NEWSLETTER / DECEMBER 1984

CANADIAN ARTIFICIAL INTELLIGENCE 2

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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Editor's Notes

Hey, everyone! Let's parlons français!

Graeme Hirst
Editor

The anglophone domination of AI in Canada occasionally leads to embarrassing problems.

The day before the first *Newsletter* was to go to the printer's, Nick Cercone hit me with the following fact. The society's French name appeared wrongly on the *Newsletter*'s flyers and many other publications. What it said was:

(1) Société canadienne pour études d'intelligence par ordinateur

which is not syntactically well-formed French. What it should have been, said Nick, was:

(2) Société canadienne *des* études d'intelligence par ordinateur

Apparently someone once made a mistake, and many anglophones (including myself) had blindly copied it. A review of old CSCSI/SCEIO conference proceedings confirmed this. In more than one, form (1) appeared on the title page and form (2) appeared on the copyright page. Form (2) is apparently the one used in our charter.

Nick said that a press article that mentioned the society used form (1) and put "[sic]" after it, which is a little embarrassing to say the least. Clearly, we had to start getting things right. Accordingly, Nick had been using form (2) in matters concerning *Computational Intelligence* (though he got the French capitalization wrong).

Well, I thought, it's just as well I found this out *before* the *Newsletter* went to press. However, a little research on my part revealed that form (2) is also not well-formed French.

This was a problem. I needed to determine a correct French name for the society, and do so very quickly so the newsletter could be printed. I was therefore put in the position where I had to work out a new name for the society and immortalize it for all time in the *Newsletter* without having time to consult any of the members of the

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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.

CSCSI/SCEIO is affiliated with the Canadian Information Processing Society and the International Joint Council on Artificial Intelligence.

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Canadian Artificial Intelligence Newsletter

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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 6). 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:
CSCSI/SCEIO, c/o CIPS
243 College Street, 5th floor
Toronto, CANADA M5T 2Y1

New Fee Structure for CSCSI/SCEIO

Gordon McCalla
President, CSCSI/SCEIO

The Bad News:

The dues for CSCSI/SCEIO membership will go up, as of 1 January 1985. The new fee structure is as follows:

Regular membership fee: $20.00
Student membership fee: $10.00

There will be a $5.00 discount for members of CIPS.

Raison d'Etre:

It has been obvious to the Executive for some time that the current dues do not provide enough revenue to adequately support the Society's many activities. The coffers have never been full enough to allow comprehensive advance publicity for our bi-annual conference, let alone to support many of the day-to-day administrative and other costs of the organization. Moreover, we are taxed $5.00 by CIPS for every CSCSI/SCEIO member who is not a member of CIPS, which means, for example, that many of our student members have provided us with no revenue at all.

Until recently, we were able to make do, however, through judicious use of our own funds and through a cautious approach to expenditures on new projects. The current AI boom has demanded a more professional approach to existing activities and a more flexible attitude regarding new directions. This increased professionalism has manifested itself in several ways, including the new newsletter format and the higher profile taken by CSCSI/SCEIO in national AI policy discussions. The society has also taken on several new projects, including the recently completed survey of AI in Canada (and its spin-off papers at CIPS Session '84, the Fifth CSCSI/SCEIO National Conference, *INFOR Forum*, and *AI Magazine*); the Workshop on Theoretical Approaches to Natural Language in Halifax next May; and sponsorship of the new international AI journal, *Computational Intelligence*, published by the National Research Council of Canada. Most of these activities have needed funds either to seed them or to support them on an ongoing basis. Put simply, CSCSI/SCEIO is now doing more things than we have the money to support. An increase in dues seems the only alternative.

The Good News:

The dues increase will have its compensations. In addition to the tangible and intangible benefits of all the Society's activities outlined above, we are going to provide a number of perks to Society members.

First, you will be able to get *Computational Intelligence* for $16 on top of your membership dues. Even for "full fare" members, this will mean that the journal plus dues will cost less than the normal price of journal alone (whose cost to individual subscribers will be $37). [See pages 12–13 for details of the journal and discount subscriptions.]

Second, at all future conferences sponsored by CSCSI/SCEIO, including the Natural Language Workshop in Halifax and the next National Conference in Montreal in May 1986, there will be a discount of at least $10 for CSCSI/SCEIO members. (Future conference organizers take note!)

Other goodies may yet come to pass, including a reduced rate for proceedings of upcoming CSCSI/SCEIO conferences, a discount on future CSCSI/SCEIO reports, and so forth. The Executive is hopeful that this "sugar" will take away at least some of the bad taste of increased dues. □

Let's parlons français!

(Continued from page 3)

executive. This I did, in consultation with all the French speakers that I was able to muster at short notice.

So now, here is the new French name of our society:

(3) Société canadienne pour l'étude de l'intelligence par ordinateur

Here are the reasons for the changes:

(a) In English you say both "computational studies of intelligence" or "the computational study of intelligence". In French, the plural form carries only the connotation of a set of projects rather than a field of study; you have to use the singular to connote a discipline.

(b) There was no general agreement among the panel on "pour l'étude" versus "d'étude", but some went strongly for the former as stylistically better.

(c) Everyone agrees that you can't say "d'intelligence"; it *has* to be "de l'intelligence".

Francophones are urged to try not to disagree with any of this.

Of course, the society's legal French name remains the syntactically incorrect version that is in our charter. I suggest that we ignore that fact when at all possible, and maybe sooner or later we will get around to quietly changing it.

□ □ □ □ □

The response to the first issue of the *Newsletter* has been very gratifying. I am especially pleased by the number of companies that, on the basis of our first issue, have taken out advertisements in the present issue. The advertising of AI-related products and services will be of interest to readers, and will help defray the Society's expenses in publishing the *Newsletter*.

This issue is large, but we are always on the lookout for more material—especially from groups and companies that have not yet been represented in the *Newsletter*. If you have something you want the Canadian AI community to know about—a report, a company, a product, an opinion, a project, or anything else—just let us know. □

Readers write

Letters to the Editor

Kind words for the *Newsletter*

Just got my *Newsletter* today—beautiful! It will certainly be a pleasure looking forward to getting and reading a regular newsletter of this quality.

Can I purchase a few extra copies to use promotionally around BC and in my travels? I'm really very impressed.

Nick Cercone
Simon Fraser University

The *Newsletter* looks good. It certainly spruces up the organization.

Wayne Davis
University of Alberta

A very positive step for the organization.

Bonnie Webber
University of Pennsylvania

Congrats on the new format—it's very professional. Is there any reason not to publish it online (apart from the obvious potential loss of revenue and the lack of images of our beloved President)? Would the revenue loss materialise? Why not try it as an experiment for a year?

Alan Mackworth
University of British Columbia

The obvious problems, none necessarily insurmountable, are these: Large size (about 100K) for phone transmission and for archiving by individuals; difficulty in browsing with conventional terminals;

more work for me in formatting both a version typesetting and one for ASCII terminals; loss of advertising content and revenue. What do other readers think?—Editor

Intent clarified

It has been suggested to me that my use of the words "sycophants" and "charlatans" in my outgoing President's message jeopardized the achievements of our entire community. May I clarify my use of the objectionable language? I was referring to some small portion of the entire new audience who have recently become interested in AI. I was simply commenting on the tremendous increase in public awareness of AI which I had observed during my 2 years in office, and how AIers get frustrated by popular misconceptions about the field.

It was also found objectionable that I described the CIAR as egomaniacal and deceptive during most of 1983 and early 1984. Egomania is defined as "limited in outlook or concern to one's own activities or needs or to those of one's group: wrapped up in oneself". The CIAR asked the CSCSI/SCEIO for co-operation on the promotion of AI research, and then for an extended period of time did not return that co-operation by informing the CSCSI/SCEIO about CIAR intentions and activities. It seemed to me egocentric to not appreciate that the CSCSI/SCEIO would of course be affected by additions and revisions to the Canadian AI infrastructure, and that even at the planning stage the CIAR would have an impact on the plans of the rest of the community. My use of the word "deceptive" was probably mistaken, and I apologise. I was deceived by the delay between my request for information from the CIAR and the date of receipt of information. Academics who are preoccupied by research are understandably hard pressed but, I hope, all of us charged with the responsibility of communication will become more effective with experience.

Nick Cercone
Past President, CSCSI/SCEIO

Guidelines for electronic submissions

The *Canadian A.I. Newsletter* prefers submissions to be made by network mail, 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 edited out again before typesetting. The best thing to send is plain typing or *troff* source (preferably with *–me* macros).

A Catechism for the Neat AI Person

(To be chanted by Apostles of the Unification Church, and their Disciples)

Q: What is First-Order Logic?

A: It is the one and only Knowledge Representation Language with a precise semantics. All other KRLs are false pretenders, or disguised and disfigured variants of FOL.

Q: Why did God make FOL?

A: God made FOL to describe and glorify his works and to provide gainful employment for logicians thereby keeping them off the streets and out of dangerous paradoxes that can destroy unprepared souls.

Q: What is a semantic net?

A: A semantic net is to a set of wffs as Lucifer is to Gabriel.

Q: Is FOL a programming language?

A: Yes and no.

Q: Is Horn a vision hacker or a logician?

A: Yes.

Q: If this sentence is Horn or not-Horn then is it false?

A:

—Alan Mackworth

Advertising in the *Canadian A.I. Newsletter*

An advertisement in the *Canadian A.I. Newsletter* reaches CSCSI/SCEIO's 450 (and rapidly growing) members in the AI R&D community, and also key people in the Canadian media and federal and provincial governments.

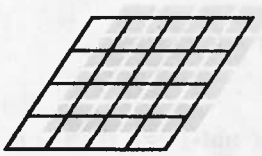
Our rates are extremely reasonable; $CDN100 ($US75) buys a full-page black-and-white advertisement. For full details, or to book space, contact the editor, Graeme Hirst, 416-978-8747.

Deadline for the March *Newsletter* is 15 February.

How the CIAR Program in Artificial Intelligence was set up

Peter Munsche
Executive Director
Canadian Institute for Advanced Research

Editor's note: In his President's report in the last *Newsletter*, Nick Cercone complained of the apparently mysterious way in which the Canadian Institute for Advanced Research had gone about supporting AI research in Canada, and raised some questions that he felt needed answering. In this article, Peter Munsche, the Institute's Executive Director, attempts to demystify CIAR.



