the final detailed design including the beam-column connections ready for fabrication. In addition, it can explain the basis of design and the principles behind the design specification. STEELEX has been developed using a domain-specific tool called SDL (for structural design language). Implemented in the INTERLISP environment, SDL provides a design problem-solving environment using a hierarchical cooperating specialists paradigm. STEELEX has a debugging facility and provides a multiwindow graphics interface for drawing isometric as well as orthographic views of the steel frame and beam-column connections (19 refs.)

2414 An expert system for system identification.
M. Haest, G. Bastin, M. Gevers, V. Wertz (Lab. d'Automatique de Dynamique et d'Analyse des Syst., Univ. Catholique de Louvain, Belgium).
Artificial Intelligence in Real-Time Control. Proceedings of the IFAC Workshop, Swansea, UK, 21-23 Sept. 1988 (Oxford, UK: Pergamon 1989), p.91-6

An expert system for system identification written with the OPS83 knowledge-based programming language, is

presented. It provides the user with a set of good models for the system under investigation. If the sampling period used to collect the data seems to be unadapted, the expert system modifies it. An intelligent search through the set of all admissible models is made in order to find the best models of the system. Some validation criteria are used to classify the models and a complete set of facilities is at the user's disposal to modify the expert system behaviour at execution time. One advantage of the expert system approach is that one can not only change decision parameters (such as confidence levels) very easily but one can also change existing rules or add new rules at the price of only one more compilation. Finally, some simulations on data from industrial processes show that the expert system behaves just as well as human experts, while on simulated noisy data it finds the true model in the class of ARX or ARARX (also called GLS) models that was used to produce them. (6 refs.)

2424 A design talk advisor.
M.-M. Boulet, P. Duchastel (Laval Univ., Que., Canada), J.W. Brahan, R.A. Orchard, A.T. Parent, C.S. Phan, A.J. Cole, J.R. Hartley, R. Pilkington. Artificial Intelligence and Education.
Proceedings of the 4th International Conference on AI and Education, Amsterdam, Netherlands, 24-26 May 1989 (Amsterdam, Netherlands: IOS 1989), p.25-31

Systems with embedded computer capabilities provide a natural environment for the application of knowledge-based technology in support of the user. This is particularly true of systems with the design tools used in the application of new methodologies. The National Research Council of Canada in collaboration with Universite Laval, the University of Leeds and SystemOID Inc., has underway the development of an advisor to support the user of computer-based design tools. The advisor is to be capable of three modes of operation. In reactive mode, it will offer meaningful responses to user questions, in proactive mode, it will monitor the user and intervene with sugggestions to assist the user achieve the indicated goal; in the tutorial mode it will provide a guided instruction to the system for the neophyte user. The authors discuss the design concepts for each of the modules and the approach to implementation of a prototype applied in the area of database design methodology. (13 refs.)

2434 A model for an intelligent operating system for executing image understanding tasks on a reconfigurable parallel architecture.
C.H.Chu (Center for Adv. Comput. Studies, Univ. of South-western Louisiana, Lafayette, La, USA), *E.L. Delp, L.H. Jamieson, H.J. Siegel, F.J. Weil, A.B. Whinston.* J. Parallel Distrib. Comput. (USA), vol.6, no.3, p.598-22 (June 1989).

Parallel processing is one approach to achieve the large computational processing capabilities required by many real-time computing tasks. One of the problems that must be addressed in the use of reconfigurable multiprocessor systems is matching the architecture configuration to the algorithms to be executed. This paper presents a conceptual model that explores the potential of artificial intelligence tools, specifically expert systems, to design an intelligent operating system for multiprocessor systems. The target task is the implementation of image understanding systems on multiprocessor architectures. PASM is used as an example multiprocessor. The intelligent operating system concepts developed here could also be used to address other problems requiring real-time processing. An example image understanding task is presented to illustrate the concept of intelligent scheduling by the intelligent operating system. Also considered is the use of the conceptual model when developing an image understanding system in order to test different strategies for choosing algorithms, imposing execution order constraints, and integrating results from various algorithms. (23 refs.)

2435 TUNEX: a knowledge-based system for performance tuning of the UNIX operating system.
B.Samadi (AT&T Bell Labs., Holmdel, NJ, USA).
IEEE Trans. Softw. Eng. (USA), vol.25, no.7, p.861-74 (July 1989).

TUNEX, an expert system developed for performance tuning of the UNIX operating system, is described. TUNEX was developed on UNIX system V. It uses the properties, commands and utilities of this version. The tuning activities it is concerned with include: (1) adjusting operating system tunable parameters, such as number of disk buffers; (2) running maintenance routines, i.e. reorganizing file systems; (3) developing operation rules, such as off-peak hour runs of backups; and (4) modifying hardware, buying an additional disk drive. The structure of TUNEX is presented and performance analysis modules which provide quantitative information to this tool are briefly described. The overhead in the resource usage introduced by the performance monitoring and tuning tool itself is discussed; the author points to the areas in which additional resources are required by TUNEX. (9 refs.)

