

NEWSLETTER / JUNE 1985

CANADIAN ARTIFICIAL 4 INTELLIGENCE

An official publication of CSCSI/SCEIO Canadian Society for Computational Studies of Intelligence/
Société canadienne pour l'étude de l'intelligence par ordinateur





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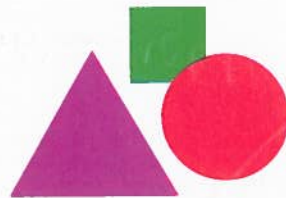
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NEWSLETTER
**CANADIAN
 ARTIFICIAL
 INTELLIGENCE**

An official publication of the Canadian
 Society for Computational Studies of
 Intelligence / Société canadienne pour
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Number 4, June 1985

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 Cover logo: Kathryn Finter
 Printing and Production Assistance: University of Toronto Press

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Canadian Society for Computational Studies of Intelligence

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

CSCSI/SCEIO is the Canadian society for the promotion of interest and activity in Artificial Intelligence. It conducts workshops and fully refereed national conferences, publishes this newsletter, sponsors the journal *Computational Intelligence*, and coordinates activities with related societies, government, and industry.

To join CSCSI/SCEIO, use the membership form in this issue. Non-Canadian members are welcomed.

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Canadian Artificial Intelligence Newsletter

Number 4 (New series)
June 1985

ISSN 0823-9339

The *Canadian Artificial Intelligence Newsletter* is published quarterly by CSCSI/SCEIO, and is a benefit of membership in the society.

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The *Newsletter* 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.

Please send submissions, either on paper or by network, to the editor or to your local *Newsletter* representative (see list on page 3). On-line submissions are preferred, but they should not contain justification spaces or hyphenated line breaks.

The *Newsletter* is published in March, June, September, and December. Material for publication is due on the 15th of the preceding month.

Please send changes of address to:
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Toronto, CANADA M5T 2Y1

Should CSCSI/SCEIO Attempt to Influence National Policy?

Gord McCalla
President, CSCSI/SCEIO

A number of people have suggested to me that CSCSI/SCEIO should take a more active role in providing input to government and industry policy decisions in areas affecting and affected by AI. This issue was raised, as well, at last year's CSCSI/SCEIO conference in London, with the bulk of the comments indicating that we shouldn't take a more active role in such matters.

What do we do currently which affects policy decision making? Not much, at least directly. We provide information to government and industry through *Canadian Artificial Intelligence* (which is distributed to a number of relevant federal and provincial government departments). We occasionally embark upon special projects, such as the 1984 McCalla / Cercone inventory of Canadian AI skills and attitudes (and its spin-offs). We host a biennial conference and the occasional workshop where AI practitioners and others can get together and exchange knowledge and opinions. These are relatively passive contributions, as befits our past status as a loose amalgamation of AI academics.

Unfortunately or fortunately, times are changing. A great clamoring for AI has begun to reverberate through the land, and with or without CSCSI/SCEIO participation, promises will be made for AI which will affect all of us. Is there any way we as an organization can respond? Can we act as a voice of reason in the great technology debates sweeping the country? Can we make our knowledge available to all of those who seem to want it? Do we want to?

I have considered a number of possible responses, some of which I outline below.

1. Do nothing new

CSCSI/SCEIO might do nothing more than it is already doing. We could continue to act as a passive repository of knowledge and skills, holding

our various meetings and communicating through *Canadian Artificial Intelligence*. This is a safe course, and one which smacks of integrity. While all around us are losing their heads, we continue to steadfastly pursue our various objectives confident that "truth" will eventually triumph.

This is appealing, but has the drawback that in real life virtue does not always triumph. Decisions are going to be made in the name of AI which we are all going to have to live with. If these decisions aren't made with the input of reputable AIers, the consequences might be disastrous. I can certainly vividly remember the days when all of AI was rejected and despised because a few early AI researchers had made some overconfident predictions as to AI's potential for success. It could easily happen again; I suspect that the nay-sayers are biding their time, waiting for their chance.

2. Try harder

CSCSI/SCEIO could continue to do much as it is doing now, but could try harder to translate our science to government and industry. This could include periodic updates to the McCalla / Cercone inventory (and a more formal methodology for collecting the information). It could involve holding CSCSI/SCEIO-sponsored tutorials and workshops for non-AI professionals. It might be possible to set up a person or a committee which would try to put government and industry people in contact with AI people who might be able to help them (or vice versa).

These steps are appealing, but there are potential problems. First, CSCSI/SCEIO would need to figure out some way of making sure that the people who carry out these various activities bring to their task as unbiased a perspective as possible. I know that when Nick Cercone and I put together our resource inventory, we couldn't do justice to everybody simply because of our own idiosyncratic knowledge of the Canadian AI scene. (Of course, more of you could have answered the questionnaire!) This raises the second and most major difficulty in carrying out these activities: how to we get anybody (reputable or not) to do them? It is difficult enough in

a small society like ours to carry out the tasks we currently have set for ourselves without adding time-consuming new duties. Anybody out there like to volunteer?

The final hurdle is money to finance these new activities. We are chronically strapped for funds now; these new activities would have to be self-supporting in a big hurry or we couldn't afford them. This does seem possible, however; these activities could even be a big money raiser if done right, both for the society and for the individuals carrying out the duties.

3. Be a professional society

CSCSI/SCEIO could move in the direction of becoming a professional society, complete with accreditation, professional discipline, periodic reviews of the status of each of its members, etc. We could start to try to formally lobby for the "AI point of view" in Ottawa and elsewhere.

This emphatically does not appeal to me. Apart from the impossibility of defining what AI is, apart from the incredible variety of perspectives of CSCSI/SCEIO members, apart from the probable violation of various sections of the charter of rights, it seems to me totally inappropriate to CSCSI/SCEIO's *raison d'être*. Even if it were desirable, we don't have the resources nor people to embark on such a major enterprise. I only raise this suggestion because in some of my discussions with various AI people there seems to be a hint of this perspective. I cannot see CSCSI/SCEIO trying to impose any set of philosophies on its members or the world at large.

I am sure that there are many other ways that CSCSI/SCEIO could begin to try to impact policy decisions affecting AI in Canada. I would be interested in hearing your suggestions as to how or whether we should move in this direction. Send those cards and letters to the editor; he'll welcome them with open arms, I'm sure. □

Be in the Canadian AI Business Directory

The September issue of *Canadian A. I.* will contain a directory of Canadian AI businesses. We are especially interested in including startups and small software or consulting companies. If you have an AI business that is not yet known to us, please send the following details to the editor by 10 August: Business name, address, and phone; name of proprietor; list of products or services.

CSCSI/SCEIO Annual General Meeting

The CSCSI/SCEIO annual general meeting will be held at IJCAI-85 in Los Angeles this August. It is tentatively planned for Thursday 22 August, just after the morning session, and just before the free half day that is scheduled for Thursday afternoon. It shouldn't take more than an hour, so you should still have time to enjoy the half day off. Plan to attend. Tell your friends.

Gord McCalla, President

Letters to the Editor

Good iterations!

Regarding reviewable works mentioned in March issue *Canadian A. I.* Please place me on your list of potentials. Quite enjoyed the astute Thoreau-ness.

Lamarck's lament, "Does the ontology of carbon intelligence recapitulate the silicon phylogeny of inform-a-to-z-tion?"

*O. Puck, Synergic Strategist
Vizzion Vizars
575 Pape Avenue, # 3A
Tellurian Toronto M4K 3R5*

I just saw a copy of the CSCSI/SCEIO *Newsletter*, and found it very nice. It makes AI fun again!

*Sharon Salveter
Boston University*

Erratum

In the supplement to the March issue, "Towards a Canadian Fifth Generation Research Plan", several words were inadvertently omitted from the "Conclusions" section on page 13. The third bullet point under the heading should have read as follows:

- A direct-costs budget of very roughly \$10 million per year would be appropriate, bearing in mind the success rate in completion, which may lie in the 30-50% range, and the additional requests for funds which do not appear in this report but which will emerge once funding is available. . . .

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Newsletter

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Assemblée Générale Annuelle
du CSCSI/SCEIO

L'assemblée générale annuelle du CSCSI/SCEIO se tiendra à IJCAI-85 à Los Angeles, au mois d'août. Officieusement, elle aura lieu le jeudi 22 août, suivant la session du matin et juste avant la demi-journée prévue pour jeudi après-midi. Elle ne devrait durer plus d'une heure, de sorte qu'il vous sera possible de jouir du reste de la journée. Soyez-y! Parlez-en à vos amis.

Gord McCalla, Président

L'échéance pour le numéro
de septembre est le 15 août.

Canadian Artificial Intelligence Conference

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Montréal, Canada

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CONFERENCE LOGO BY KATHRYN FINTEK

Call for papers

Canadian Artificial Intelligence Conference 1986

CSCSI-86, the Sixth National Conference of CSCSI/SCEIO, invites submission of theoretical and applied research papers in all areas of Artificial Intelligence research, particularly those listed below:

- Knowledge Representation
- Expert Systems and Applications
- Natural Language Understanding
- Social Aspects of AI
- Logic Programming and Formal Reasoning
- Robotics
- Planning, Problem Solving, and Learning
- Cognitive Science
- AI Architecture, Languages, and Tools
- Computer Vision

All submissions will be fully refereed by the program committee. Authors are requested to prepare full papers of no more than 5000 words in length and specify in which area they wish their papers reviewed. All papers should contain concise clear descriptions of significant contributions to Artificial Intelligence research with proper references to the relevant literature. Figures and illustrations should be professionally drawn.

Three copies of each submitted paper must be in the hands of the Program Chairman by 31 December 1985. Electronic submissions are, unfortunately, not acceptable. All accepted papers will be published in the conference proceedings.

Correspondence should be addressed to either the General Chair or the Program Chair, as appropriate.

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AI Research and Politics

Government Research Spending Won't Increase as much as Promised

The Canadian federal Minister for Science and Technology, Dr. Thomas Siddon, recently announced that the government would not meet the goal, promised in last year's election campaign, of doubling its spending on research and development during its first term of office. However, the government would still like to increase spending considerably, he said.

Canada presently spends about 1.24 percent of its gross national product on research, about \$5.35 billion this year.



Dr. Siddon

Dr. Siddon said that the government would like to increase this to closer to the level achieved by other large industrialized countries, which is between 2.0 and 2.5 percent. In March, Dr. Siddon announced a \$20 million increase in the current year's budget of

the Natural Sciences and Engineering Research Council; the money will be used to award additional university research equipment grants.

In response to a question by Michael Cassidy, the NDP science critic, Dr. Siddon later told the Commons that he had never promised to double R&D spending, but merely to increase it to the level in comparable countries.

The Globe and Mail said that the promise was made on 3 May 1984 by Dr. Siddon when he was opposition science critic. It appeared in PC party campaign handbooks, and was mentioned by Mr. Mulroney in speeches.

Canadian Talent Shortage

Canada is dangerously short of research talent, according to a report released last month by the Natural Sciences and Engineering Research Council (NSERC).

The report, entitled *Research Talent in the Natural Sciences and Engineering*, said that talented researchers in applied sciences and

engineering are in world-wide demand, and Canada is in danger "of losing the already limited talent being trained here to other countries".

"Everyone thinks of increasing money for research; no one thinks about the talent required to do the research," Dr. Gordon MacNabb, president of NSERC, said.

Canada's present output of postdoctoral researchers will barely fill research openings between now and 1990 at current levels of spending on R&D, said the report. If the level were increased from 1.24 percent of the GNP to 1.5, Canada would be short by thousands of researchers in all fields of science, especially applied science, engineering, physical sciences, and mathematics.

There are presently 28,430 (full-time equivalent) researchers in science and engineering in Canada, an increase of 10,000 in the last ten years, the report said.

Between a quarter and a third of graduate degrees awarded in Canada go to foreign students obliged by law to then leave the country. When all factors are considered, the net gain to the Canadian labour force is expected to be about 2,000 people with masters degrees and 850 with doctorates in science and engineering each year between now and 1990. The U.S., although only 10 times the size of Canada, has an annual net gain of 20 times as many doctoral-level researchers.