On 1 July 1984, the Canadian Institute for Advanced Research launched its first program, Artificial Intelligence and Robotics. Its initial focus is sensory perception and the application of this capacity to robotic devices. To date twelve Fellows have been appointed to do research in this area; in addition, there are five Associates in the program and the Institute intends to increase their number in the coming year. In the Canadian context, this represents a substantial investment, and thus it is not surprising that it has sparked a great deal of interest in the Canadian artificial intelligence community. I am pleased, therefore, to have this opportunity to explain why and how the Institute's program was developed.

Before doing so, I should say something about the Institute itself. CIAR is not a granting council or a foundation. It is a private, non-profit corporation established to focus resources, both financial and intellectual, on research areas that are important to Canada's future but which, for a variety of reasons, cannot be explored adequately within existing institutions. The Institute's aim is to build, in selected fields, the concentrations of research talent that are necessary to be competitive internationally. "Concentration", I should add, is not solely a matter of numerical strength. Many of the emerging areas of research require a high degree of cross-disciplinary interaction in order to move ahead. This kind of interaction is difficult to achieve in our universities, organized as they are on "departmental" lines. By constructing networks of researchers in selected fields, the Institute builds concentrations of research talent in both the cross- disciplinary and the numerical sense. Out of the interaction of our Fellows and Associates, both within and among their base institutions, we hope that a stronger, more dynamic research environment in Canada will be created.

The program in Artificial Intelligence and Robotics is our first attempt to implement this approach to research. The program grew out of the discussions of our Research Council. At its first meeting, the Council had asked that a task force be established to survey the general area of "man and machines". In its report, the task force recommended that the Institute focus on artificial intelligence and robotics. After additional investigation and discussion, the Council decided to refine the focus further and concentrate, at least initially, on sensory perception and robotics. While other areas of AI are undoubtedly challenging and important, the Council felt that this particular field was the one in which the Institute was most likely to have a beneficial impact. There were several reasons for this viewpoint, but two stand out: the opportunity to promote interaction among computer scientists, psychologists, neuroscientists, and engineers; and the presence in Canada of several centres of research strength on which a national program could be built.

The latter point was important not only in the selection of the program's focus, but also in our approach to its development. Since the Institute's aim was to build a concentration of research talent, the existing centres of strength in the field were the obvious places to begin. The strategy adopted by the Research Council was fairly straightforward. First, the initial appointments of Fellows would be made at these centres—or, in CIAR parlance, "nodes".

FELLOWS OF CIAR

University of British Columbia:
- †Daniel Kahneman (Psych)
- °Alan Mackworth (CompSci)
- Ray Reiter (CompSci)
- Anne Treisman (Psych)
- Robert Woodham (CompSci)

McGill University:
- †Pierre Bélanger (Eng)
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University of Toronto:
- Hector Levesque (CompSci)
- °John Mylopoulos (CompSci)
- John Tsotsos (CompSci)
- †John K. M. Stevens (Neuroscience)
- William Tatton (Neuroscience)

Elsewhere:
- †Richard B. Stein (Physiology, University of Alberta)
- †Max Cynader (Psych and Physiology, Dalhousie University)

°Node coordinator
†Associate Fellow

Secondly, the Institute would help these universities recruit additional researchers to complement and strengthen the work being done there. This, in the opinion of the Council, would provide the program with a firm foundation. Once it was in place, it would be possible to consider appointing Fellows outside the nodes. In the meanwhile, to ensure that the impact of the program was not confined solely to a few individuals, it was decided that the Institute would appoint a number of Associates to participate in seminars, workshops, and other activities organized by the Fellows. These Associates, because of the part-time nature of their participation in the program, did not have to be located at the nodes; in fact we have already appointed two who are not.

The most important step in beginning the program was, of course, the recruitment of Fellows. In this process the Council followed several general guidelines. One, as I have explained, was the limitation of initial appointments to the three nodes: the University of British Columbia, McGill University and the University of Toronto. The second was that the Fellows should be researchers "in, or entering, the most productive stage of their careers". Third, they should be able—and want—to interact productively with researchers in other disciplines. To assist it in making a judgement, the Research Council solicited the assessments of prominent researchers in other countries, including the United States, England, France, and Germany. The Research Council then considered the dossiers and made recommendations to the President and Board of Directors. We now have a dozen Fellows—four at each node (see table)—and are turning to the next challenge: to develop mechanisms for regular and productive interaction within the program. In that effort, the Fellows and Associates will be assisted by an Advisory Committee chaired by Arthur Bourns, former President of McMaster University. This committee will monitor the program's progress and, near the end of its initial five-year cycle, set up the arrangements for a full-scale appraisal.

The Institute has come a long way in two years, and a considerable amount of the credit for this must go to Bill Tatton, Director of the Playfair Neuroscience Unit at the University of Toronto. Without his vision and energy, it is very unlikely that we would now have a functioning national program in sensory perception and robotics. In October, Bill stepped down as coordinator of the program, but as a Senior Fellow he will continue to participate in its development in the years to come.

The Institute is currently in the process of developing several other potential research programs. One of these will focus on the social and cultural implications of advanced technology, including artificial intelligence; others are concerned with the factors that determine the health status of populations; cosmology; and empirical studies of the impact of laws and legal procedures. Significantly, all of these proposed programs could, and probably will, employ the information technologies now being developed in Canada and other countries. Thus, the potential for cooperation between the Institute and the Canadian artificial intelligence community goes well beyond our first program, and we look forward to a continuing interaction with its members as the Institute develops and grows. □

What is an AI program?

"An AI program is a program written by a person who fervently believes that he is doing AI as he writes the program. Mere belief is not sufficient; it must be zealous belief."

— Brian Reid

Opinion

On the U.S. Strategic Computing Plan

Peter Rowley
Department of Computer Science
University of Toronto
Toronto, CANADA M5S 1A4

After many decades of supporting basic research in Computer Science, and Artificial Intelligence in particular, the Defense Advanced Research Projects Agency (DARPA) of the U.S. Department of Defense indicated a change in direction on 28 October 1983, when it released details of its "Strategic Computing Plan" (SCP). In addition to continued support of basic research, DARPA indicated it would be spending enormous sums of money ($^{US}600 million over the first five years) to develop computer technology specifically directed to military applications. As it has been a major funder of CS research, it is in a good position to make its voice heard, and to have its preferred research put in a position of priority.

But there is concern in the computing community over the SCP, for ethical, political, and technical reasons. Some are worried of the spectre of the CS research establishment being increasingly steered into exclusively military research, with the accompanying problems of ethics and secrecy. Others feel that continued focus on military technology encourages people to ignore the social and political problems that create military conflicts; what should be sought are social, rather than technological, solutions. Finally, some AI researchers in particular are concerned that the specific plan outlined in the SCP depends on AI programs being far more reliable than they should be considered to be, given the current state of the art. Three such people, Severo M. Ornstein, Brian C. Smith, and Lucy A. Suchman, prepared a response to the SCP, based on comments from the members of Computer Professionals for Social Responsibility. The following is based closely on their statement.

The SCP document contains several specific military applications, all of which rely on AI technology and illustrate the hopes that DARPA has for that technology—to provide machines with "human-like, intelligent capabilities" including natural language understanding, vision, speech, and various kinds of automated reasoning. For the Army, the SCP proposes a class of "autonomous vehicles", able not only to move around independently, but also to "sense and interpret their environment, plan and reason using sensed and other data, initiate actions to be taken, and communicate with humans or other systems". For the Air Force, the SCP plans a "pilot's associate" to aid aircraft operators who are "regularly overwhelmed by the quantity of incoming data and communications on which they must base life-or-death decisions", in tasks ranging from the routine to those that are "difficult or impossible for the operator altogether" and that require the "ability to accept high-level goal statements or task descriptions". Finally, the Navy is offered a "battle management system", "capable of comprehending uncertain data to produce forecasts of likely events, drawing on previous human and machine experience to generate potential courses of action, evaluating these options, and explaining the supporting rationale". Also envisaged are "completely autonomous land, sea, and air vehicles capable of complex, far-ranging reconnaissance and attack missions".

These systems are asked to respond appropriately to "unanticipated enemy behaviour in the field" and, as an aside, it is noted that systems capable of this could "fundamentally change the nature of future conflicts". Indeed, this appears to be the case, as these systems propose to take the human "out of the loop", partially or completely. However, it is thought that current AI systems are simply not up to the task, nor are such systems in sight. While able to operate within well-defined and delimited domains, they fail badly when asked to employ common-sense reasoning or to deal with unanticipated situations, such as exactly those that the battlefield machines would face.

The research programme to build such machines would be highly directed, with a variety of mechanisms used: a close coupling of fundable research goals and military needs, adherence to strict development timetables, and the selection of specific development projects, such as the above examples.

Space does not permit a fuller discussion of these issues, but interested persons may obtain the full statement from Computer Professionals for Social Responsibility, P.O. Box 717, Palo Alto, CA 94301, U.S.A.

The importance of these and related issues has led to the formation of a discussion group in the Computer Science Department at the University of Toronto. Initially inspired by CPSR newsletters, the group (of approximately 15 people) has since discussed more general issues of the impact of computer technology on society, with a view to making fellow researchers aware of these concerns. Specifically, we'd like to make ourselves and others in the field aware of how our work in CS has a social impact, how we can consider such factors when planning research, and how to use our expertise to influence public policy on the use of the technology we create. We would like to correspond with other such groups. Please feel free to write to the "Social Impacts Discussion Group", in care of the author. □

IJCAI Award Nominations Solicited

The Board of Trustees of International Joint Conferences on Artificial Intelligence, Inc., solicits nominations for the following awards.

The IJCAI Award for Research Excellence

The Board of Trustees is proud to announce the establishment of The IJCAI Award for Research Excellence to honour sustained excellence in Artificial Intelligence research. The Award will be made every second year, at the International Joint Conference on Artificial Intelligence, to a scientist who has carried out a program of research of consistently high quality yielding several substantial results. If the research program has been carried out collaboratively the award may be made jointly to the research team.