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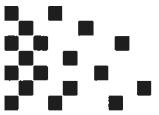

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ASSOCIATION FOR COMPUTATIONAL LINGUISTICS ACL CONFERENCE INFORMATION

January 1990

Preprations for ACL-90 well under way; 145 papers submitted

The 28th Annual Meeting of the ACL will be held 6-9 June 1990 at the University of Pittsburgh. The physical accommodations are particularly attractive and convenientl, with talks, exhibits and registration all in close proximity. Program and registration information will be mailed in late February. The Program Committee is being chaired by Bob Berwick [MIT AI Laboratory, Room 838, 545 Technology Square, Cambridge, MA 02139 USA; (+1 617) 253-8918; berwick@wheaties.ai.mit.edu]. Local Arrangements, including exhibits and demonstrations, are being handled by Rich Thomason [Intelligent Systems Program Cathedral of Learning 1004, University of Pittsburgh, Pittsburgh, PA 15260, USA; (+1 412) 624-5791; thomason@cad.cs.cmu.edu]. Tutorials are being organized by Dan Flickinger [Hewlett-Packard Research Laboratories, 1501 Page Mill Road, Palo Alto, CA 94304, USA; (+ 415) 857-8789; flickinger@hp.com.].

Coling-90 in Helsinki this August; New program Structure

COLING-90, the 13th International Conference on Computational Linguistics will take place in Helsinki, Finland, 20-24 August 1990. The conference will be divided into topical papers on crucial issues in computational linguistics and brief reports with software demonstrations. A strong emphasis is placed on controversial proposals and their resolution. Equal time will be given to presenting papers and discussing them. A description of the philosophy of the Program Committee is featured in the forthcoming issue of The FINITE STRING (Volume 15, Number 4) by the Program

Chair, Hans Karlgren [KVAL, Skeppsbron 26, S-111 30 Stockholm, SWEDEN; (+46 8) 7896683; coling@qzcom.bitnet or coling@com.qz.se]. Fred Karlsson is responsible for Local Arrangements [Dept of General Linguistics, University of Helsinki, Hallituskatu 11, SF-00100 Helsinki, FINLAND; (+358 0) 1911; (+358 0) 656591; coling@finuh.bitnet]. Conference management will be handled through Riitta Ojanen [Kaleva Travel Agency Ltd, Congress Service, Box 312, SF-00121 Helsink, FINLAND; (+358 0) 602711; (+358 0) 629019 fax]. Registration information should be requested directly form Ojanen or Karlsson. Proceedings will be available through the ACL Office after the conference.

5th European Chapter in East Germany in April 1991

The Fifth Conference of the European Chapter of the ACL will be held 9-11 April 1991 in East Berlin. The Program and Local Arrangements Committees will be chaired by Juergen Kunze and Dorothee Reimann [Akademie der Wissenschaften der DDR, Zentralinstitut fuer Sprachwissenschaft, Prenzlauer Promenade 149-152, DDR-1100 Berlin, GERMAN DEMOCRATIC REPUBLIC; (+37 2) 47 97 153 or 47 97 168; telex: 114713].

Berkeley Site Selected for ACL-91

The 29th Annual Meeting of the ACL will be held 18-21 June 1991 at the University of California in Berkeley. The Program Committee will be chaired by Doug Appelt [Artificial Intelligence Center, SRI International, 333 Ravenswood Road, Menlo Park, CA 94025, USA; (+1 415) 859-6150; appelt@ai.sri.com]. Responsibility for Local Arrangements will be shared by Peter Norvig [Division of Computer Science, University of California, 573 Evans Hall, Berkeley, CA 94720, USA; (+1 415) 642-9533; norvig@teak.berkeley.edu] and Bob Wilensky [Division of Computer Science, University of California, 517 Evans Hall, Berkeley, CA 94270, USA; (+1 415) 642-7034; wilensky@teak.berkeley.edu].

3rd Applied Conference Set for April 1992 in Italy

The 3rd Conference on Applied Natural Language Processing of the ACL will be hald 1-3 April 1992 in Trento, Italy. Oliviero Stock is Program CoChair and will be responsible for Local Arrangements [IRST: Istituto per la Ricerca Scientifica e Tecnologica, I-38100 Trento, Loc. Pante di Povo, ITALY; (+39 461) 810105; stock%irst@uunet.uu.net]. Lyn Bates will be Program CoChair [BBN Systems & Technologies Corporation, 10 Moulton Street, Cambridge, MA 02238, USA; (+1 617) 873-3634; bates@bbn.com].

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La revue Intelligence informatique, organe officiel de la Société canadienne pour l'étude de l'intelligence par ordinateur, est publiée quatre fois par an par le Conseil national de recherches du Canada depuis 1985. Elle renferme des articles de qualité dans le domaine de l'intelligence artificielle, tant au niveau théorique qu'expérimental, et encourage la publication de communications dans les domaines suivants: la représentation des connaissances, la compréhension des langages naturels, la vision computationnelle, les applications de l'intelligence artificielle, la programmation logique, la démonstration de théorèmes, l'apprentissage, la science cognitive, la résolution et la planification de problèmes, les langages et les outils de l'intelligence artificielle, la compréhension de la parole, les jeux, la portée philosophique et les fondements de l'intelligence artificielle. Trois numéros spéciaux ont été publiés en 1988: Forum : "An Inquiry into Computer Understanding" (février), "AI in France" (mai) et "Planning" (novembre). La revue est internationale tant par l'origine des auteurs qui y contribuent que par sa distribution et est rapidement en voie de devenir une publication de pointe dans le domaine de l'IA.

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