In considering short-term solutions to the problem, the report was pessimistic. Neither 'occupational mobility' nor immigration of foreign-trained researchers were adequate solutions. There are not enough people in Canada with suitable training who aren't already in research for occupational mobility to be a solution, and the world-wide nature of the shortage makes it hard to get trained people from other countries.

The report suggested that it could be made easier for foreign students, at least those from developed countries, to remain in Canada after finishing their education. The report noted that were it not for foreign student participation, many university departments would have difficulty maintaining their present research programs.

AI Opposition to "Star Wars" Research

Members of the Canadian AI community have been prominent in the opposition to Canadian participation in the research phase of the U.S.

Strategic Defense Initiative (SDI or "Star Wars").

A petition initiated by AI researcher Ray Reiter of the Department of Computer Science, University of British Columbia, has been signed by more than 750 engineers and scientists in Canada, and 250 more are anticipated. The petition asks the government not to involve Canada in SDI, and says that the signatories are not willing to be involved in any SDI-related research should the invitation be accepted.

The petition claims that SDI will escalate the arms race, and that it violates the 1972 U.S.—U.S.S.R. anti-ballistic missile treaty.

A similar petition was signed by 40 members of the University of Toronto Computer Science Department, including a large proportion of AI faculty and students. A petition circulated at McMaster University was signed by 650 people, including the university president, Alvin Lee.

There is apparently no organized pro-SDI movement in the scientific community.

The government was originally asked by the U.S. to decide by late May upon participation in the research phase of SDI. However, this deadline has been removed, and the government now intends to delay the decision until the fall, in order to allow for more public comment and debate. In addition, it has appointed Arthur Kroeger, a senior civil servant, to report by the end of June on all aspects of the invitation.

Both opposition parties want Canada to decline the invitation, as France, Australia, and Norway have already done. □

Magnum, P. I., and the AI researcher

*John Tsotsos
University of Toronto*

On occasion (dare I say it!), I watch *Magnum, P. I.* on television.

A recent episode focused on an AI researcher, who was under contract to the military to develop some software. It seems that he was being hounded by the Russians because of his expertise. Anyway, Magnum came to the rescue of the guy's wife, a friend of Magnum's, in order to try and ensure that this AI genius would not be harmed.

At one point, Magnum picked up a publication of the researcher's to read titled "Goal-Directed Analysis of the Infinite Loop", and the

guy's wife proudly pointed out to him that her husband was an acknowledged leader in the field because of that paper. This guy, it seems, while under contract to the military, developed a "formula" for something or other, that would tip the balance of power for whichever side had access to it. After the usual murders, car chases, etc., the U.S. military caught up with him in a safe place and he handed over his formula, scribbled on an 8½-by-11 piece of paper. The military's AI expert, a naval officer and willowy blonde, who doubled as a spy disguised as a call girl, took one look at it and exclaimed "This is obsolete!!", much to the surprise of the AI researcher and Magnum.

Later, Magnum challenged our AI genius on this. You see, Magnum had hypnotized his wife, who had a photographic memory, in order to find out what the Russians were after, and she revealed the formula to Magnum—"3 bracket prompt semicolon"—and this was not the formula that the AI genius gave to the military.

Then our AI hero revealed to Magnum that he purposely gave the wrong formula to the military. He had decided that the world was not ready for his invention and that it would be better off without it.

Thus ended Magnum's introduction to AI. □

P. S. Mueller



SEMINAR on ARTIFICIAL INTELLIGENCE

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Canadian Robotics Research Inventory

A report to the National Research Council (NRC) says that Canada has significant and high-quality research in robotics. The report includes an inventory of the Canadian laboratories involved in R&D in robotics and related areas. University, government, and industrial labs are included.

The report was prepared by the Robotics and Automation Laboratory of the Department of Mechanical Engineering, University of Toronto and the Ontario Robotics Centre, Peterborough, Ont., under the direction of Prof. Andrew Goldenberg.

The survey team "was impressed with the quality of robotics-related work being conducted across Canada," the report said. "The potential which exists at some of the centres is considerable."

The report pointed out that Canada does not fund robotics research to the extent that other countries participating in the Joint Co-ordinating Forum on International Co-operation in Advanced Robotics do. It called for more effective funding for the "world-recognized successes in both industry and academia". One well-known Canadian robotics project is the space shuttle's 'Canadarm', built by Spar Aerospace of Toronto.

The report is expected to be available from NRC shortly. □

Halifax Workshop on Theoretical Approaches to Natural Language Understanding

As this issue of *Canadian A.I.* went to press, the Workshop on Theoretical Approaches to Natural Language Understanding, sponsored by CSCSI/SCEIO, was being held at Dalhousie University, Halifax. A full report will appear in the next issue.

New Bindings

Bob Mercer, from University of British Columbia to University of Western Ontario.

Stephen Regoczei, from University of Toronto to Trent University.

Ray Reiter, from University of British Columbia to University of Toronto.

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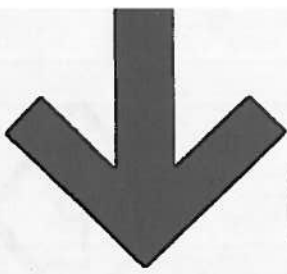
The English Machine

The English Machine is an artificial intelligence starter kit which allows non-technical users to operate BASIC programs with plain English. The kit includes a grammar preparation editor and an English language parser.

The English Machine reduces the need for user training. It is an innovative alternative to menu driven programs. It employs many of the same principles as much more sophisticated artificial intelligence programs.

The English Machine allows you to interface with up to 40 BASIC subroutines using a vocabulary of up to 150 words. It has a dynamic grammar which allows you to change the interface without changing the code. (List Price: \$149.95)

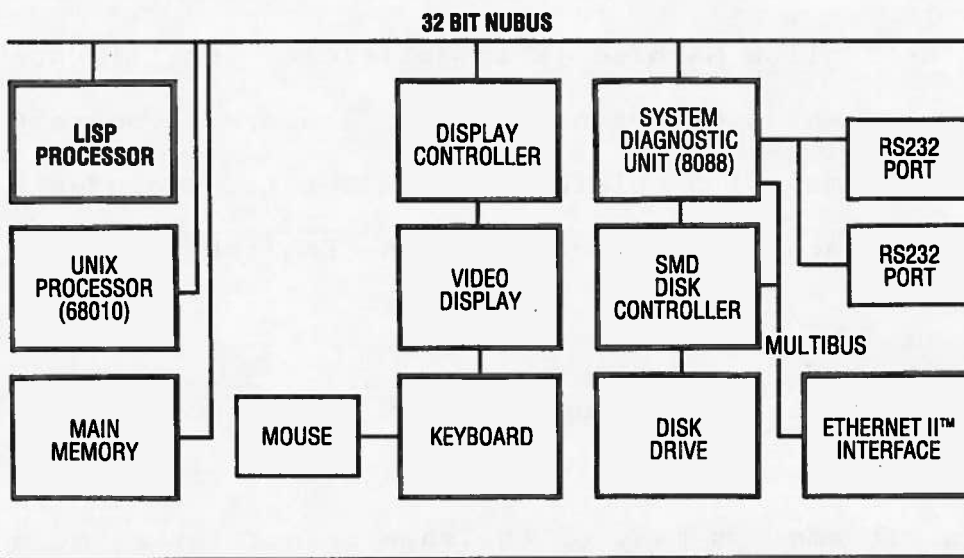
Requirements: IBM PC with 64K (96K with DOS 2.0), and one disk drive.



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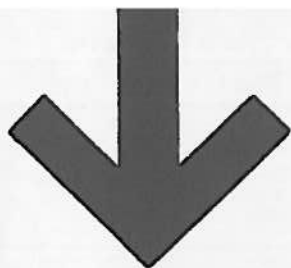
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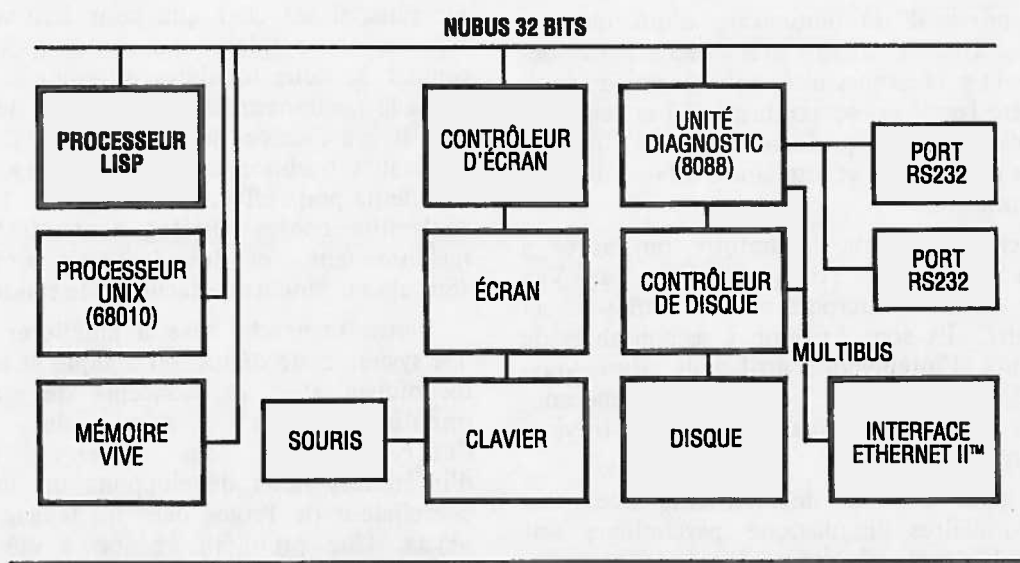
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INCOGNITO:

Laboratoire d'informatique cognitive, Université de Montréal

Guy Lapalme
Département d'informatique et recherche
opérationnelle
Université de Montréal

Le but principal du laboratoire d'informatique cognitive est de réunir les recherches des étudiants et professeurs intéressés au génie cognitif. Il a été fondé en septembre 1983 et regroupe actuellement cinq professeurs ainsi qu'une vingtaine d'étudiants et étudiantes à la maîtrise et au doctorat.

Les chercheurs du laboratoire ont accès à plusieurs interprètes Prolog et Lisp sur Vax 750/780 ou sur microordinateurs (IBM-PC et Macintosh). Ils sont également responsables de deux cours d'intelligence artificielle: l'un sous-gradué et l'autre gradué. Un séminaire hebdomadaire est consacré exclusivement aux travaux reliés à Incognito.

Des gens d'autres départements avec des intérêts similaires (linguistique, psychologie, sciences de l'éducation) y participent en plus des informaticiens.

Intérêts de recherche des professeurs responsables

Jean Vaucher

Nos intérêts de recherche tournent autour de deux méthodes de représentation des connaissances: les représentations par objets et les représentations logiques. Notre département est un des pionniers en Amérique du Nord pour l'utilisation de la programmation orientée-objet. Depuis près de 15 ans, nous utilisons Simula, le prototype dans le domaine, pour concevoir des environnements pour la simulation, le graphisme, et les banques de données. Nous sommes convaincus de la puissance du concept pour l'expression naturelle de divers types de connaissance et nous voulons étendre nos interprètes

logiques dans cette direction.

D'autre part, la logique est un formalisme privilégié pour l'expression des connaissances par le biais d'affirmations et de règles de déduction. Cependant notre expérience avec Prolog a démontré certaines lacunes des représentations logiques du point de vue de l'efficacité du traitement et de la structuration des connaissances. De plus, il est clair que pour être un assistant efficace, un système expert doit pouvoir fonctionner de deux manières différentes: d'une part il y a le raisonnement (la recherche de solution), puis il y a l'action qui en découle. Les langages impératifs traditionnels (Pascal, Lisp, etc.) sont excellents pour effectuer des actions, les langages déclaratifs comme Prolog sont idéals pour le raisonnement, et les langages orienté-objets (Simula ou Smalltalk) facilitent la modularité.