The Award carries with it a certificate and the sum of $1,000 plus travel and living expenses for the IJCAI. The researcher(s) will be invited to deliver an address on the nature and significance of the results achieved. Primarily, however, the award carries the honour of having one's work selected by one's peers as an exemplar of sustained research in the maturing science of Artificial Intelligence.

We hereby call for nominations for The IJCAI Award for Research Excellence to be made at IJCAI-85 in Los Angeles. The section below on Selection Procedures for IJCAI Awards provides the relevant details.

The Computers and Thought Award

The Computers and Thought Lecture is given at each International Joint Conference on Artificial Intelligence by an outstanding young scientist in the field of artificial intelligence. An award of $1,000 and payment for travel and subsistence expenses are provided to the recipient. The Lecture is given one evening during the Conference, and the public is invited to attend. The Lectureship was established with royalties received from the book *Computers and Thought*, edited by Feigenbaum and Feldman; it is currently supported by income from IJCAI funds.

Past recipients of this honour have been Terry Winograd (1971), Patrick Winston (1973), Chuck Rieger (1975), Douglas Lenat (1977), David Marr (1979), Gerald Sussman (1981), and Tom Mitchell (1983).

Nominations are invited for The Computers and Thought Award to be made at IJCAI-85 in Los Angeles. The note on Selection Procedures for IJCAI Awards covers the nomination procedures to be followed.

Selection Procedures for IJCAI Awards

Nominations for The Computers and Thought Award and The IJCAI Award for Research Excellence are invited from all in the international Artificial Intelligence community. The procedures are the same for both awards.

There should be a nominator and a seconder, at least one of whom should not have been in the same institution as the nominee. The nominee must agree to be nominated. The nominators should prepare a short submission of less than 2,000 words for the voters, outlining the nominee's qualifications with respect to the criteria for the particular award.

The award selection committee is the union of the Program, Organizing and Conference Committees of the upcoming IJCAI and the Board of Trustees of IJCAII with nominees excluded. Nominations should be submitted before 31 March 1985 to the IJCAI-85 Conference Chair:

Alan Mackworth
Department of Computer Science
University of British Columbia
Vancouver, BC CANADA V6T 1W5

Phone: (604) 228-4893
CSNET: mack@ubc
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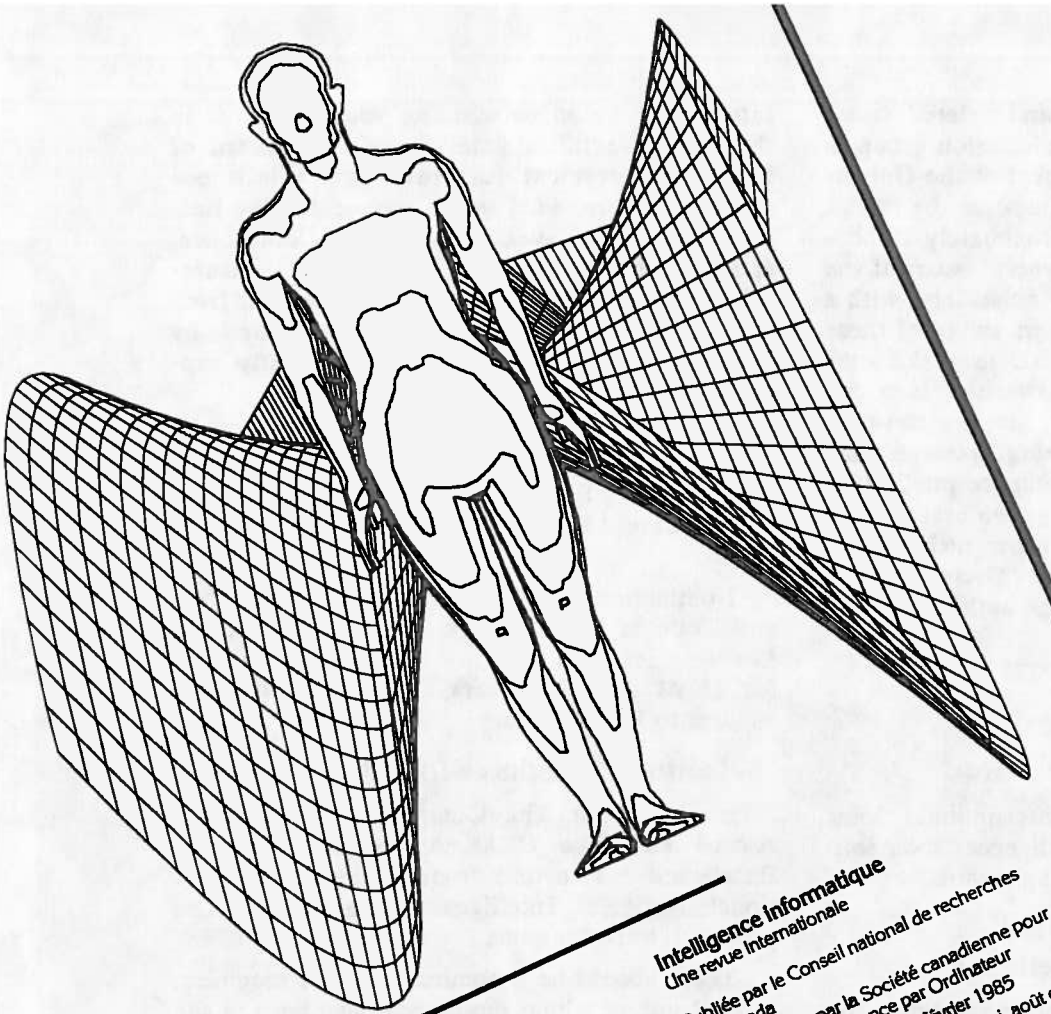
UUCP: mack@ubc-vision

New Bindings

Jim des Rivieres, from Xerox PARC to University of Toronto.

Vicky Snarr from University of Toronto to Bell-Northern Research.



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Computational Intelligence is a new journal which will publish, in English or French, high-quality original theoretical or experimental research papers in the areas of knowledge representation, natural language understanding, computational vision, applications of artificial intelligence, logic programming, theorem proving, learning, cognitive science, problem-solving and planning, computational tools for artificial intelligence, speech understanding, game playing, philosophical implications, and foundations of artificial intelligence.

Intelligence informatique
Une revue internationale

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La nouvelle revue **Intelligence informatique** publiera, en français ou en anglais, des comptes rendus de recherche théorique originale de grande qualité ou de recherche expérimentale sur l'intelligence informatique (artificielle), incluant des communications dans les domaines de la représentation de la connaissance, la compréhension du langage naturel, la vision informatique, les applications de l'intelligence artificielle, la programmation logique, la démonstration de théorèmes, l'apprentissage, la science cognitive, la planification et la résolution des problèmes, les langages et les outils servant à l'intelligence artificielle, la compréhension du discours, des jeux, les répercussions philosophiques et les fondements de l'intelligence artificielle.

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Artificial Intelligence and Fifth Generation Activities at the University of Waterloo

Robin Cohen and Randy Goebel
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University of Waterloo
Waterloo, Ont N2L 3G1

1. Logic Programming and AI Group

The Logic Programming and Artificial Intelligence Group ("LPAIG") at the University of Waterloo began life as the Logic Programming Group on September 22, 1983. At this time Maarten van Emden and Randy Goebel initiated regular meetings that have continued to the present time. The group was formed to provide a focus for faculty and graduate students interested in logic programming and AI.

With the growing interest in logic programming and AI, three new faculty have been hired, and two others have associated themselves with the group. The new additions have brought a wealth of AI expertise, thus the name change.

The group currently meets twice a month, with a meeting format that gets group business done with in order to discuss technical issues relating to logic programming and AI. The technical discussions alternate between logic programming and AI issues with frequent (and inevitable) overlap.

The LPAIG has fostered the development of two subsidiary groups, the Learning Group and the Prolog implementation group. Both of these groups meet regularly, to discuss issues relating to their interests.

Here follows a synopsis of the research interests of LPAIG faculty members.

Romas Aleliunas:
- **Architectures for logic programming.**
- **Modular structure for logic programs.**
- **Variants of logic programming.**

Bruce Char:
- **Using the inference machinery of Prolog to support the manipulation of equalities and inequalities in symbolic algebra systems.**

Robin Cohen:
- **Computational linguistics; in particular, models of discourse and pragmatic analysis (understanding that is relative to beliefs of agents involved).**
- **Developing user-directed language interfaces for expert systems.**
- **Social issues in computing (a side-line to AI).**

Marlene Jones Colbourn:
- **The development of expert systems to assist in diagnosing learning disabilities, particularly reading problems.**
- **Intelligent CAI, including student models and representation of teaching strategies.**
- **Various aspects of learning.**
- **Other interests include algorithmic aspects of combinatorial design theory, and special education.**

Maarten van Emden:
- **Theoretical foundations of logic programming.**
- **User interfaces for logic programming.**
- **Knowledge-based programming.**

Randy Goebel:
- **The semantics of descriptions in logic-based knowledge representation languages.**
- **The design and implementation of logic programming systems and architectures.**
- **The theory and practice of integrity maintenance in logic databases.**
- **AI applications in the Intelligent UNIX Shell project.**

David Poole:
- **Artificial intelligence.**
- **Automated logical and common-sense reasoning.**
- **Reasoning about uncertainty, particularly default reasoning systems with model-theoretic semantics and efficient implementations; this includes implementations of the scientific method, and diagnosis expert**

systems.

- Other interests include efficient deduction in knowledge-based systems, logic databases (particularly integrity issues), theorem proving, logic programming.

2. Fifth Generation Research at Waterloo

The participants of the Canadian Society for Fifth Generation Research (CSFGR) have recently received the steering committee's draft plan that summarizes the proposals of numerous Canadian researchers. Seven of the proposals were from the University of Waterloo: four from Computer Science, two from Electrical Engineering, and one from Systems Design.

The Waterloo projects span the complete spectrum of both hardware and software development. At the basic hardware level, the Systems-on-Silicon Group (Prof Seviora) proposes the design and fabrication of custom VLSI circuits to support logic programming machines. This project is intended to support the requirements of related projects at the architecture level.

The architecture-level projects include the design and construction of a prototype sequential Prolog workstation, and the design and construction of a parallel Prolog processor based on Waterloops. Professors Burkowski and Goebel have outlined the design of a Prolog workstation based on Sylvan, Burkowski's architecture designed to support message-passing system software. The proposed workstation will be based on a single Sylvan node whose architecture provides high speed communication amongst a small cluster of co-processors. The current plan is to provide a micro-coded Prolog kernel for an inference engine, and a Motorola 68020 for executing built-in operations (database operations, I/O). The co-processor organization of the architecture means that appropriate custom VLSI circuits can simply be connected to the message bus. For example, a graphics processor to support a bit-map screen is currently being designed.

The system software of the Prolog workstation is to provide an environment for the further development of logic programming languages and systems, including Professor van Emden's QUARFE ("QUestion-Answer-Rule-Fact-Explanation") proposal, and Professors Colbourn, Poole, and Cohen's CONLOG development. Van Emden has proposed the development of a logic programming software environment that begins with conventional hardware technology and provides a novel user interface that supports the development of mundane expert systems. The idea is to provide an expert system–type interface for all interactions with a computer, from powering up to switching off. The hardware proposals of Ostlund, Burkowski, and Goebel provide the necessary support for the QUARFE workstation idea.

Colbourn, Poole, and Cohen plan to implement CONLOG, a logic programming language with extended logical and reasoning capabilities, and to use CONLOG in experimental applications. CONLOG has been designed to provide a mechanism for both acquiring and using symbolic knowledge, by providing an enriched reasoning mechanism that aids in maintaining consistent knowledge bases. The applications providing focus to the CONLOG development include the reconstruction of an existing expert system for the diagnosis of children's reading disabilities (Colbourn), and the development of a sophisticated natural language interface based on Cohen's research on discourse.

Other related Waterloo projects include the proposal of Professor Wong of the Pattern Analysis and Machine Intelligence Group for the construction of a roving robot, and that of Seviora and others of the Systems-on-Silicon Project for development of expert software for VLSI design.

The excitement at Waterloo is not so much a result of the Fifth Generation project of the CSFGR response. It comes from the more general feeling of being able to grasp a complete system, from custom VLSI to natural language interface. This provides all the researchers involved with the rare opportunity to receive feedback from a wide variety of hardware and software experts. □

AI in the media

"Computers come into the world full-grown and ignorant. They don't even know enough to come in out of the rain. But even so, I couldn't deny an almost dizzying sense of absurdity when I first heard about PANDORA. I felt as if I'd entered some sort of bizarre computational netherworld where the Promethean and the quixotic had somehow merged. 'Welcome to AI,' Wilensky said with a smile."

—Frank Rose, "The PANDORA project."
Esquire, July 1984.

[The article described AI research at the University of California, Berkeley.]

Project report

A Second-Generation Expert Systems Technology

The Artificial Intelligence Group
Department of Computer Science
University of Toronto

A technology developed 5–10 years ago within AI for building "expert systems" is currently spearheading national and international research and development projects on "Fifth Generation Systems" in Japan, the U.S., England and the European Economic Community. At stake is control of the software industry of the 90s. This technology is based on the premise that heuristic knowledge can be represented effectively in terms of "rules" or (Prolog) "clauses".

Despite its successes, however, this technology is generally recognized as limited in its range of applicability, simply because it does not take into account recent research on knowledge representation, reasoning techniques, natural-language interfaces and knowledge acquisition. The aim of the present project is to consolidate research carried out at the University of Toronto over the past decade into a second-generation technology for building expert systems. The advantages of the new technology are expected to come from an emphasis on knowledge organization, a control structure that is based on relaxation labelling rather than backtracking, and a thorough treatment of time and causality, which are essential semantic ingredients of many expert system applications. Such a second generation framework has a wide variety of applications including communications, diagnosis, sensor data interpretation, software engineering, and intelligent robotics systems.

A strategic grant in the Computers and Communications category was granted by the Natural Sciences and Engineering Research Council of Canada supporting this effort. It is the largest grant for AI research and development ever given by NSERC. The group will receive $1,495,000 over a three-year period, commencing 1 November 1984. This amount includes a large hardware component (for Lisp machines, of type yet to be determined), in addition to funds for hiring three PhD-level Research Scientists and 2 programmers, as well as graduate student support and other general research support items.

The members of the AI group at the University of Toronto are Graeme Hirst, Allan Jepson, Hector Levesque, John Mylopoulos, Raymond Reiter (starting spring 1985), and John Tsotsos. The group has strong contacts with several industrial research laboratories, as well as being a node of the Artificial Intelligence and Robotics Program sponsored by the Canadian Institute for Advanced Research. □

Company reports

LISP Canada Inc: The first Canadian distributor of Lisp Machines

Guy Chevalier, Sales Manager
LISP Canada Inc

The most sophisticated tool available to AI practitioner, the Lisp machine is now offered on the commercial market by several companies.

One of the most advanced Lisp machines is the Lambda™ system manufactured by LISP Machine Inc (LMI). The new LMI Lambda is a commercial Lisp machine developed through the joint efforts of LMI and Texas Instruments (TI). It uses the TI NuMachine™ developed at M.I.T. and licensed to TI as a computing environment for LMI's Lisp processor. The NuBus architecture of the LMI Lambda gives it a multiprocessor capability, with full communication between different processors and the programs on them. The LMI Lambda is offered with both Lisp and UNIX™ processors so that users have the option of running conventional application programs on the machine, in addition to Lisp-based software, enabling them to interface traditional applications, such as large database management, with intelligent Lisp-based programs.

In view of the potential commercial applications of AI technology and the new availability of high performance, reliable mainstream Lisp machines, LISP Canada Inc was created in

September 1984 to distribute and service the LMI Lambda machine in Canada. The first few months of operation of the company have already shown the need for such a Canadian distributor.

LISP Canada Inc was created by Guy Montpetit, who is already well known to the AI community in Canada and abroad. Guy Montpetit is the founding president of LOGO Computer Systems Inc (LCSI) and chairman of the board of Silicart Inc, a Montreal-based company involved in silicon technology. Both LCSI and Silicart have extensively used Lisp machines for major industrial undertakings. LCSI is engaged in software development; Silicart is involved in the design of silicon chips as well as the development of new efficient systems for chip design.

LISP Canada Inc plans to offer to its Canadian customers services in three major areas: Canadian distribution of LMI products; maintenance of all hardware and software sold by LISP Canada; and user information and training.

Distribution: LISP Canada Inc is the exclusive distributor of LMI products in Canada. LMI computers and parts are stocked in Canada and will be ordered and paid for in Canadian funds with minimal delays due to importation procedures.

Maintenance: LISP Canada Inc offers service contracts on hardware and support contracts on software directly from Canada. Delays on service should never be more than one working day since all technical personnel and computer parts come from Canada. LISP Canada Inc plans to open offices in major Canadian cities as soon as demand for such services arise.

User information and training: LISP Canada Inc is setting up a training center as part of its Montreal office. The training center will be operational at the beginning of 1985. Actual and prospective Lisp users will be offered, at regular intervals, courses in Lisp programming which include hands-on experience in Lambda machines.

LISP Canada Inc plans to offer both introductory and advanced courses in Lisp as well as courses in Prolog and specialised topics of applied AI techniques.

In addition to its own staff, LISP Canada Inc can rely on the full support of LMI personnel in the U.S., and on the expertise of the staff of Silicart in Montreal.

LISP Canada Inc intends to play a role in the Canadian effort in accelerating the realization of the new technology, by providing an easier access to Canadian users to the most advanced type of machines and software available in the field of AI today. □

Xerox to Market AI Products in Canada

Roy Diggle, Manager
Xerox Advanced Systems Group

Xerox Canada Inc has formed an Advanced Systems Group to promote the sale and use of Xerox Artificial Intelligence products in Canada. Our group, operating out of the company's North York, Ont., headquarters, has national responsibility. Hardware maintenance in major Canadian cities will be provided by the Xerox field service organization.

Our group has staff, line, and support responsibilities. We have a dual mandate—to inform Canadians about our capabilities, and, equally important, to act as a conduit back to our development groups in Palo Alto and Pasadena, to ensure that Canadian requirements (and accomplishments) are given visibility, within their worldwide product mandates.

Formation of the Canadian group follows U.S. developments in which a separate business unit, responsible for Xerox AI activity, was created in May 1984. While our initial focus is California, longer term relationships could develop with both Rank Xerox in the U.K. and Fuji Xerox in Japan. □

AI in the media

The relationship between AI, Cognitive Science, and religion, as explained by *The Globe and Mail* (30 March 1984):

"On one side are the physiologists and 'cognitive scientists' who think the human body and brain must first be thoroughly understood, and then similar processes reproduced mechanically to achieve action and thought by machines.

"On the other side are the computer scientists and robotics specialists who think machine intelligence is different from human intelligence.

"Some of these (most of them profess to be atheists) . . . ."

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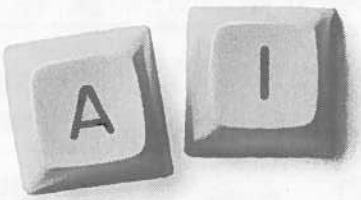

The keys to Artificial Intelligence are at Xerox.