Notre recherche vise à améliorer l'efficacité des systèmes de déduction logique et intégrer ces techniques avec les concepts de structuration orientés objets. Afin de permettre l'expérimentation des diverses techniques d'inférence, nous développons un interprète / compilateur de Prolog dans les langages orientés objets. Une première version a été écrite en Simula et nous avons l'intention d'en implanter une deuxième version en Smalltalk sur Xerox Dandetiger au courant de l'été 1985. Un langage comme Simula fournissant la gestion dynamique de l'espace mémoire et le "garbage collection", les algorithmes d'inférence s'en trouvent simplifiés; de plus, le fait que les objets se comportent comme des coroutines facilite l'expression d'algorithmes de recherche parallèle. Parmi les techniques que nous allons étudier, il y a le "backtrack" intelligent ainsi que l'analyse dynamique des alternatives et l'ordonnancement des buts en conséquence ("foretrack")

Summary

*AI and Cognitive Science
at the University of Montreal*

Group interests include logic programming, humanities applications, deterministic parsers, game-playing, scene analysis, and object-oriented programming.

intelligent). Dans un autre ordre d'idée, nous allons combiner les objets et la logique sous la forme d'affirmations de propriétés de classes d'objets.

Paul Bratley

Nous nous intéressons à toutes les applications de l'informatique dans les humanités: littérature, linguistique, musique, beaux-arts, etc. A l'Université de Montréal nos activités dans ce domaine concernent surtout le traitement de textes littéraires. Avec Serge Lusignan de l'Institut d'études médiévales, je dirige un Laboratoire de traitement de textes qui fournit des services à plusieurs clients d'autres départements. Actuellement nous avons des projets en cours impliquant le traitement de textes en ancien français, en latin, en grec, en bouroushaski, ainsi qu'en français moderne.

Ceci implique que nous faisons des efforts pour développer et mettre en production des logiciels spécialisés. Le logiciel JEUEMO pour la production de listes de vocabulaire et de concordances, développé au Laboratoire, est utilisé pour l'enseignement et la recherche dans les humanités ici, à Paris, et à Madrid. COMPO, un logiciel pour la photocomposition, est utilisé à Montréal et a été adopté par une compagnie commerciale suisse. Actuellement un logiciel pour le dépistage de textes entiers, FATRAS, subit des tests au Laboratoire avant d'être distribué. Nous nous intéressons également à la représentation, l'organisation, et l'utilisation des connaissances pour construire des systèmes experts, des logiciels pour applications linguistiques, et d'autres programmes faisant preuve d'une certaine "intelligence". Bien sûr, il existe des liens étroits entre les techniques utilisées pour traiter les langues naturelles dans ce domaine et celles qui servent aux fins littéraires.

Guy Lapalme

Etude du Français Fondamental: Nous nous intéressons à l'implantation sur ordinateur du sous-ensemble du français qu'est le Français Fondamental. Il consiste en un vocabulaire et une sélection des règles de grammaire qui permettent à un étranger de comprendre environ 80% des phrases courantes. Nous voulons expérimenter avec cette approche qui devrait faciliter l'implantation d'interfaces usagers en langue naturelle.

Analyseurs déterministes: Marcus a développé une méthode d'analyse déterministe (sans retour-arrière) pour les langues naturelles. En

collaboration avec Jean-Yves Morin du département de linguistique, nous voulons développer un environnement d'expérimentation pour des analyseurs dérivés de ces principes.

Correction automatique de textes en français: Il y a déjà quelques travaux qui ont été effectués dans ce domaine en anglais, mais ils reposent en grande partie sur la recherche dans des dictionnaires. Les résultats s'expriment en une liste de mots qui sont jugés douteux car ils n'ont pu être trouvés dans le dictionnaire. Nous-mêmes, avons effectué quelques travaux en ce sens en français qui ont donné des résultats surprenants malgré la simplicité de l'approche et la petite taille des dictionnaires. Toutefois, des lacunes sont apparues au niveau du traitement des fautes de grammaire, où il s'agit de bien faire accorder les mots entre eux et non seulement d'aligner des mots dont l'orthographe est correcte, hors de tout contexte. Nous comptons nous attaquer au problème des fautes de grammaire. Nous sommes pleinement conscients que résoudre ce problème dans toute sa généralité est pour l'instant un but assez lointain. Toutefois, nous croyons qu'en nous limitant à certains problèmes précis et en nous attaquant à ces problèmes par étapes, nous devrions en arriver à traiter des textes simples du niveau rencontré dans les lettres d'affaires.

Programmation logique: Nous utilisons Prolog dans le cadre de nos projets sur le traitement des langues naturelles. Nous aimerions également explorer son application dans d'autres domaines connexes: graphisme, compilation, génération de tableaux (style VISICALC), intégration à d'autres langages, etc.

Scrabble par ordinateur: Au cours des dernières années, nous avons développé Athena qui est un joueur champion de scrabble duplicate et nous continuons à l'améliorer. Nous voudrions également le transporter sur d'autres machines, des micros entre autres. Nous nous intéressons également à d'autres jeux de vocabulaires (mots croisés, boggle, Jarnac, etc.) en utilisant la même liste de mots.

Michel Boyer

Nos intérêts de recherche touchent des domaines relevant de l'intelligence artificielle dont la programmation logique et le traitement des langues naturelles (analyse, représentation de contenu, génération). Ces intérêts se concrétisent dans les projets suivants:

- Génération de phrases à partir de réseaux sémantiques en utilisant des modèles de la théorie Sens-Texte de Mel'čuk.

- Construction en Prolog d'un générateur d'analyseur syntaxique lui aussi en Prolog; l'idée est de s'inspirer des grammaires syntagmatiques généralisées pour spécifier un programme d'analyse en restant dans un formalisme relativement près de celui auquel le linguiste est habitué. Nous sommes aussi impliqués dans un projet d'analyse de scène où la segmentation se fait en s'appuyant sur des connaissances a priori de caractéristiques de la scène analysée (méthodes d'IA).

Jean-François Lamy

Nos activités portent principalement sur la programmation orientée-objet. Cette méthodologie de programmation a plusieurs intérêts. Elle est un outil approprié pour la réalisation de gros systèmes pour lesquels les spécifications sont floues ou changeantes. La grande modularité permise par les langages objets permet de procéder par voie de prototypes facilement modifiables. De tels systèmes sont très courants en intelligence artificielle. De plus, les langages orientés-objet offrent certains mécanismes de représentation des connaissances utiles pour ces applications. Cette méthodologie a été appliquée à la réalisation d'un mécanisme d'inférence pour le langage Prolog. Cet interprète, vu sa flexibilité servira à expérimenter avec diverses stratégies d'accélération de l'exécution de programmes logiques. Ce travail nous a permis de mieux percevoir certaines des faiblesses des langages de programmation logique. On peut leur reprocher en particulier leur manque de modularité et la nécessité de se fier à des conventions pour réaliser l'indépendance vis-à-vis des structures de données. Un langage de programmation-objet dans lequel les interactions entre objets seraient exprimées sous forme de règles logiques serait extrêmement intéressant. □

Company Reports

Applied AI Systems, Inc.

Takashi Gomi
President, Applied AI Systems, Inc.
Kanata, Ontario

Applied AI Systems, Inc., was established and

incorporated in January 1983. Since then the company has been actively engaged in research and in projects directly associated with artificial intelligence.

The company's principal aims are:

- to contribute to the establishment of an industry base for AI technology in Canada;
- to produce and market computer systems and software packages using state-of-the-art R&D in AI;
- to offer intensive tutorials on knowledge-based system development and AI theory.

Applied AI Systems offers broad competence in knowledge-based systems, and is dedicated to the application of leading-edge AI theory to practical problems in business, industry and government.

- The company develops expert systems and other AI systems such as natural language interfaces and intelligent dialogue systems.
- It provides domestic and international consulting services in AI.
- It is a dealership for micro-PROLOG, APES (an expert system shell) and Golden Common Lisp.
- It offers application-oriented education in AI, through intensive public courses and in-house tutorials.

The objective of Applied AI Systems is to be an application-oriented company. The staff at Applied AI Systems has extensive business and industry experience in system development. It can offer its clients access to the most recent developments in AI because it relies on consultations, education and advice from world-renowned experts in AI. Company members of Applied AI Systems travel extensively throughout the world, maintaining a close relationship with other experts in AI.

Consulting: The company provides domestic and international consulting services. It aids in the selection, acquisition, and customizing of AI software.

Expert system development: Through the knowledge acquisition phase to the installation of an expert system, the company offers a broad range of experience. The company for the past two years has been developing a set of expert systems for the Department of Communications as part of their satellite program.

Education: Through seminars and tutorials, Applied AI Systems attempts to give the participant both the theoretical and practical aspects to AI. It takes pride in acquiring world-class experts

in their field as lecturers. It offers complete in-house training in AI, taking the participants through the introduction to AI through to building expert systems and natural language interfaces.

As well as qualified regular staff with extensive business and industry experience, Applied AI Systems maintains advisory and consultative status with some world-renowned experts in AI:

- Professor Franz G. Oppacher, Carleton University, Ottawa, is involved in research in natural language.
- Dr. Peter Hammond, Imperial College, London, is associated on a consulting and lecturing basis.
- Professor Tom Carey, University of Guelph, Ontario, works on the design of intelligent interfaces.
- Professor Alan Robinson, Syracuse University, New York, is a lecturer and advisor on theoretical matters behind Fifth Generation developments.
- Dr. James Naughton, President of Expert Knowledge Systems, lectures for Applied AI Systems and provides assistance on knowledge acquisition techniques.
- Professor David Thomas is associated with Applied AI Systems in an advisory capacity.
- Professor Randy Goebel, University of Waterloo, is an internationally recognised Canadian researcher in logic programming.
- Professor Drew McDermott, Yale University advises on AI theories.
- Professor Kenneth Bowen, Syracuse University, is an advisor to Applied AI Systems. □

AI Software

Logicware's MPROLOG Takes Off

Ian MacLachlan
Vice-President, Marketing
Logicware Inc., Toronto

MPROLOG is rapidly replacing Lisp as the top-

selling artificial intelligence language in North America.

We at Logicware have sold about 500 MPROLOG systems—most of them for commercial applications—since we entered the U.S. market last July. We concluded earlier this year that we must be the market leader in logic programming and we are pleased to see that this has now been confirmed by an independent editorial source.

The April issue of *Artificial Intelligence Newsletter* (AIM Publications Inc., Natick, MA), puts Logicware at the top of all AIM's four categories of AI-language vendors for 1984 with 51% of the "Independents (High End Hardware)" sales by dollar value.

U.S. industry, commerce, and the federal government have endorsed and are using logic programming. Those who decide on corporate or government expenditures are more likely to favor an AI language which is uncomplicated. This pattern is increasingly apparent, day by day.

Lisp, without a doubt, is a powerful language but it is far from simple to teach and therefore to learn. As yet, there is no standardization for it, for example. Meanwhile, there is a remarkable surge in the number of managers who want to take advantage of expert systems. This, in turn, has intensified the need for experienced programmers. As a result, decision-makers are buying MPROLOG because, in addition to other benefits, it is easier to learn than Lisp and, over-all, costs less.

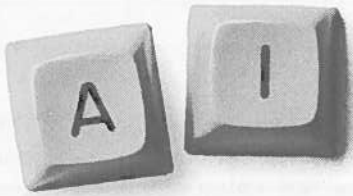
Sales of MPROLOG, particularly since last November's introduction of PC versions, now are running far ahead of Logicware's forecasts. MPROLOG's portability and ease of learning and application have made it the number one AI language in less than a year.

MPROLOG operates in a number of computer environments including:

- IBM: VM/CMS, OS/MVS/TSO, and PC/DOS;
- DEC: Vax/VMS and Vax/Unix;
- AI work stations: Tektronix 4404, Sun, Charles River, and other M68000/Unix.

Other versions under development include additional M68000-based workstations and selected Lisp machines. MPROLOG prices range from \$CDN975 for small machines, to \$7,500 for workstations, \$25,000 for Vaxes and Lisp machines, and \$32,000 for IBM mainframes. Rental programs are available for the high-end systems.

In addition to its head office in Toronto (Downsview), Logicware has offices in Los Angeles, Atlanta, and Boston. □



The keys to Artificial Intelligence are at Xerox.

The Xerox 1108 Series of Artificial Intelligence Workstations provide an affordable, high-performance line of personal computers in an integrated, interactive environment that greatly enhances programmer productivity.