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
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- Multiprocessing capacity
- Support of an extensible, interpreted language
- Display-oriented programming tools
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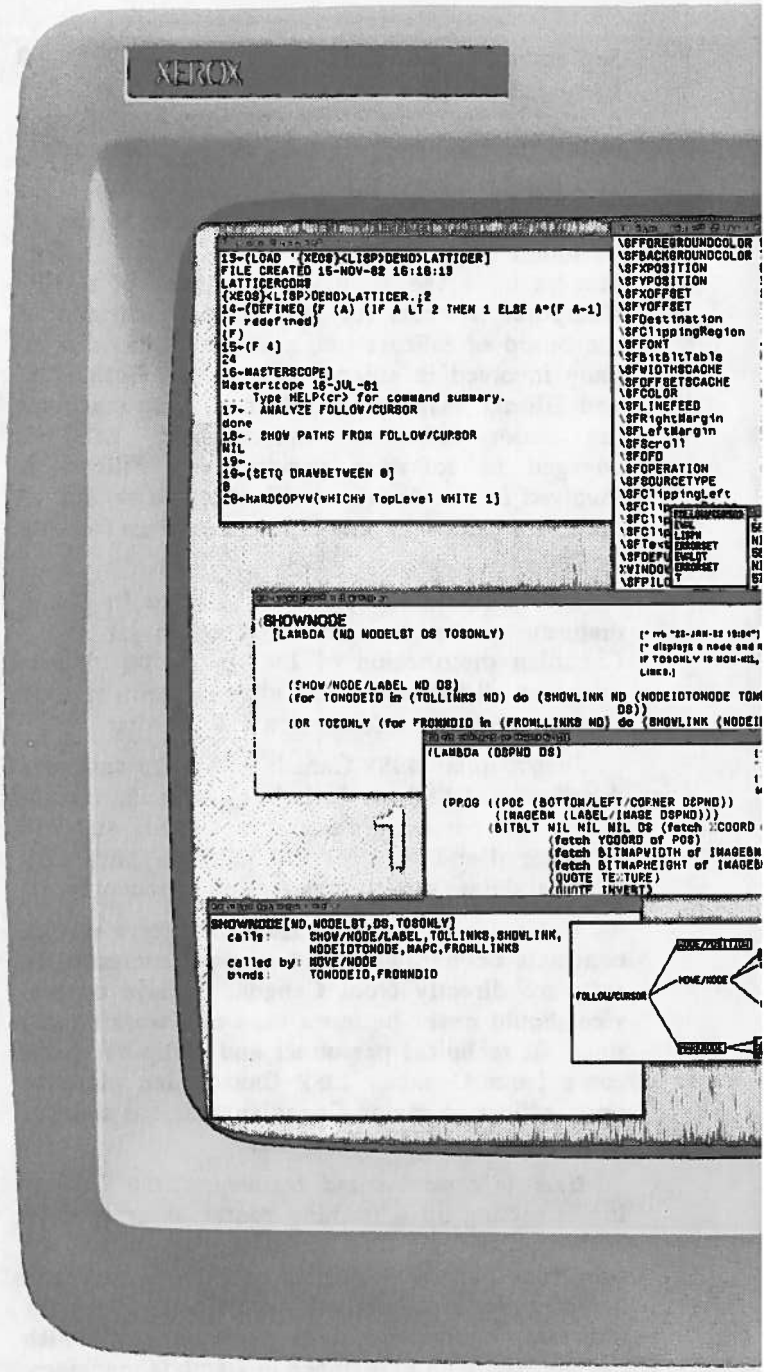


Power Tools for Programmers

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.

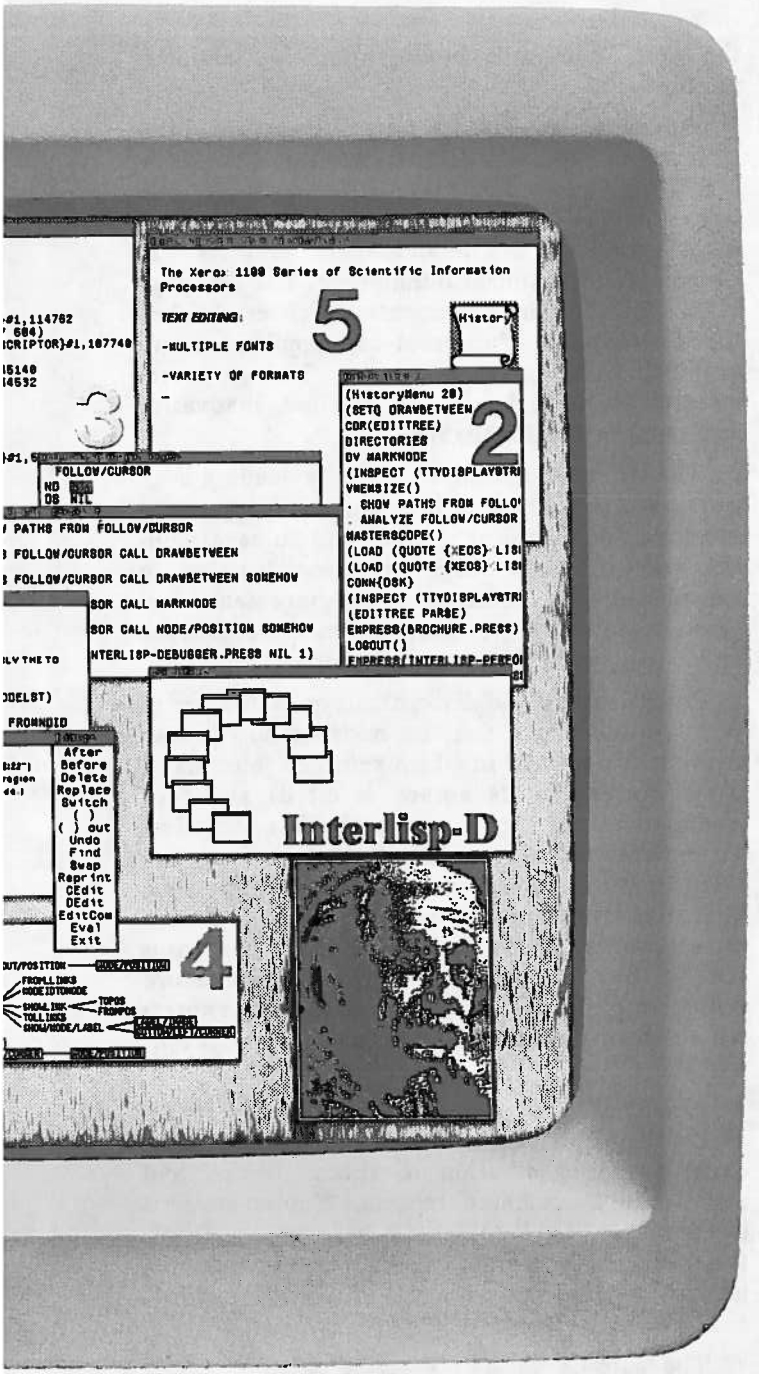
2. Programmer's Assistant

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

XEROX



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 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.

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Book Reviews and Publishing News

Artificial Intelligence: Making machines "think"

Neill Graham

Tab Books, Inc., Blue Ridge Summit, PA, 1979
Distributed in Canada by John Wiley
(ISBN 0-8306-1076-6; ^{CDN}14.50)

This book, intended for the popular market, is a relatively pedestrian re-hash of some old chestnuts like *Computers and Thought* [Feigenbaum and Feldman, eds.] as well as some newer chestnuts like *The Psychology of Computer Vision* by Patrick Winston. Embracing traditional (and sometimes obsolete) topics like state graphs, search trees, and/or trees, procedural nets, game playing, and pattern recognition, the book moves on to more modern topics like knowledge representation and natural language processing. It reads more like a tour of historical high-points in AI than a review of all the strategies and theories which seem to be relevant today.

There is the question, moreover, of whether the popular reader is really ready for a level of presentation which is only a mildly modified version of what appears in numerous AI textbooks.

On the plus side, Graham introduces the motif of a cartoon robot which becomes a vehicle for the presentation of several topics. This creates the impression, however, that all AI is aimed, ultimately, at the creation of robots. The chapter on robots itself is disappointingly short, the implication being that robots will ultimately embody every chapter of the book. Given these caveats, however, the chapters are each well-written and readable, especially toward the end of the book.

—*A.K.Dewdney*
University of Western Ontario

Artificial Intelligence: Bibliographic Summaries of the Select Literature

Henry Rylko, editor

The Report Store, Lawrence, KS, 1984
(ISBN 0-916313-02-6; ^{US}145.00 ppd.)

An innovative literature analysis technique designed to identify "leading-edge" scientific and professional knowledge has been used to produce the first "consensus bibliography" on artificial intelligence.

Published by The Report Store (910 Massachusetts St., Suite 503, Lawrence, KS 66044, U.S.A.), *Artificial Intelligence: Bibliographic Summaries of the Select Literature* includes original capsule reviews and bibliographic data for 210 documents on artificial intelligence. The 560-page work identifies the documents which established the foundations of present-day applications of artificial intelligence research. Though early research in AI technology is detailed, innovative new work is also highlighted.

The technique used to identify leading-edge works was developed to help prevent information overload for technical readers and to save valuable research time. Ergosyst Associates, Inc., a multidisciplinary information management firm based in Lawrence, Kansas, applies this technique to the compilation of consensus bibliographies.

By systematic and discriminating evaluation of each available title (on the basis of how extensively it is used and in which refereed journals or other documents its author is cited) a list of leading-edge researchers in the field is compiled. To isolate the best works of these experts and their sources, similar independent and objective bibliometric techniques and screening processes are employed. Titles included in every consensus bibliography published by The Report Store reflect an implicit consensus of opinion by experts whose work defines the most useful literature of a field.

Artificial Intelligence, edited by Henry Rylko of the Ergosyst research staff, features seminal early works in addition to recent works, and more than 20 research reports. Topics covered include robotics, automatic programming, cognitive science, computer vision, expert systems, natural language processing, machine learning, and problem solving.

The capsule reviews describe selected documents and frequently offer the reader commentary on an abstracted item's readability, intended audience, methods, and (when appropriate) preliminary conclusions.

Full tables of contents for titles are included. The work also includes a subject/author index and a quick-reference title/author list.

Artificial Intelligence is the first of a two-volume set. The second volume, available early next year, will emphasize recent literature, especially research and technical reports.

The literature analysis technique described above was developed by, and is applied to bibliography compilation by, Bernard O.

Williams, manager of literature analysis and research for Ergosyst Associates, and John L. Burch, publisher.

—From the publisher's announcement

Computational Intelligence to appear in February

***Computational Intelligence*, a new international AI journal, commences publication in February. The journal is sponsored by CSCSI/SCEIO and published by the National Research Council of Canada, which also publishes 12 other scientific journals.**

Members of CSCSI/SCEIO will be offered a substantial discount on subscriptions. Details of the journal and how to order it appear on pages 12–13 of this *Newsletter*. Orders should be sent as soon as possible to ensure timely receipt of the inaugural issue.