- High resolution graphics display
- Interactive user interface
- Ability to mix interpreted and compiled code
- Multiprocessing capacity
- Support of an extensible, interpreted language
- Display-oriented programming tools
- Local area networks and data communications through XEROX ETHERNET
- 8 Mbytes virtual memory

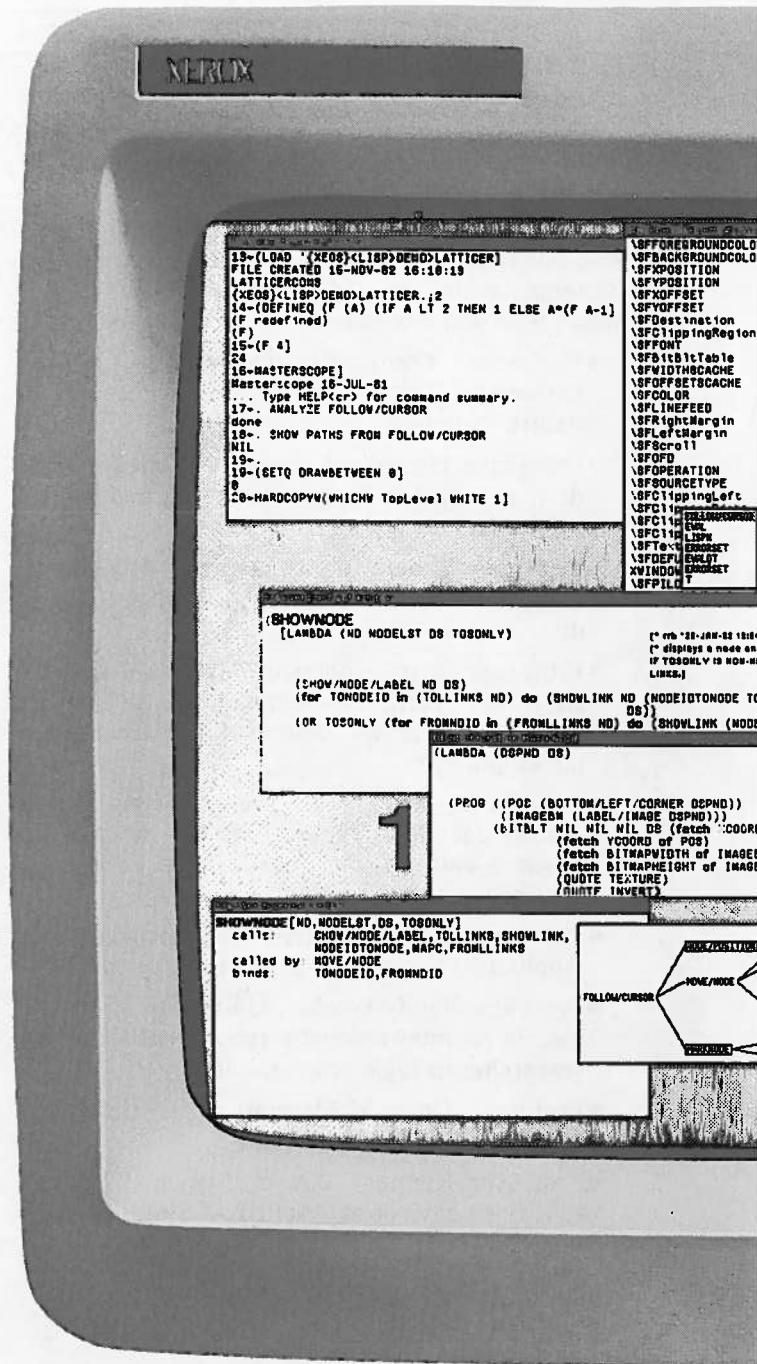
Power Tools for Programmers

1. Display Editor and Inspector

The display-based structure editor allows the interactive editing of programs and other list data. Structure-based editing exploits the form of an object, emphasizes the meaning of its parts, and thus reduces errors. The data inspector extends the philosophy to both system and user data types, allowing easy inspection and modification of any object in the system.

2. Programmer's Assistant

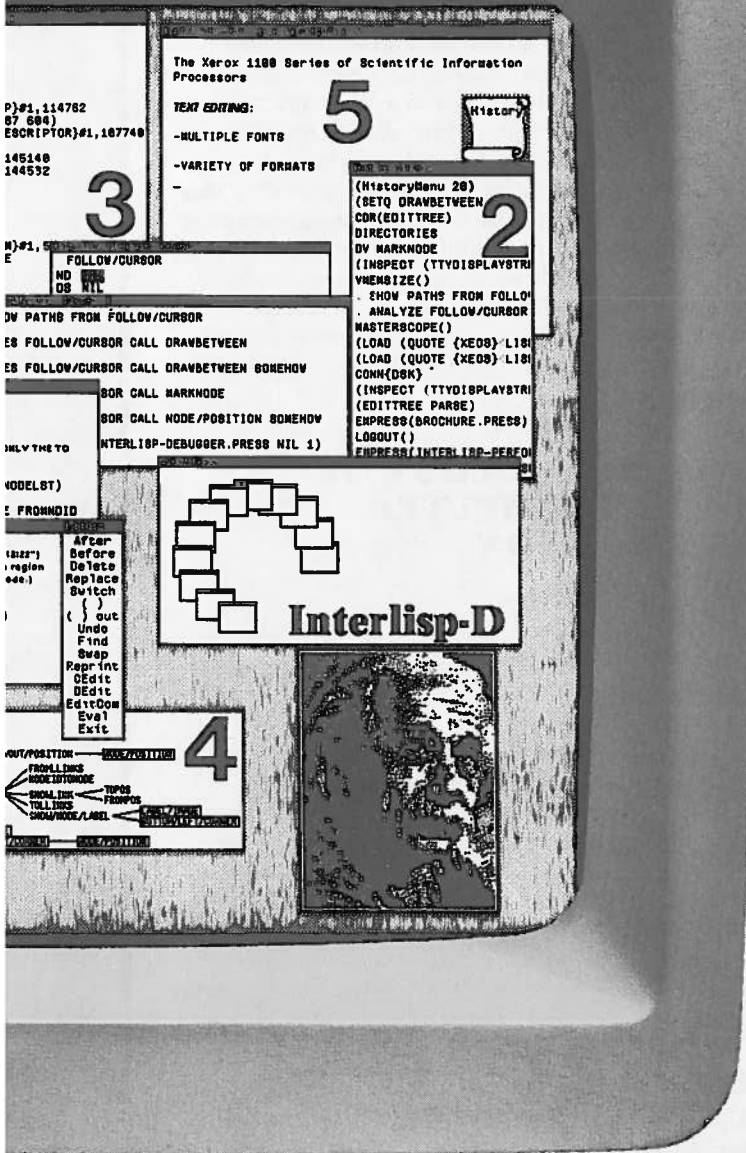
The Programmer's Assistant provides an intelligent assistant and bookkeeper that frees the programmer from much mundane detail. The Programmer's Assistant includes an error analysis capability and also monitors and records all user inputs. For example, a history is kept of the commands typed, their side-effects, and the results. Thus, one can request that a previous command or sequence of commands be repeated, modified and then repeated, or even undone (which undoes all the changes it may have caused). Also



provided is a spelling corrector that automatically corrects spelling mistakes using information from the local context. To simplify file management for the programmer, Interlisp-D automatically keeps track of where in the file system each object is stored and which ones have been modified. In response to a simple request, the system can therefore save the user's state, updating all changed files automatically. The Programmer's Assistant provides a programming environment which cooperates in the development of programs allowing the user to concentrate on higher level design issues.

3. Debugging Tools

Debugging tools allow the user to break and trace



the program's structure and assist in the process of making modifications automatically. Because MasterScope is interfaced with the file package and editor, it re-analyzes a program whenever it is modified. Information about program calling structure, variable and data structure usage, and side effects can be graphically displayed and used to provide a map or browser for the system. The same information can be used to make systematic changes automatically. Further, Interlisp-D's measurement tools can be used to analyze the behavior of a system after it has been developed to pinpoint those areas that may need improvement.

5. A Professional Workstation

A high bandwidth user interface is provided by combining the mouse and the high resolution display. The mouse permits the user to specify and manipulate positions or regions on the screen. The interactive display facilities include complete raster graphic functions as well as a display management system supporting multiple overlapping windows, menu driven selection of operations, and a wide range of built-in graphical abstractions. Functions are also provided to display text in multiple fonts, manipulate raster images, and draw spline curves. The large format, high resolution display and the sophisticated multiple window system allow concurrent sessions, close-up views, and simultaneous displays of multiple representations of complex data. It is easy to create windows with text, graphics, or both and to make them scroll, update and interact in useful ways with the end user.

6. Knowledge Programming System (Optional)

LOOPS extends the programming environment to provide a powerful tool for research and expert system development. LOOPS combines four programming styles:

- Procedure-Oriented
- Data-Oriented
- Object-Oriented
- Rule-Oriented

Xerox Canada Inc.

Advanced Systems Group
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arbitrary functions, and examine the state of the machine at any desired level of detail. Not only can the state of a suspended computation be displayed and perused graphically, but it can be manually unwound to a specified point, the offending program edited, and execution resumed, all without loss of state. Also included is the capability of specifying complex, user-defined intervention conditions, such as allowing breaks only when a given function is called from another given function. These debugging tools allow bugs to be tracked down quickly and easily.

4. Program Analysis

The Masterscope facility can analyze a user's program and use that information to answer questions, display

NEW JOURNAL

HUMAN-COMPUTER INTERACTION

Thomas P. Moran, Editor
Xerox Palo Alto Research Center

How does computer system design affect the user? This new quarterly journal explores the theoretical, empirical, and methodological issues underlying user psychology and system design. Its approach will be interdisciplinary, sifting the best research and design work from diverse areas (computer science, psychology, AI, human factors, man-machine systems) into a distinct new field of human-computer interaction. Write for further information. Individual subscriptions are \$25.00, prepaid.

NEW

RETRIEVAL AND ORGANIZATIONAL STRATEGIES IN CONCEPTUAL MEMORY:

A Computer Model

Janet L. Kolodner
Georgia Institute of Technology

Here is a theory of remembering that begins to address many of the hard problems involved in making computers store and retrieve unconstrained information. Based on observations of human information processing, the theory offers a comprehensive account of reconstructive memory that is unique in considering organization (storage), retrieval, and the integration of new ideas into memory (encoding) as inseparable problems. The theory's practical applications are demonstrated in the computer program CYRUS, which stores and retrieves day-to-day events from the lives of political dignitaries.

0-89859-365-4 1984 280 pp. \$29.95

ALSO OF INTEREST

ARTIFICIAL INTELLIGENCE PROGRAMMING

Eugene Charniak, Christopher Riesbeck,
& Drew McDermott

0-89859-004-3 1980 336 pp. \$24.95

MENTAL MODELS

Edited by
Dedre Gentner & Albert L. Stevens

0-89859-242-9 1983 360 pp. \$29.95

NEW

TEACHING COMPUTERS TO TEACH

Esther R. Steinberg
University of Illinois, Urbana-Champaign

A timely and practical guide to the process of computer-assisted instruction (CAI), *Teaching Computers to Teach* is written expressly for those who wish to design CAI. The systematic procedures outlined here adapt the results of research in cognitive psychology and instructional design to the unique aspects of human-machine interaction. Clear, step-by-step instructions guide the CAI author through each phase of the design process, from initial planning to final evaluation, and are illustrated with specific examples taken from diverse subjects and educational levels. These recommended procedures are applicable to computer systems of all sizes.

0-89859-368-9 1984 200 pp. \$24.95 (cloth)
0-89859-453-7 \$14.95 (paper)

THE PSYCHOLOGY OF HUMAN-COMPUTER INTERACTION

Stuart K. Card
Thomas P. Moran
both of Xerox Palo Alto Research Center

Allen Newell
Carnegie-Mellon University

The Psychology of Human-Computer Interaction is an in-depth study, based on several years of research, of the behavior of users interacting with computer systems. The authors present specific models of the time course of expert user behavior, relate these models to an overall psychological model of human information processing, and show how these models can be used in the design of interactive computer systems.

0-89859-243-7 1983 496 pp. \$39.95

INSIDE COMPUTER UNDERSTANDING: Five Programs Plus Miniatures

Edited by Roger Schank & Christopher Riesbeck

0-89859-071-X 1981 400 pp. \$29.95

PARALLEL MODELS OF ASSOCIATIVE MEMORY

Edited by Geoffrey E. Hinton & James A. Anderson

0-89859-105-8 1981 336 pp. \$29.95

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Book Reviews and publishing news

**The Commercial Application of
Expert Systems Technology**

Tim Johnson

Ovum Ltd., London, England, 1984.

Distributed by the publisher,

14 Penn Road, London,

England N7 9RD.

(Softbound, 382 pages; no ISBN;

\$US395 including airmail postage;

£255 in the UK.)

Reviewed by

John Tsotsos,

University of Toronto

This book would be a very valuable addition to any library of a corporation interested in this new wave of technology that is currently enjoying so much prosperity. There are many aspects of it that provide important information; it is well researched and well written, and basic discussions of the technology and underlying hardware and software are provided so that AI novices can benefit from the book as well. The problem is that some of the information is already out-of-date, and I would estimate that within two or three years, the contents would be of historical value only.

A very wide variety of topics is overviewed—and overviewed quite well. These include: basic definitions; the technology; market, personnel and funding forecasts; currently available expert system shells; specialized AI hardware such as Lisp Machines; and descriptions of several systems and research and development efforts in university, government and industry.

A specific topic that I would suggest is “must” reading for anyone wishing to enter this activity is the discussion of what makes an application domain appropriate for solution by an expert system. Too often expert systems (particularly the rule-based ones that are so popular) are regarded by the novice as a “cure-all”. It is important to stress that these systems cannot solve a problem for you that you do not already know how to solve! Even if you know how to solve your application problem, the commercially available rule-based system may not be the

appropriate means by which to solve it. Dr. Johnson does an admirable job of emphasizing this point in several ways throughout the book. His predictions, however, for where the state-of-the-art will be in five years seem overly optimistic. I personally do not believe that real-time expert systems for significant tasks will surpass human performance by 1990.

Much of the book is dedicated to tables and charts of market, personnel, and funding forecasts and I do not feel competent to judge these properly. These seem to be the only portions of the book that may fall into the category of “hype”. They may indeed be accurate, as long as the current “bubble” of promise is not burst by the reality of the technological difficulties of many important application problems. The “expert systems industry influence” diagram is particularly interesting, yet I find it difficult to evaluate.

As mentioned, the book is already a bit out of date. For example, Texas Instruments is mentioned only as a potential manufacturer, yet already TI has a major product line. The Carnegie Group has a major product, SRL+, that is not included. Symbolics and LMI have major new products. There are more examples.

Reading the book, I did not get the feeling that enough emphasis was given to the outstanding problems in research on knowledge-based systems—and there are many. Those outstanding research issues basically define the limits of application for the current technology, and would remind industry of the need to either develop in-house research capabilities (not terribly easy to do!), or maintain strong ties with university research centers. If the book is intended for an industrial market, I can understand why this discussion is omitted. It is also understandable, yet a bit disconcerting, that the emphasis is only on efforts in the U.S. and in the U.K. The European ESPRIT project and Japanese efforts are not overviewed in comparable depth; Canada is not mentioned.

Notwithstanding the few criticisms, I would recommend this book highly to persons in academia, but particularly in government and

industry, who are considering entering the expert systems game. □

**Artificial Intelligence:
Bibliographic Summaries of the
Select Literature (Volume I)**

Henry M. Rylko, Compiling Editor

The Report Store, Lawrence, KS, 1984
(Paperbound, xxi+541 pages;
ISBN 0-916313-02-6; \$^{US}145.00)

*Reviewed by
Graeme Hirst,
University of Toronto*

Everyone likes best-of lists—like the ten best-selling books or the 100 most popular songs ever. So how about a list of the 210 most important AI publications of all time? In this book, it's yours. Quick, see if you're listed in the index!

Obviously, no one will agree exactly what should or shouldn't be in such a list, but by a technique of bibliographic analysis (described in *Canadian A.I.*, December 1984), editor Rylko and his staff have produced a compilation with which there can only be general agreement. Think of any important AI publication, and it's almost certainly in here: *Computers and Thought*, all the IJCAIs, Clocksin and Mellish's Prolog textbook, you name it. If you didn't find your favorite publication, then you probably didn't define *publication* correctly. We're not talking about journal papers—there are already plenty of indexes to those. In this book a publication is just about anything else: a technical report, a conference proceedings, a thesis, a book.

Each entry includes a brief description of the publication (a "capsule review"), full bibliographic information, and a full table of contents—which can be several pages long, especially in the case of conference proceedings. One expects the occasional error in such a compilation, but some here raise eyebrows—such as the assertion (p. 14) that papers at the AAI-83 conference were not refereed. On page 44, the name of the editor (David Waltz) is omitted from the entry on TINLAP-2. On the other hand, we are given such useless information as the universities that co-sponsored AAI-83—twice on one page.

This is the first volume of a projected two-volume set. It concentrates on the earlier works in AI; the second, to be published in July, will deal with the current literature. Although it tries to cover all of AI, the bibliography really only includes "mainstream" literature and selected important works in the various subfields. It does not, for example, contain as a subset all the

important publications in computer vision or language understanding.

Why would you want to pay \$^{US}145.00 for such a bibliography in AI? A lot of work may have gone into the selection and compilation, but it doesn't even have a decent binding. In the two months it sat on my desk, I found it surprisingly useful in checking references. But the main customer for this book is, I think, the company or university library who wants to get into AI in a big way and in a hurry. It's a first-class shopping list for the publications any such library should have. And what's more, the publishers also run a technical report store. Just about everything in the bibliography is in stock and ready to be rushed to your door. An instant AI library—order by phone. It's exactly what a lot of organizations need, and the speed and convenience will make the cost worthwhile. □

**L'intelligence artificielle:
Promesses et réalités**

Alain Bonnet

Interéditions, Paris, 1984

*Compte rendu par
Guy Lapalme,
Université de Montréal*

Ce livre porte un titre très "à la mode" et "tape à l'oeil" mais il n'en constitue pas moins une excellente introduction informelle au domaine de l'intelligence artificielle. Il vise un public averti c'est-à-dire qui connaît bien l'informatique, tout en réussissant à garder un sain équilibre entre le superficiel et le trop technique. M. Bonnet a choisi quelques sujets qui le passionnent et les décrit judicieusement.

Après une brève présentation des buts et concepts fondamentaux de l'intelligence artificielle, l'auteur nous présente les différentes étapes de la compréhension des langues naturelles: compréhension de phrases isolées avec leurs techniques d'analyse, la compréhension de la parole, les interfaces "amicales" en langue naturelle et la compréhension des textes. Ce tour d'horizon est rapide (60 pages), mais il est très bien structuré et toujours illustré d'exemples bien choisis.

Le traitement automatique de la langue naturelle nous mène directement aux méthodes de représentation des connaissances et aux mécanismes de raisonnement: logique du premier ordre, représentations procédurales, réseaux sémantiques, règles de production et objets structurés. Ici encore, l'autre offre beaucoup d'exemples appropriés et très bien présentés dans

un cadre toujours révélateur.

Nous avons ensuite droit au traditionnel chapitre sur les programmes d'échecs et de résolution de problèmes même si son apparition à cet endroit et même dans ce livre nous semble un peu parachuté.

Le chapitre d'introduction aux systèmes experts est vraiment un modèle du genre, très précis et sachant toujours garder son sang froid autour d'un sujet malheureusement trop galvaudé de nos jours. On y présente même un "Petit guide du constructeur de systèmes experts" pour aider le "cogniticien" (néologisme traduisant l'expression anglaise "knowledge engineer"). Suivent ensuite des énumérations d'applications en médecine, en science, et en industrie.

La dernière partie du volume est consacrée aux perspectives futures: enseignement assisté par ordinateur, apprentissage et finalement ce qu'on nous avait promis dans le titre: les promesses et réalités. C'est un exposé lucide des attentes, des succès, et des échecs obtenus dans ce domaine au cours des années.

Le volume est complété par une annexe où on donne un aperçu du langage de programmation Lisp et un glossaire; ce sont deux parties très insuffisantes et inutiles dans leur forme actuelle: le survol du Lisp est beaucoup trop superficiel et ne fait pas ressortir l'essentiel du traitement symbolique; quant au glossaire il regroupe 17 mots avec des définitions insipides du genre: "Prolog: deuxième langage le plus populaire en intelligence artificielle".

Somme toute, ce volume est une excellente introduction au domaine de l'intelligence artificielle. C'est d'ailleurs le volume que je recommande aux étudiants sous-gradués (BScI) qui veulent avoir une bonne idée des travaux d'IA. Ce n'est toutefois pas un livre de classe du style de ceux de Rich (1983) ou Winston (1984) car on n'y trouve aucun exercice, ni description d'algorithme, ni définition précise.

Un reproche qu'on est toutefois en mesure de faire pour un livre d'un auteur européen, même s'il a fait une partie de ses études aux Etats-Unis, est celui de l'omission presque totale des travaux des Européens dans le domaine. La plupart des travaux ne sont mentionnés qu'en bibliographie. Les exemples sont en general très "classiques" (SHRDLU, MYCIN, dépendances conceptuelles, etc). Le seul exemple original est celui d'Alice de Jean-Louis Laurière. A ce niveau, le volume aurait pu faire mieux, surtout lorsqu'on connaît le niveau d'activités dans ce domaine: la citation donnée plus haut est la description la plus précise faite de Prolog ce qui, pour un auteur français,

est tout de même étonnant.

Malgré ces minces lacunes, c'est un livre que je recommande beaucoup, surtout pour quelqu'un qui veut avoir un bon survol du domaine et se donner envie d'en savoir plus.

Bibliographie

- Elaine Rich (1983). *Artificial Intelligence*. McGraw-Hill.
Patrick Winston (1984). *Artificial Intelligence*, 2nd ed. Addison-Wesley.

New AI journal

The first issue of *The Journal for the Integrated Study of Artificial Intelligence, Cognitive Science, and Applied Epistemology* was recently published. The journal is published quarterly by the society Communication and Cognition—AI at the State University of Ghent, Blandijnberg 2, B-9000 Ghent, Belgium. Membership is \$US13.50.

Abstracts of papers in *Computational Intelligence*, 1(2), May 1985

What is a Heuristic?

Jeffry Francis Pelletier and Marc H.J. Romanycia
(University of Alberta)

From the mid-1950's to the present, the notion of a heuristic has played a crucial role in AI researchers' descriptions of their work. What has not been generally noticed is that different researchers have often applied the term to rather different aspects of their programs. Things that would be called a heuristic by one researcher would not be so called by others. This is because many heuristics embody a variety of different features, and the various researchers have emphasized different ones of these features as being essential to being a heuristic. This paper steps back from any particular research programme and investigates the question of what things, historically, have been thought to be central to the notion of a heuristic, and which ones conflict with others. After analyzing the previous definitions and examining current usage of the term, a synthesizing definition is provided. The hope is that with this broader account of 'heuristic' in hand, researchers can benefit more fully from the insights of others, even if those insights are couched in a somewhat alien vocabulary.

Analysis by Synthesis in Computational Vision with Application to Remote Sensing

Robert Woodham, E. Catanzariti,
and Alan Mackworth
(University of British Columbia)

The problem in vision is to determine surface properties from image properties. This is difficult because

the problem, formally posed, is underconstrained. Methods that infer scene properties from image properties make assumptions about how the world determines what we see. In this paper, some of these assumptions are dealt with explicitly, using examples from remote sensing. Ancillary knowledge of the scene domain, in the form of a digital terrain model and a ground cover map, is used to synthesize an image for a given date and time. The synthesis process assumes that surface material is lambertian and is based on simple models of direct sun illumination, diffuse sky illumination and atmospheric path radiance. Parameters of the model are estimated from the real image. A statistical comparison of the real image and the synthetic image is used to judge how well the model represents the mapping from scene domain to image domain.

The methods presented for image synthesis are similar to those used in computer graphics. The motivation, however is different. In graphics, the goal is to produce an effective rendering of the scene domain. Here, the goal is to predict properties of real images. In vision, one must deal with a confounding of effects due to surface shape, surface material, illumination, shadows and atmosphere. These effects often detract from, rather than enhance, the determination of invariant scene characteristics.