Cognitive Science becomes cheaper for Canadians

The Cognitive Science Society, sponsor of the journal *Cognitive Science*, has rescinded the $^{US}8.50 surcharge that it used to place on Canadian members to cover the additional cost of postage to Canada from the U.S. (which was in fact only about one quarter of the surcharge levied). Canadians may now join for only $^{US}35 (regular) or $^{US}20 (students). For more information, write to Allen Munro, Behavioral Technology Labs, University of Southern California, 1845 South Elena Avenue (4th floor), Redondo Beach, CA 90277, U.S.A.

Free books for *Newsletter* readers

From time to time, publishers send AI books for review in the *Newsletter*, and we are therefore in need of reviewers, who of course may keep the book after writing the review. If you would like to be a book reviewer for the *Newsletter*, contact the editor, giving your subfields of interest.

In stock at press time: Feigenbaum, Edward A and McCorduck, Pamela, *The fifth generation: Artificial Intelligence and Japan's computer challenge to the world*, Addison-Wesley, 1983 (to be reviewed from a Canadian perspective).

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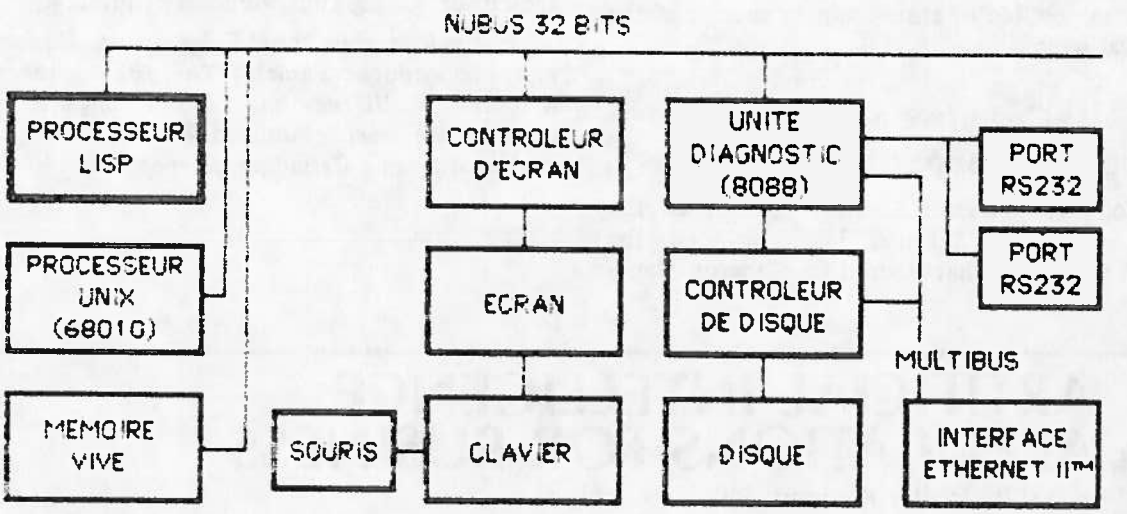

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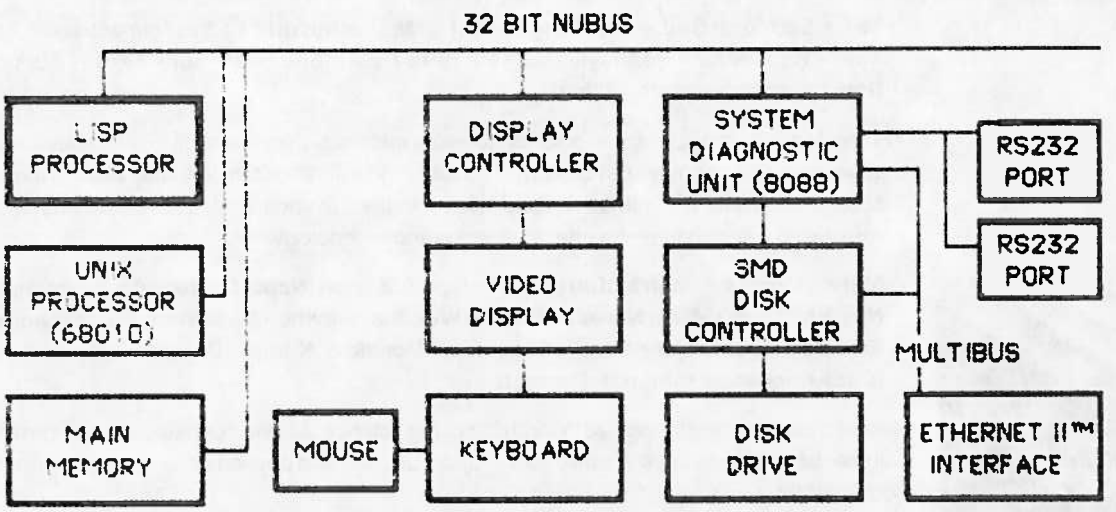

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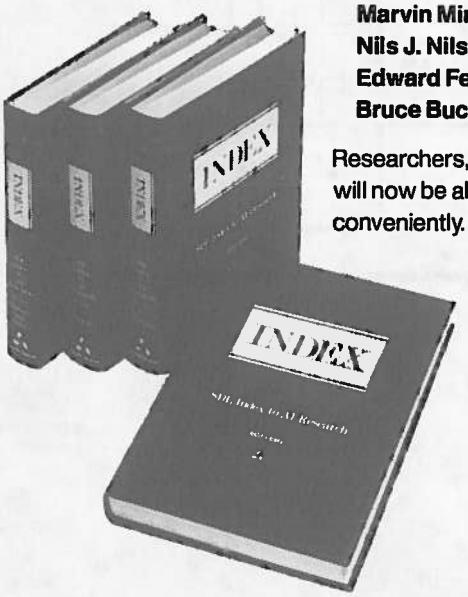

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Recent Technical Reports

Editor's note: Recent Canadian technical reports are listed in this department. Abstracts will be included as space permits, with preference being given to theses.

University of British Columbia

Requests for the following technical reports should be addressed to:

Department of Computer Science
University of British Columbia
Vancouver, BC, CANADA V6T 1W5

The Laboratory for Computational Vision

William Havens, Alan Mackworth, and Robert J. Woodham

April 1983

An introduction to the Laboratory.

Formalizing Non-Monotonic Reasoning Systems

David W. Etherington

TR 83-1

In recent years, there has been considerable interest in non-monotonic reasoning systems. Unfortunately, formal rigor has not always kept pace with the enthusiastic propagation of new systems. Formalizing such systems may yield dividends in terms of both clarity and correctness. We show that Default Logic is a useful tool for the specification and description of non-monotonic systems, and present new results which enhance this usefulness.

On the Complexity of Achieving k-Consistency

Raimund Seidel

TR 83-4

A number of combinatorial search problems can be formulated as constraint satisfaction problems. Typically, backtrack search is used to solve these problems. To counteract the frequent thrashing behaviour of backtrack search, methods have been proposed to pre-condition constraint satisfaction problems. These methods remove inconsistencies involving only a small number of variables from the problem. In this note we analyze the time complexity of the most general of these methods, Freuder's k-consistency algorithm. We show that it takes worst case time $O(n^k)$, where n is the number of variables in the problem.

A Prological Definition of HASL, A Purely Functional Language with Unification-Based Conditional Binding Expressions

Harvey Abramson

TR 83-8

We present a definition in Prolog of a new purely functional (applicative) language HASL (Harvey's Static Language). HASL is a descendant of Turner's SASL and differs from the latter in several significant points: it includes Abramson's unification-based conditional binding constructs; it restricts each clause in a definition of a HASL function to have the same arity, thereby complicating somewhat the compilation of clauses to combinators, but simplifying considerably the HASL reduction machine; and it includes the single element domain {fail} as a component of the domain of HASL data structures. It is intended to use HASL to express the functional dependencies in a translator-writing system based on denotational semantics, and to study the feasibility of using HASL as a functional sublanguage of Prolog or some other logic programming language. Regarding this latter application we suggest that since a reduction mechanism exists for HASL, it may be easier to combine it with a logic programming language than it was for Robinson and Siebert to combine Lisp and logic into LOGLISP: in that case a fairly complex mechanism had to be invented to reduce uninterpreted logic terms to Lisp values.

Scale-Based Descriptions of Planar Curves

Alan Mackworth and Farzin Mokhtarian

TR 84-1, March 1984

The problem posed in this paper is the description of planar curves at varying levels of detail. Five necessary conditions are imposed on any candidate solution method. Two candidate methods are rejected. A new method that uses well-known Gaussian smoothing techniques but applies them in a path-based coordinate system is described. By smoothing with respect to a path-length parameter, the difficulties of other methods are overcome. An example shows how the method extracts the major features of a curve, at varying levels of detail, based on segmentation at zeroes of the curvature. The method satisfies the five necessary criteria. [*Proc. 5th CSCSI/SCEIO Conference*, London, 1984,

114–119.]

A Sound and Sometimes Complete Query Evaluation Algorithm for Relational Databases with Null Values

Raymond Reiter

TR 83-11

A sound and, in certain cases, complete method is described for evaluating queries in relational databases with null values where these nulls represent existing but unknown individuals. The soundness and completeness results are proved relative to a formalization of such databases as suitable theories of first-order logic.

Definite Clause Translation Grammars

Harvey Abramson

TR 84-3

In this paper we introduce Definite Clause Translation Grammars, a new class of logic grammars which generalizes Definite Clause Grammars and which may be thought of as a logical implementation of Attribute Grammars. Definite Clause Translation Grammars permit the specification of the syntax and semantics of a language: the syntax is specified as in Definite Clause Grammars; but the semantics is specified by one or more semantic rules in the form of Horn clauses attached to each node of the parse tree (automatically created during syntactic analysis), and which control traversal(s) of the parse tree and computation of attributes of each node. The semantic rules attached to a node constitute therefore, a local data base for that node. The separation of syntactic and semantic rules is intended to promote modularity, simplicity and clarity of definition, and ease of modification as compared to Definite Clause Grammars, Metamorphosis Grammars, and Restriction Grammars.