A Functional Approach to Non-Monotonic Logic

Erik Sandewall
(University of Linköping)

Axiom sets and their extensions are viewed as functions from the set of formulas in the language, to a set of four truth-values t, f, u for undefined, and k for contradiction. Such functions form a lattice with 'contains less information' and the partial order \subseteq , and 'combination of several sources of knowledge' as the least-upper-bound operation \sqcup . We demonstrate the relevance of this approach by giving concise proofs for some previously known results about normal default rules. For non-monotonic rules in general (not only normal default rules), we define a stronger version of the minimality requirement on consistent fixpoints, and prove that it is sufficient for the existence of a derivation of the fixpoint.

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A Brief Review of Ignorance Engineering

Rock R. Farmer-Taylor
Generic Laboratory for AI Research
Artificial Industries Inc.
Wipineg, Manitoba

Because of the failure of so-called "knowledge-based expert systems" a new area of research has recently been receiving much attention among researchers. This new field, called *ignorance engineering*, promises much better results than the much ballyhooed but ultimately sterile field of knowledge engineering. However, many people are confused as to exactly how ignorance engineering could be different from knowledge engineering because, at least at first glance, the end products of both look so similar.

Part of this confusion is caused because of the similar definitions of the two fields. Knowledge engineering is described in Hayes-Roth (1984) as "the subfield of AI concerned with applying knowledge to solve problems that ordinarily require human intelligence". The definition of ignorance engineering is quite similar. Ignorance engineering is *the subfield of AI concerned with applying ignorance to solve problems that ordinarily require human stupidity*. Although these definitions are very similar on the surface, a closer investigation will reveal that the methods they use differ widely even though their respective end products have similar appearance and functionality. One important result of these definitions is that ignorance engineering has a much wider scope than knowledge engineering.

History

Ignorance engineering was developed in part to solve the "knowledge engineering bottleneck". This problem arose because each knowledge-based expert system had to be hand-crafted over a long period of time by highly-paid knowledge engineers in consultation with scarce and uncooperative domain experts. The costs associated with this approach are not a problem

Major funding for this research was supplied by the Luddite League of Canada and the Society for the Prevention of Cruelty to the Artificial Intelligentsia. The views and conclusions contained in this document are not necessarily those of the author.

because expert systems can be sold at any price. The problem is that there are too few knowledge engineers and, like engineers the world over, they much prefer to drink beer, so not enough expert systems can be produced and marketed to support the founders and stockholders of AI start-up companies.

Another problem with knowledge engineering is that knowledge-based expert systems are fragile and work only on small well-defined domains. Users of such systems are led to believe that the system contains real knowledge about the domain and are often rudely surprised by the actual behavior of the system. Further, expert systems are very poor at explaining and justifying their behavior, leading to suspicion of their correctness on the part of users. Both these problems serve to limit the utility of expert systems.

The idea behind ignorance engineering was to create an alternative to knowledge engineering that would not suffer from these problems and thus would produce more revenues. Ignorance engineering is based on a fundamental axiom of artificial intelligence: the *ignorance principle*, which states, essentially, why clutter up the system with a lot of knowledge?

Differences between Ignorance and Knowledge

The main differences between ignorance engineering and knowledge engineering stem from the differences between ignorance and knowledge. As stated by Hayes-Roth (1984), "knowledge [is] like a rare metal, [which] lies dormant and impure, beneath the surface of consciousness. Once extracted, an element of knowledge must undergo other transformations [such as refinement] before it acquires commercial value."

Ignorance, on the other hand, is like the air. It is very active and is always self-evident. Ignorance need not be extracted or refined to have tremendous value, it is easily accessible to anyone without the use of a specialist. This obviates the need for a group of over-paid ignorance engineers, and thus there will be no "ignorance engineering bottleneck".

Knowledge is inherently specialized. Knowledge is useful in only one domain and for one thing within that domain. This is why knowledge-based expert systems are limited in scope. However, ignorance has wide applicability over many domains. In other words, knowledge is knowledge in one area only, whereas ignorance is ignorance everywhere. This means that products of ignorance engineering will have very wide applicability.

Uncertain knowledge poses yet another problem for knowledge engineering. Many schemes have been proposed for handling uncertain knowledge, none of which have been successful, and there is a heated debate on how uncertain knowledge can be accommodated in knowledge engineering. This problem is not faced in ignorance engineering because there is no such thing as uncertain ignorance. Therefore, a major problem of knowledge engineering is absent from ignorance engineering.

Ignorance also is very different from knowledge in one other aspect. Where knowledge-based expert systems require explanation and justification of their reasoning and actions, ignorance engineering products will not have to perform these difficult tasks. This is because knowledge is not self-evident and must be explained but ignorance stands on its own—it needs neither explanation nor justification nor excuses but is self-evident to all. This means that a very difficult problem of knowledge engineering is totally absent from ignorance engineering.

Ignorance Engineering Techniques

Because of the differences between knowledge and ignorance there are differences between the techniques used in knowledge engineering and ignorance engineering. Figure 1 shows some of the techniques that are used in building ignorance engineering products. Because of the differences the products have come to be called “ignorance-based novice systems”, a name chosen to distinguish them from “knowledge-based expert systems”. As will be shown later, this is not to say that such products have less utility than expert systems. On the contrary, early ignorance-based novice systems often could not be distinguished from recent knowledge-based expert systems without examination of their internals. Of course, newer ignorance-based novice systems are readily distinguishable from knowledge-based expert systems.

In ignorance engineering, there is also no need to consult domain experts since any human has more than enough ignorance for any domain. The only foreseeable problem in ignorance engineering is that if domain experts are used they will try to hide the ignorance that they have. This possibility must be prevented at all costs. However, in all other cases, any ignorance-based novice system will perform perfectly the first time and ignorance refinement activities are never needed.

Ignorance-based novice systems also do not have to worry about many other problems that knowledge-based expert systems do. For example, expert systems must decide whether to do backward-chaining reasoning or forward-chaining inference. Novice systems do not have to worry about this problem because

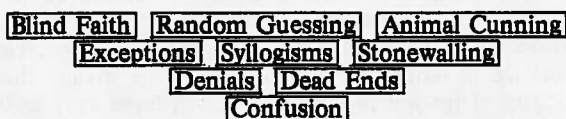


Figure 1. Techniques Used in Ignorance Engineering

ignorance is the same whether used backward or forward.

Another problem with knowledge engineering is that to be really successful, knowledge-based expert systems need a knowledge representation system for storing and retrieving knowledge. Such knowledge representation systems cause many problems for expert systems because of their limited expressive power and computational intractability. Further, there are many knowledge representation systems, almost one for each knowledge-based expert system and the designers of such systems constantly argue over their relative merits.

In ignorance engineering there is no similar problem. Because ignorance can be used freely anywhere in any form only a very simple ignorance representation system is needed. This reduces the complexity of ignorance-based novice systems considerably. It also means that all ignorance-based novice systems can be built in a general purpose programming language such as LISP, thus speeding up such systems by at least a factor of π .¹

One other problem solved by ignorance engineering is how to learn. Learning is a very hard problem in expert systems, largely because knowledge is so hard to acquire. Ignorance, on the other hand, is easy to acquire as demonstrated by how easily people do it. This means that creating an ignorance-based novice system that learns ignorance should be a very simple task.

An Ignorance-Based Novice System

There have been very many successful ignorance-based novice systems already reported in the literature. Almost all of these systems have gone on to be big money-makers for their developers. A recent ignorance-based novice system, belonging to the fifth generation of such systems, is the HELPER system marketed by Artificial Industries.

The HELPER system is designed to supplement the user help facilities available on UNIX.² This area was chosen for several reasons. First, it is an area where there is an abundance of ignorance—manifestly demonstrated in any introductory programming class using UNIX. Second, a knowledge-based expert system has already been built for this purpose (Wilensky 1984) and, though partly successful, has neither completely solved the problem nor generated any revenue. Third, such a system can be sold for an obscene amount of money to universities.

The HELPER system consists of three parts. The first part is a natural language interface. This part of the system will not be described here because, as

¹This factor is derived from the observation that expert systems tend to go around in circles whereas novice systems get straight to the point. This is similar to the differences between real-world experts and novices.

²UNIX is a trademark of MA BELL. MA BELL is an ex-trademark of AT&T.

everyone knows, natural language interfacing is a solved problem. The second part of the system is a falsity-destroying inference engine that is used to draw premises from conclusions. The third part is an ignorance base that stores the ignorance used in the rest of the system. This ignorance base is eminently computationally tractable—all its operations run in constant ($c=0$) time.

The HELPER system has been written in VAPOR-LISP,³ a new programming language specifically designed by Artificial Industries to make it easier to develop vaporware. Besides subsuming all of LISP, VAPOR-LISP includes the falsity-destroying inference engine and ignorance base system used by HELPER. The use of VAPOR-LISP allowed HELPER to be written in only twenty-five man-hours—a new record (but only by two man-hours) for the development of a useful ignorance-based novice system. HELPER currently runs on a PDP-11/03 under the UNIX⁴ operating system.

Here is a simple session with HELPER. User input is in italics because users tend to shout at the system. System output is in small capitals because the system is modest. Manually added comments are in roman mixed case to distinguish them from the actual system's responses (which otherwise might be difficult).

> helper

HELLO, MASTER.

It is important to get started on the right foot to prevent user fear of the awesome capabilities of the system.

How can I get rid of unwanted files?

SAY PLEASE.

The system enforces polite communication protocols. This is sadly lacking in most computer systems.

Please.

PLEASE WHAT?

The system can also ask questions.

How can I get rid of unwanted files, please?

HAVE YOU TRIED PUTTING THEM IN THE TRASH CAN?

The system does not just provide answers but tries to get the user to learn. The principle behind this is that if it is easy for ignorance-based novice systems to learn ignorance it should be even easier for humans to learn it.

There is no trash can available.

HOW ABOUT THE CIRCULAR FILE?

This correlation between trash cans and circular files was chosen entirely at random but demonstrates how well ignorance performs in general.

There is nothing like that here.

TRY COPYING THEM INTO /DEV/NULL.

The system has recognized a dead end and starts another.

That doesn't get rid of them.

HOW ABOUT TYPING '*remove <filename>*'?

³VAPOR-LISP will be available as a commercial product from Artificial Industries "real soon now".

⁴UNIX is still a trademark of MA BELL.

The system can use italics if it really has to.

It says <filename> not found.

YOU MUST HAVE A FILE WITH UNMENTIONABLE CHARACTERS IN IT.

This is an example of the system using a leap of blind faith — one of the more important types of ignorance.

TRY TYPING '*rm -f -r .*'.

The standard solution. This is the only place where knowledge is used in the system.

It worked!

GOOD.

The system realizes that praising users will ensure that it will be used again.

Quit.

BUT I'M NOT DOING ANYTHING.

The system realizes its capabilities.

Bye.

YOU HAVEN'T THANKED ME.

Again maintaining politeness.

Thank you.

YOU'RE WELCOME.

Bye.

BYE-BYE.

It can easily be seen that this system provides a useful service for UNIX users ranging from novices to experts. Over a series of trials at Artificial Industries user confidence in the system averaged ninety percent. Although this is in part due to the polite behavior of the system, most is due to its novel uses of ignorance. This represents a spectacular improvement over all expert systems.

Conclusion

As has been shown, ignorance engineering produces ignorance-based novice systems which can be used in many areas where knowledge-based expert systems would be impossible to build. The field as a whole depends on the superiority of ignorance over knowledge for this enhanced utility. The future of this emerging field looks extremely bright and promises to break the current view of Artificial Intelligence as "stark naked from the ankles up" (Grosch 1984).

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Rock R. Farmer-Tailor recently completed his Ph.D. in AI at the University of North Bay in 1980 in only 37 years, the fastest ever at that university.

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CSG-EESI: A new solid representation scheme with a conversion expert system

S. Xie and T. Calvert

LCCR TR 85-1

Methods for the representation of solids are important in computer vision, computer graphics, CAD and related areas. In computer vision systems, it is relatively straightforward to derive a boundary representation (BR) from a 2½-D sketch. However, for the recognition of bodies it is usually important to have the structural information which may be contained in constructive solid geometry (CSG), or equivalent, representations.

In this paper, we present a new representation scheme for describing 3-D mechanical parts and structured bodies which are formed from planes and quadric surfaces. Since the new method combines features of the CSG representation and an extension of the enhanced spherical image representation (ESI) we designate the method CSG-EESI. In this scheme the body model can be roughly divided into two levels. The higher level corresponds to a restricted CSG tree which contains the structural information describing how the various subparts form the body. The lower level contains the geometric information for those simple subparts and represents them by an extension of enhanced spherical images. The CSG-EESI scheme may be used both as the medium between pictorial models and relational models and as an internal model to facilitate the recognition of bodies.

An expert system written in the C-PROLOG language on a Vax 11/750 converts BR-like models into the CSG-EESI representation. The expert system is hierarchical and extendible. On the basis of the type

and convexity of faces and the convexity of their intersection edges, the system deduces reasonable decompositions for bodies and offers structural information for them. This expert system partly fulfills the conversion gap from BR to CSG representations. It will form a part of our developing robot vision system.

An interactive system for finding perfect hash functions

Nick Cercone, J. Boates, and M. Krause

LCCR TR 85-3

New methods for computing minimal and almost-minimal perfect hash functions and an application of such functions are discussed. Our interactive implementation of one particular algorithm is used to present several examples of large lexicon design and it is also used to present several other examples drawn from natural and artificial languages.

The SAUMER User's Manual

Fred Popowich

LCCR TR 85-4

With the SAUMER system, one can specify a SAUMER specification language (SSL) grammar, which consists of rules and metarules, and obtain semantic interpretations for input sentences. This system incorporates facilities for the redirection of input and output, the use of a top-down parser, use of lexicons and morphological analysers, and for access to Prolog routines, including the debugging facilities. Some sample grammars are provided that can analyse sentences containing topicalisation, relative clauses, passivisation, and questions.

Logic-Based Metagrammars for Natural Language Analysis

Veronica Dahl

CMPT TR 85-1

The main concepts involving parser development in Prolog are introduced—in particular, transforming input into logical form. The problems typically encountered are discussed with some of the alternatives for solving them.

The Many Dimensions of Logical Form

Nick Cercone, Gordon McCalla,
and Paul McFetridge†*

LCCR TR 85-8

To appear in *Translating Natural Language into Logical Form*, Leonard Bolc (editor), Springer-Verlag.

Linguistics has coined the term "logical form" to designate an essentially syntactic level of analysis useful for handling aspects of linguistic processing more

*Department of Computational Sciences, University of Saskatchewan.

†Department of Linguistics, Simon Fraser University.

usually thought of as semantic (e.g. determining pronoun referents). AI uses the same term to designate the underlying (logical) level meaning representation which eventually derives from surface structure. After the linguistic notion of logical form is described, the effect of AI researchers' assumptions about the process of interpreting language on their notion of logical form is explained. Several AI representations of the internal "logical" form of natural language, including first-order predicate calculus, esoteric logics, procedures, semantic networks, frames, scripts, productions, logic programs and several knowledge representation languages are described. Finally, the place of logical form in the computational model of natural language is discussed.

**An optimal algorithm to perform
set intersections and/or unions
on a broadcast network**

WoShun Luk

CMPT TR 84-12, LCCR TR 84-5

The significance of a broadcast network lies in the fact that two or more processors attached to a network can receive the same information at the same time. In addition to fewer data needing to be transmitted, processors can proceed to process the data simultaneously. We study the problem of finding objects satisfying a set expression in conjunctive normal form of sets of objects which are located in different nodes attached to a broadcast network. This is one type of problem that can exploit the properties of a broadcast network. For a certain class of set expressions, we have been able to present a scheme to derive a schedule whereby the answer set is obtained with minimum amount of data transmission. The result has direct applications to query processing in distributed database systems.

**A new machine model for
high-level language interpretation**

*Rick Hobson, John Gudaitis,
and J. Thornburg*

LCCR TR 84-8

We describe a structured architecture machine (SAM) for the execution of high-level-language-derived directly executable (interpretable) languages (DEL/DIL). The model was derived through simulation studies seeded by Flynn and Hoevel's work with DEL techniques and Johnston's contour model. Simulation shows that HLL interpretation overhead can be reduced to a negligible factor. Noninterpretive execution should also be very efficient.

**Deadline for the
September Newsletter
is 15 August.**

read

AI Grad Student Meetings Held

*Robin Cohen
University of Waterloo*

The University of Toronto AI group and the University of Waterloo logic programming and AI group recently held the first two of a series of workshops. The first was Saturday 30 March, at the University of Waterloo, the second on Friday 10 May at U of T. The main co-ordinators were Robin Cohen at Waterloo and Brian Nixon at Toronto.

The workshops were billed as an informal gathering of graduate students and faculty, for the purpose of discussing research and broadening horizons. With this aim in mind, the meetings were designed to feature one sub-group from each institution.

At the first workshop, the morning session was chaired by Marlene Jones, who introduced the University of Waterloo's learning group. Brief presentations were provided by Ray Leung, Bruce Cockburn, Sheila McIlraith, Ken Wellsch, Barb Wasson, and David Poole. The afternoon session discussed the University of Toronto's TAXIS group. Martin Stanley and Brian Nixon provided the presentations. Included in the day's events were a lunch, organized by graduate students at the University of Waterloo with Barb Wasson, and an evening party offered by David Poole.

The second workshop featured presentations by U of T's group in natural language understanding: Brenda Fawcett, Yves Lespérance, Ed Plantinga, Jean-Pierre Corriveau, Diane Horton, Bart Selman, and Stephen Regoczei. UW's logic programming group then presented their research. Talks were given by Mantis Cheng, Randy Goebel, David Poole, David Rosenblueth, and Kei Yukawa. In addition, Matt Ginsberg of Stanford University gave a seminar on his work on counterfactual implications. In accordance with Toronto AI tradition, lunch was The Special at the Szechuan Garden restaurant.

Several people from the Universities of Western Ontario and Guelph attended the second workshop, and it is proposed that future workshops include the other universities in the Southern Ontario / Western New York region. □

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- the **GCLisp** manual

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GCLisp package is available from Applied AI Systems Inc. for \$675 Canadian + tax + shipping and handling. Optional technical support is available. (Price may change without notice)

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Applied AI offers consultation to (potential) users of **RuleMaster** with their requirement definition, installation, training, and prototyping phases of Expert System development. **RuleMaster** is a registered trademark of RADIANT Corporation (U.S.A.) and Intelligent Terminals Ltd. (U.K.)



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1. Invited Speakers

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Director of the Robotics Institute at
Carnegie Mellon University
- Prof. Jonathan Allen
Professor of Electrical Engineering
and Computer Science, and Director
of Research Laboratory for Electronics,
Massachusetts Institute of Technology.
- Prof. David Parnas
Landsdowne Professor, Department of
Computer Science, University of Victoria.
- Prof. Toshiyuki Sakai
Head of Information Science Department,
Kyoto University
President, International Association
for Pattern Recognition

2. Special Sessions

A. Research activities on new generation computers.

A unique opportunity to meet representatives of the world's major projects on new generation computer technologies. The projects and institutions represented:

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USA

National Project for New Generation
Computer Technology—Japan
Institute for Computer Research
University of Waterloo—Canada
Prof. Eric Manning

Intelligent System Architecture (ESPRIT)
Europe
Prof. Jean-François Omnes

ALVEY Program for Advanced Information
Technology—Britain
Dr. Brian Oakley

B. Robotics and Industrial Systems with
Dr. Jean-Claude Latombe
Institut Mathématique Appliqué de Grenoble

COMPINT 85
Sept. 9-12, 1985
Montréal, Canada

3. Tutorials

Topics include:

- Artificial intelligence
- CAD/CAM
- Local area networks
- Software engineering
- Robotic manipulators
- Robotic vision

4. Exhibition

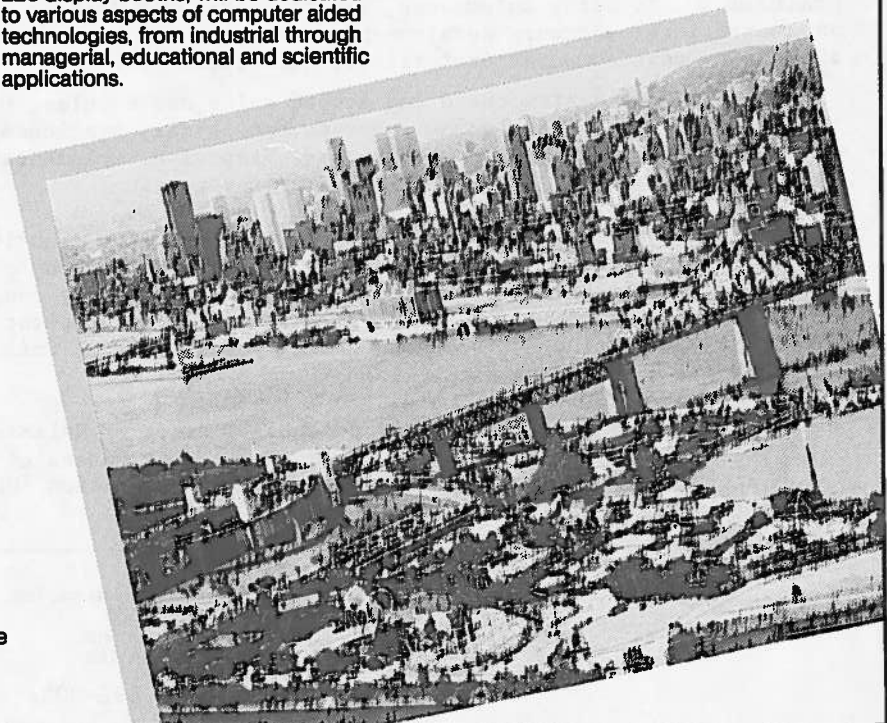
An international exhibition, including some 220 display booths, will be dedicated to various aspects of computer aided technologies, from industrial through managerial, educational and scientific applications.

The location

As the world's second largest French speaking city, Montréal presents a myriad of attractions to the international traveller: fine hotels, world famous restaurants, an underground city covering miles of boutiques, cinemas and restaurants, and Vieux Montréal, to name but a few.



For registration forms
and more information,
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Postal Station, Montréal, Québec,
Canada H5B 1B7 or phone
(514) 394-5542.



Forthcoming Conferences, and Calls for Papers

**CSCSI-86:
Canadian Artificial Intelligence
Conference**

21–23 May 1986

Montréal

For details, see the announcement on page 8.

**IJCAI-85:
International Joint Conference
on Artificial Intelligence**

18–24 August 1985

Los Angeles

See the announcement on page 37.

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**COMPINT 85:
International Conference on
Computer-Aided Technologies**

9–12 September 1985

Montréal

For details see the announcement opposite.

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**First International Conference on
Applications of AI
to Engineering Problems**

15–18 April 1986

Southampton University, England

Papers are solicited in the following topics and related areas: Computer-aided design; Computer-based training; Planning and scheduling; Constraint management; Intelligent tutors; Expert systems; Knowledge representation; Learning; Natural language applications; Cognitive modelling of engineering problems; Robotics; Database interfaces; Graphical interfaces; Knowledge-based simulation; Design Modelling.

Authors are invited to submit three copies of a 500-word abstract containing enough detail to permit evaluation by the program committee. Authors should indicate topic area and branch of engineering addressed. Deadline: 1 June 1985. Send abstracts to:

Dr. R. Adey, General Chairman, AIEP
Computational Mechanics Centre
Ashurst Lodge, Southampton SO4 2AA

England

For more information in North America, contact:

D. Sriram, Technical Chairman, AIEP
Department of Civil Engineering
Carnegie-Mellon University
Pittsburgh, PA 15213, U. S. A.
ARPANET: sriram@cmu-ri-cive

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**Conference on Theoretical Aspects of
Reasoning about Knowledge**

19–22 March 1986

Asilomar Conference Center,
Monterey, California

While traditionally research in reasoning about knowledge was mainly done by philosophers, recently it has been shown to be of great relevance to computer science, especially in such areas as AI, distributed systems, database systems, and cryptography. There has also been interest in the area among linguists and economists. The aim of this conference is to bring together researchers from these various disciplines with the intent of furthering our theoretical understanding of reasoning about knowledge.