On the Adequacy of Predicate Circumscription for Closed-World Reasoning

David W. Etherington, Robert E. Mercer, and Raymond Reiter

TR 84-5

We focus on McCarthy's method of predicate circumscription in order to establish various results about its consistency, and about its ability to conjecture new information. A basic result is that predicate circumscription cannot account for the standard kinds of default reasoning. Another is that predicate circumscription yields no new information about the equality predicate. This has important consequences for the unique names and domain closure assumptions.

Photometric Method for Determining Shape from Shading

Robert J. Woodham

TR 84-10, July 1984
[To appear in *Image Understanding 1984*, S. Ullman and W. A. Richards (eds.), Ablex Publishing Co., Norwood, NJ.]

A smooth opaque object produces an image in which brightness varies spatially even if the object is illuminated evenly and is covered by a surface material with uniform optical properties. Photometric methods relate image irradiance to object shape and surface material using physical models of the way surfaces reflect light. A reflectance map allows image irradiance to be written as a function of surface orientation, for a given surface material and light source distribution. Shape from shading algorithms use a reflectance map to analyze what is seen.

The development of photometric methods for determining shape from shading is discussed, beginning with examples from lunar astronomy. The results presented delineate shape information that can be determined from geometric measurements at object boundaries from shape information that can be determined from intensity measurements over sections of smooth surface. Recent work of Ikeuchi and Horn is presented which relaxes the requirement that the image irradiance equation be satisfied exactly. Instead, the image irradiance equation specifies one constraint that is combined with another constraint derived from general surface smoothness criteria. Shape from shading is expressed as a constrained minimization problem.

Another method uses multiple images in a technique called photometric stereo. In photometric stereo, the illumination is varied between successive images while the viewing direction remains constant. Multiple images obtained in this way provide enough information to determine surface orientation at each image point, without smoothness assumptions.

Constraints, Descriptions, and Domain Mappings in Computational Vision

Alan Mackworth

[In *Physical and Biological Processing of Images*, O. J. Braddick and A. C. Sleigh (eds.), Springer-Verlag, Berlin, 1983, 33–40.]

The central paradox of computational vision is that given only one or more images of a scene the set of possible scenes depicted is underconstrained; however, our subjective experience is the opposite: the scene appears to be heavily overconstrained. Every aspect of our own visual

experience offers mutually confirming evidence for the existence of a single, specific, non-ambiguous scene. This paradox can only be resolved by postulating that any perceiving system must supply organized knowledge of the scene domain, the imaging projection process, the radiometric and geometric aspects of lighting, the reflectance, transmission, and refractance properties of scene materials and many other relevant physical regularities. This knowledge spans a spectrum from general a priori knowledge of all scenes in the domain assumed to be imaged—what can be and what can not—to the specific, contingent knowledge of the actual scene and imaging situation involved what is and what is not.

Representing Knowledge of the Visual World

William Havens and Alan Mackworth

[*IEEE Computer*, 16(10), 1983, 90–96.]

We outline current scene analysis methodology and identify a number of its deficiencies. In response to these problems, some recent systems use schema-based knowledge representations. Examples taken from a system called Mapsee2 illustrate our arguments.

Recovering The Meaning Of Diagrams And Sketches

Alan Mackworth

[*Proc. Graphics Interface '83*, Edmonton, 1983, 313–317.]

Humans exploit diagrams and sketches in everyday communication with each other. Such images convey information because they have meanings fixed by the graphic conventions of the domain. Computer graphics has traditionally concentrated on representing and manipulating image structures and three-dimensional scene structures. But a friendly computer system must be able to share its interpretation of a diagram with the user. Expert systems that acquire knowledge from computer-naive experts particularly require this capacity. It can only be achieved by explicitly representing the scene/image mapping process. Various explicit representations have been proposed including grammars, constraint methods, predicate calculus and object-oriented schemata. Working systems that use these representations to interpret diagrams and sketches are discussed. The representations are evaluated using descriptive and procedural adequacy criteria. The advantages of explicit knowledge representations for image synthesis and analysis, image transmission and human-machine communication are described.

On Seeing Things, Again

Alan Mackworth

[*Proc. 8th International Joint Conference on Artificial Intelligence*, Karlsruhe, 1983, 1187–1191.]

Computational vision has developed as a distinct scientific field in the last decade with a shared paradigm, a research strategy and a collection of results within a common theory. That development has focused on an analysis of the visual task itself; the task requires the unpacking of a collection of confounding processes. Explicit intermediate representations of the confounded domains must be constructed, with certain characteristics. Constraint-based representations and processes provide a common methodology at all levels of the visual system. Adequacy criteria may be applied to the various representations of visual knowledge, both implicit and explicit, that have been proposed. Finally, nine broad areas of research progress are summarized. The agenda for the next decade must include understanding meta-knowledge computation such as the representation and use of the hierarchies of default assumptions that our microtheories require.

The Complexity of Some Polynomial Network Consistency Algorithms for Constraint-Satisfaction Problems

Alan Mackworth and Eugene C. Freuder

[To appear in *Artificial Intelligence*.]

Constraint-satisfaction problems play a central role in artificial intelligence. A class of network consistency algorithms for eliminating local inconsistencies in such problems has previously been described. We analyze the time complexity of several node, arc, and path consistency algorithms and prove that arc consistency is achievable in time linear in the number of binary constraints. The Waltz filtering algorithm is a special case of the arc consistency algorithm. In the edge-labelling computational vision application, the constraint graph is planar and so the time complexity is linear in the number of variables.

University of Toronto

New AI technical reports from the University of Toronto are available from three research groups:

1. Representation of Knowledge
2. The Taxis Project
3. Research in Biological and Computational Vision

Requests for any of the following publications should be addressed to:

Artificial Intelligence Group
Department of Computer Science
University of Toronto
Toronto, Ont., CANADA M5S 1A4

1. Representation of Knowledge

APSN: A Hybrid System for Representing Belief and Knowledge

Greg McArthur

MSc thesis
Forthcoming, 90 pages

We describe a formalism called APSN which uses an object-oriented language to define terms for both generic and individual concepts and a logical language to make assertions using these terms as well as terms for non-concepts. APSN has the advantages of both object-oriented and logical languages: the organizational ability of the former sort of language and the expressive power of the latter sort. Having terms for both concepts and non-concepts allows us to represent knowledge about belief and knowledge within the logical language, by distinguishing between cases in which the meaning of a term is its extension (the thing itself) and cases in which the meaning is its intension (the concept of the thing). The term-forming facility allows concepts to be related in a definitional, and not merely contingent way.

APSN is based on the Procedural Semantic Network (PSN): a modified version of PSN is used as the object-oriented language, and the logical language can be represented in PSN.

2. The Taxis Project

TAXIED-e: Automation of Scripts and User Interface in an Integrated Interactive Design Environment for Taxis

Sun G. Park

MSc thesis
Forthcoming, 130 pages

Taxis, a language for designing interactive information systems, is one of a number of recently proposed conceptual modeling languages. Taxis offers an object-oriented framework for associating objects with operations for access, modification and long-term information management. Moreover, all objects are organized in terms of three abstraction principles: aggregation, classification and generalization. Long term processes are modeled in terms of *scripts*, which are a version of augmented Petri nets.

In an MSc thesis by Patrick O'Brien, an interactive program design environment is presented for a subset of the Taxis language which does not include scripts. In the present thesis, we augment the environment to handle scripts by offering a *Petri net analyzer* and extending O'Brien's interpreter-simulator and syntax-directed editor.

The analyzer performs static analysis of a script class, providing a Petri net diagram which shows transition evolutions in the form of a simplified graph. It can also be used to display state-transition relationships and cross-references between script classes. In addition, a *script interpreter* was developed to simulate and monitor the interpretation of scripts thus allowing the designer to experiment with scripts under development, on the basis of the knowledge obtained from the net analyzer.

3. Research in Biological and Computational Vision

The Stereopsis of Time-Varying Imagery

Michael Richard MacLean Jenkin

Technical Report RBCV-84-3
M.Sc. thesis, July 1984

The goal of this research was to design a non-cooperative algorithm for the problem of the stereopsis of time-varying images. The algorithm has been implemented in a computer system capable of interpreting a three-dimensional visual scene as presented in a sequence of stereoscopic images. The input to the system consists of a sequence of digitized stereoscopic snapshots. The output of the system is a description of the three-dimensional motion of the objects being viewed by the system.

The system integrates two problems; the problem of stereopsis and the problem of tracking objects through time. Rather than finding the intersection of the two problems to be more difficult than solving each problem separately, it was found that by solving the two problems simultaneously, and thus incorporating the spatio-temporal context within which the scene exists, some of the hard subproblems belonging to the problems of static stereopsis and temporal correspondence can be avoided.

The system has been tested on both synthetic and real input sequences.

Survey on Color: Aspects of Perception and Computation

Ron Gershon

Technical Report RBCV-84-4
July 1984

One of the areas which has received little attention in computer vision research is color vision. This paper reviews the main aspects of color vision, which originate from different disciplines of science. Physical concepts regarding light and reflection govern the appearance of objects. The structure of the visual system (mainly in primates) may help the construction of computational models of color vision. The discussion in this paper includes the different facts and problems they pose, some of which are currently being explored.

The Early Processing of Spatio-Temporal Visual Information

David J. Fleet

MSc thesis, TR RBCV-84-7
September 1984, 115 pages

Until recently, research on machine and biological vision has implicitly assumed that spatial processing is independent of temporal context. Most approaches in machine vision assume that techniques developed for spatial analysis can be applied directly within a spatio-temporal framework. In biological studies, static spatial models are often used to describe the behaviour of neural units which exhibit significant temporal properties.

The spatial difference of Gaussians (DOG) receptive-field model is used extensively in neurophysiology, psychophysics, and machine vision. Its use in machine vision is motivated principally by its suggested biological relevance. Unfortunately, the DOG has no temporal properties and the retinal centre-surround cell types that it is often applied to exhibit significant inseparable behaviour; their spatial tuning depends on temporal context.