Topics of interest include, but are not limited to:

- Semantic models for knowledge and belief.
- Resource-bounded knowledge.
- Using knowledge to specify and reason about distributed systems.
- Semantic models of knowledge acquisition and learning.
- Nonmonotonic reasoning.

Please send 8 copies of a detailed abstract not exceeding 10 double-spaced typewritten pages in length by 15 September 1985, to the program chair:

Joe Halpern
IBM Research, K51/281
5600 Cottle Rd.
San Jose, CA 95193, U. S. A.

The abstract should include a clear description of the problem being addressed, comparisons with extant work, and a section on major original contributions of this work. The abstract must provide sufficient detail for the program committee to make a decision. Papers will be chosen on the basis of scientific merit, originality, and appropriateness for this conference.

We hope to allow enough time between the talks during the conference for private discussions and small group meetings. In order to ensure that the conference remains relatively small, attendance will be limited to invited participants and authors of accepted papers.

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IEEE Software

The March 1986 issue of *IEEE Software* will address software aspects of knowledge-based systems developed for engineering applications. The deadline

for receiving the manuscript, not more than 30 double-spaced typewritten pages, is 1 July 1985. For more information (or a copy of author's guidelines) write to:

D. Sriram / M. Rychener (Guest Editors)
Department of Civil Engineering
Carnegie-Mellon University
Pittsburgh, PA 15213, U. S. A.
ARPANET: sriram@cmu-ri-cive

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**IEEE Computer Society
Second Conference on
Artificial Intelligence Applications:
The Engineering of Knowledge-Based Systems**

11-13 December 1985

Fontainebleau Hilton,
Miami Beach, Florida

Purpose: To explore the technology, implementation and impact of emerging application areas of AI and indicate future trends in available systems and required research. Topic areas include: Knowledge acquisition and representation; System architecture; Planning and problem solving; Natural language; Reasoning with uncertainty; Sensor feedback; Validation; Learning and control; Human-computer interface; Explanation.

The program will consist of submitted and invited papers. Invited papers will provide an overview of research in selected areas. Contributed papers may be selected for presentation and publication, or for publication only. Please limit papers to five thousand words. Research proposals and minor changes to old ideas are discouraged. Four copies of the complete paper are to be submitted to:

Charles Weisbin, Program Chair
Artificial Intelligence Conference
P.O. Box 639
Silver Spring, MD 20901, U. S. A.

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**International Conference on
Future Advances in Computing:
A workshop on alternative
technologies for AI**

17-21 February 1986

Christchurch, New Zealand

In recent years some AI techniques have become mature and have even achieved commercial respectability. This success still leaves a huge area of potential AI uncharted. The time now seems ripe to reassess old ideas and technologies and to search for new ones in light of this new maturity.

Accordingly, papers are requested on the following topics:

- Technologies for AI: Neural nets, connectionist systems, perceptron-like adaptive systems, stochastic computing, associative memories.

- Robots and systems displaying: Autonomy, self-motivation, openness, self-reproduction, creativity, adaptation, learning, curiosity.
- Theoretical and foundational issues at the basis of these topics.
- Anything else that is relevant.

It is expected and hoped that many of the submissions will be controversial and speculative; however, strict refereeing standards will be applied. Papers must, above all, be clear and intelligible, and should clearly identify the problem being addressed and say why it is significant. It will not be necessary to convince the referees of your correctness, but they must be able to follow your arguments and presentation. Accepted papers will be published in the proceedings; selected papers will be submitted to the *Journal of Future Computer Systems*.

In order that participants can interact vigorously, attendance at the conference will be limited to 35.

Papers should not exceed 18 double-spaced typed pages. Six copies should be submitted by 31 July 1985 to:

John G. Cleary
Dept Computer Science
University of Calgary
Calgary, Alta., CANADA T2N 1N4
Phone: 403-284-6087

INTERNET: cleary@calgary.csnet

UUCP: {ubc-vision, ihnp4}!alberta!calgary!cleary

For information on local arrangements contact:

John H. Andreae
Dept Electrical and Electronic Engineering
University of Canterbury
Private Bag
Christchurch, New Zealand
Phone: +64-3-48-2009 or +64-3-51-7414

The other members of the organizing committee are Brain Gaines (University of Toronto) and Ian Witten (University of Calgary).

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**First International Conference on
Expert Database Systems**

1-4 April 1986

Charleston, South Carolina

The goal of this conference is to explore both the theoretical and practical issues of expert database systems. These systems represent the confluence of R&D activities in AI, logic, and database management. In order to foster the cross-fertilization of ideas between these fields, the Conference will be composed of tutorial sessions, paper sessions, and panel discussions.

The Program Committee invites original papers (of approximately 5000 words) addressing (but not limited to) the following areas: Theory of knowledge bases; Knowledge engineering; Knowledge base management; Reasoning on large data / knowledge bases; Natural language access; Intelligent database interfaces; Knowledge-based environments; Organizational issues.

Please send five copies of papers by 1 September 1985 to:

Larry Kerschberg, Program Chairman
College of Business Administration
University of South Carolina
Columbia, SC 29208, U. S. A.

Conference proceedings will be available at the conference, and subsequently will appear in book form.

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Workshop on the Foundations of Artificial Intelligence

6-8 February 1986

Holiday Inn,
Las Cruces, New Mexico

Sponsored by the
American Association for Artificial Intelligence
and the Computing Research Laboratory,
New Mexico State University

The primary emphasis for the workshop will be an exploration of the foundations of AI. The workshop will be organized under the following three subtopics. Within each subtopic a number of example issues have been identified. This set is not intended to be exclusive; papers on other relevant issues are welcomed. Nevertheless, papers that are closely tied to specific AI research projects are unlikely to be appropriate.

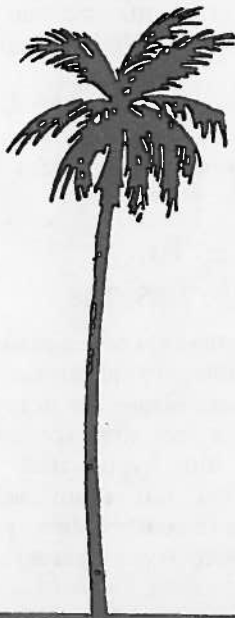
- Relationships between foundations and working

programs: How is an AI program to be evaluated? What kind of goals can an AI program achieve? Can AI's goals be realized on single-processor computers? Does it make sense to say a program is a theory? Is it possible to describe AI programs?

- Relationships between AI and other disciplines: What contribution can other disciplines make to progress in AI and vice-versa? How does cognitive science relate to AI? Is AI a separate discipline, or is it just a way of approaching many other disciplines? How can we make AI more like a neighboring science? Should we try? Are "AI discoveries" rediscoveries of matters well-known in central computer science or other neighboring disciplines — is AI just applied computer science?
- Philosophical, logical, and theoretical foundations of AI: What are AI's purposes, goals, epistemological and ontological presuppositions? Is AI still maturing or already decomposing into subfields? In what sense are there AI theories, and what kind of theories are they — hacking and hypothetico-deductive method? In what sense is AI scientific?

Submitted papers (no more than 2000 words) will be refereed and accepted for presentation on the bases of both intrinsic merit and the degree to which they contribute to a coherent and constructive discussion within a particular workshop session. It is anticipated that the workshop will be restricted to a small number of basic issues of the types illustrated under the three subtopic categories. Papers (three copies) should be submitted by 1 September 1985 to:

IJCAI-85*



THE PREMIER INTERNATIONAL CONFERENCE ON ARTIFICIAL INTELLIGENCE

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August 18-24, 1985

at

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Sponsored by the
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Co-sponsored and hosted by the
American Association for Artificial Intelligence (AAAI)

For more information, call or write IJCAI-85, c/o AAAI,
445 Burgess Drive, Menlo Park, CA 94025, USA
(415) 321-1118 or 328-3123.

* The AAAI's National Conference on Artificial Intelligence will merge with the IJCAI Conference this year.

Derek Partridge
Computing Research Laboratory
New Mexico State University
Las Cruces, New Mexico 88003, U. S. A.
INTERNET: derek@nmsu-cs.csnet
(No electronic submissions, please; use net address for correspondence only.)

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Workshop on Coupling Symbolic and Numerical Computing in Expert Systems

27–29 August 1985

Boeing AI Center
Bellevue, Washington

A majority of the current expert systems focus on the symbolic-oriented logic and inference mechanisms of AI. The objective of this workshop, which will be limited to about 35 participants, is to assemble theoreticians and practitioners of AI who recognize the need for coupling symbolic reasoning with conventional mathematical and statistical algorithms to provide the basis for multilevel expert systems. For information, contact:

Janusz S. Kowalik
Boeing Computer Services, M/S 7A-03
PO Box 24346
Seattle, WA 98124, U. S. A.
Phone: 206-763-5392

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Logic, Language, and Computation

8–20 July 1985

Stanford University

The Association for Symbolic Logic and the Center for the Study of Language and Information are planning a combined summer school and meeting at Stanford University. The first week will consist of the CSLI summer school, with the following courses: Situation semantics; Prolog; Denotational semantics; Types and ML; Complexity theory; Abstract data types; Theory of algorithms; Generalized quantifiers; Lisp; Foundations of intensional logic.

The second week will consist of an ASL meeting with invited addresses, symposia, and sessions for contributed papers.

For further information, contact:
Ingrid Deiwiks
CSLI, Ventura Hall
Stanford, CA 94305, U. S. A.
Phone: 415-497-3084

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Journal of the American Society for Information Science (JASIS)

As the new editor of the *Journal of the American Society for Information Science (JASIS)*, I am sending out a call for papers. We are a refereed professional journal seeking scholarly, relevant articles in the area of infor-

mation science. To submit an article, please send three copies of the manuscript to me at:

Donald H. Kraft
Department of Computer Science
Louisiana State University
Baton Rouge, LA 70803, U. S. A.
Phone: 504-388-1495
INTERNET: kraft@su.csnet

AI is included in the list of topics considered relevant, especially in the area of information retrieval (intelligent front ends, expert systems, and the use of natural language processing seem especially relevant to my readers at the moment). You may wish to check out the September 1984 issue, 35(5), which featured a series of articles on AI.

IJCAI-87 Officer Election and Site Selection

The Trustees of the International Joint Conferences on Artificial Intelligence, Inc. have announced that Alan Bundy, University of Edinburgh, will be Conference Chair for IJCAI-87; John McDermott, Carnegie-Mellon University, will be Program Chair; and Milan will be the site, with Marco Somalvico of the University of Milan being responsible for Local Arrangements. The conference will be held 23–29 August 1987 (Sunday through Saturday).

AI in the media

“Artificial intelligence is a carefully selected misnomer bent on perpetuating the mythology of the all-knowing machine. There may be one that thinks one day; today there’s just clever programmers.”

John Leppik
President, Knowledge Systems, Inc.
quoted in the Toronto Star, 23 May 1985

Guidelines for electronic submissions

Canadian A. I. prefers submissions to be made by network mail when possible, to eliminate the need for retyping. However, please do not send text that has been through a document formatter; extra embedded spaces and hyphenated line breaks just have to be edited out again before typesetting. The best thing to send is plain typing or *troff* source (preferably with *-me* macros).

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Application for Membership and / or Journal and Conference Proceedings Order

To join CSCSI/SCEIO and receive the *Canadian A. I. Newsletter*, fill out this form (or a photocopy of it) and send it to CIPS (which administers membership for the society) at the address below, with the appropriate fee. You need not be Canadian to be a member. This form can also be used to subscribe to the journal *Computational Intelligence* and to purchase CSCSI/SCEIO conference proceedings.

CIPS, 243 College Street (5th floor), Toronto, CANADA M5T 2Y1

Membership: \$20 regular, \$10 students (Canadian funds); there is a discount of \$5 for CIPS members. *Computational Intelligence*: \$16/year (CSCSI/SCEIO members only). Conference proceedings: \$25 each, plus \$5 for postage within Canada, \$7 for postage outside Canada. Payment may be made in U.S. dollars at the current rate of exchange.

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“... if programmed with the statements 'Boston is the capital of Massachusetts' and 'All capitals are cities', the system could deduce that 'Boston is a city'. As witnessed by the actual notation for the first statement — (capital of/Boston Massachusetts) — the language is declarative and easy to learn.”
 — High Technology, December 1984

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