The centre-surround (CS) model presented here is a natural extension of the DOG model to include time-dependent behaviour. In particular, low-pass temporal filters are added to both the centre and the surround, and the surround is delayed by a fixed amount relative to the centre. The behaviour of the model agrees closely with data from a variety of electrophysiological and perceptual experiments. The results of the model suggest that a form/motion dichotomy is not an appropriate functional characterization of ganglion X and Y cells. We conclude that alternative functional interpretations of retinal ganglion cells are in order.

In addition to the importance of early temporal processing, we stress the need for signal theory in the design and analysis of operators for visual processing. We consider the virtues of operators that maintain simultaneous localization in space-time and in frequency space for representation of visual information and the extraction of visual cues, and comment on several operators in current use that exhibit undesirable signal properties.

Simon Fraser University

Requests for the following technical reports should be addressed to:

Carol Murchison
Department of Computing Science
Simon Fraser University
Burnaby, BC V5A 1S6

A cautious scheduler for multi-step transactions

N. Katoh, T. Kameda, and T. Ibaraki

LCCR TR 84-7

SHADOW: A natural language query analyser

Robert Hadley

LCCR TR 84-3

A natural language query interpreter (SHADOW) is described which is capable of analyzing and answering a useful range of English questions posed to a Prolog database. The system is written in Prolog, and although SHADOW deals primarily with a specific academic database, it has been designed so that adaptation for use on arbitrary databases written in Prolog is straightforward. The primary aim of the system is to analyse and interpret certain problematic types of queries, such as those which involve ambiguous use of logical quantifiers, and those involving very complex set intersections. SHADOW is capable of disambiguating certain questions, and of detecting and reporting three types of false presuppositions.

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

WoShun Luk

CMPT TR 84-12, LCCR TR 84-5

Site-optimal termination protocols for a distributed database system under network partioning

D. Cheung and T. Kameda

LCCR TR 84-6

Theoretical Approaches to Natural Language Understanding

sponsored by the CSCSI/SCEIO

Dalhousie University – Halifax, Nova Scotia
28–30 May 1985

☞ CALL FOR PAPERS

General Chairperson: *Richard Rosenberg,* Math Dept., Dalhousie University, Halifax, N.S. B3H 4H8
Program Chairperson: *Nick Cercone,* Computing Science Dept., Simon Fraser University, Burnaby, B.C. V5A 1S6

Program and Organising Committee: *Len Schubert,* University of Alberta
Veronica Dahl, Simon Fraser University
David Israel, Bolt, Beranek and Newman and SRI International
Graeme Hirst, University of Toronto
James Allen, University of Rochester
Ralph Weischedel, Bolt, Beranek and Newman

Partial list of invited speakers: *Harvey Abramson, Jon Barwise, Robin Cooper, Dan Flickinger, Joyce Friedman, Don Hindle, Mitch Marcus, Fernando Pereira, Paul Sabatier, Patrick Saint-Dizier, Norm Sondheimer, David Scott Warren, William Woods*

Theoretical Approaches to Natural Language Understanding is intended to bring together active researchers in Computational Linguistics, Artificial Intelligence, Linguistics, Philosophy, and Cognitive Science to discuss/hear invited talks, papers, and positions relating to some of the "hot" issues regarding the current state of natural language understanding. The three topics chosen for discussion will form the focus for contributions to Theoretical Approaches to Natural Language Understanding. The three topics include aspects of grammars, aspects of semantics/pragmatics, and knowledge representation. Each of these topics will consider current methodologies: for grammars – theoretical developments, especially generalised phrase structure grammars and logic-based meta-grammars; for semantics – situational semantics and Montague semantics; for knowledge representation – logical systems (temporal logics, etc.) and special purpose inference systems.

Papers are solicited on topics in any of the areas mentioned above. You are invited to submit four copies of a paper (double-spaced, maximum 4000 words) to the *program chairman* before 12 January 1985. Authors will be notified of acceptances by 27 February 1985. Accepted papers, typed on special forms, will be due 30 March 1985 and should be sent to the program chairman. To make refereeing possible it is important that the abstract summarise the novel ideas, contain enough information about the scope of the work, and include comparisons to the relevant literature. Accepted papers will appear in the Proceedings; those papers so recommended by the reviewers will be considered for inclusion in a special issue of *Computational Intelligence,* an international artificial intelligence journal published by the National Research Council of Canada. Presentation of papers at the Workshop will be at the discretion of the program/organising committee in order to maintain the focus and workshop flavour of this meeting. Information concerning local arrangements will be available from the general chairman. Proceedings will be distributed at the Workshop and subsequently available for purchase.

Forthcoming Conferences, and Calls for Papers

CSCSI/SCEIO Workshop on
Theoretical Approaches to Natural Language

28–30 May 1985

Dalhousie University
Halifax, Nova Scotia

Papers are solicited in the following areas:

- **Theoretical developments in grammars, especially Generalized Phrase Structure Grammars**
- **Logic-based meta-grammars**
- **Situation semantics**
- **Montague semantics**
- **Systems of logics**
- **Special-purpose inference systems**

For details, see the announcement on the opposite page.

COMPINT '85
IEEE International Computer Conference and Exhibition

9–12 September 1985

Palais des Congrès
Montréal

The conference theme is *Computer-Aided Technologies*, from industrial through managerial, educational, and scientific applications. Areas of particular interest in AI include robotics and human-machine interfaces.

Long papers (up to 6,000 words) and short papers (up to 2,000 words) are solicited. For long papers, the complete manuscript will be reviewed; for short papers, only a 200 to 500 word summary is required. Papers must be submitted by 15 January 1985; authors will be notified by 9 April 1985.

For further information, author kits, and exhibitor's kits, write to:

COMPINT '85
PO Box 577
Desjardins Postal Station
Montréal, PQ CANADA H5B 1B7

Association for Computational Linguistics
23rd Annual Meeting

8–12 July 1985

University of Chicago
Chicago, Illinois

This international conference ranges over all of computational linguistics, including understanding, generation, translation, syntax and parsing, semantics, natural language interfaces, speech understanding and generation, phonetics, discourse phenomena, office support systems, author assistance, translation, and computational lexicons. Its scope is intended to encompass the contents of an Applied Natural Language Processing Conference as well as one on Theoretical Issues in Natural Language Processing. In short, we are striving for comprehensiveness.

The meeting will include presented papers, system demonstrations, and, on 8 July, a program of computational linguistics tutorials.

Authors should submit, by 18 January 1985, 6 copies of an extended summary (6 to 8 pages) to:

William C. Mann
ACL85 Program Chairman
USC/ISI, 4676 Admiralty Way
Marina del Rey, CA 90292, U.S.A.
Phone: 213-822-1511
ARPANET: mann@isib
UUCP: ucbvax!mann@isib

The summaries should describe completed work rather than intended work, and should indicate clearly the state of completion and validation of the research reported, identify what is novel about it, and clarify its status relative to prior reports.

Authors will be notified of acceptance by 8 March 1985. Full-length versions of accepted papers prepared on model paper must be received, along with a signed copyright release notice, by 26 April 1985.

All papers will be reviewed for general acceptability by either the Review Panel for Applications Papers or the Review Panel for Theory Papers. Authors may designate their paper as either an Applications Paper or a Theory Paper; undesignated papers will be distributed to one or both panels.

Those who wish to present demonstrations of commercial, developmental, and research computer programs and equipment specific to computational linguistics should contact:

Carole Hafner
College of Computer Science
Northeastern University
360 Huntington Avenue

Boston, MA 02115, U.S.A.
Phone: 617-437-5116 or 617-437-2462
CSNET: hafner@northeastern

For planning purposes, this information is needed as early as possible, but certainly before 30 April.

For other information on the conference, on the 8 July tutorials, and on the ACL more generally, contact:

Don Walker (ACL)
Bell Communications Research
445 South Street
Morristown, NJ 07960, U.S.A.
Phone: 201-829-4312
UUCP: bellcore!walker

Please note that the dates of the conference will allow people to attend the National Computer Conference, which will be held in Chicago the following week.

NCC '85
National Computer Conference

15–18 July 1985

McCormick Place, Chicago

The theme of the conference is "Technology's expanding horizons". For more information, write to:

AFIPS
1899 Preston White Drive
Reston, VA 22091, U.S.A.
Phone: 703-620-8900

Workshop on
Artificial Intelligence in Statistics

15–16 April 1985

AT&T Conference Center
Princeton, NJ

This workshop aims to bring together researchers in AI and statistics to broaden the flow of information between the fields to encourage interdisciplinary work.

To encourage interaction and a broad exchange of ideas, the workshop will be kept small: 20 to 30 participants. Sessions will consist of individual papers with ample time for discussion. Travel and accommodation expenses will be covered for those presenting papers. International participation is solicited.

Papers are invited for consideration in applications of AI techniques, including planning, knowledge representation, natural language, deductive retrieval, expert systems, and induction techniques to areas of statistics, including data analysis, experiment design, instruction, statistical databases, statistical strategy, and consultation. For more information, write to:

Bill Gale
AT&T Bell Labs, 2C278
Murray Hill, NJ 07974, U.S.A.

Artificial Intelligence Applications
in Chemistry

8–13 September 1985

A symposium presented by the Computers in Chemistry Division of the American Chemical Society at the ACS meeting, Chicago

Topics include: industrial applications, expert systems, natural language interfaces, structure elucidation, pattern recognition, IR, NMR, mas spectroscopy, drug design, organic synthesis, AI languages and systems. For more information, write to:

Bruce Hohne and Thomas Pierce
Rohm and Haas Research Laboratories
727 Norristown Road
Spring House, PA 19477, U.S.A.
Phone: 215-641-7854 or -7864

Artificial Intelligence Applications
in Optical Engineering

8–12 April 1985

Part of Technical Symposium East '85,
Society of Photo-Optical Instrumentation Engineers,
Hyatt Regency Crystal City Hotel,
Arlington, Virginia

For more information:

SPIE
PO Box 10
Bellingham, WA 98227, U.S.A.
Phone: 206-676-3290

Symposium on Complexity of
Approximately Solved Problems

17–19 April 1985

Computer Science Department
Columbia University
New York, NY 10027, U.S.A.

This multidisciplinary symposium, supported by a grant from the System Development Foundation, focuses on problems which are approximately solved and for which optimal algorithms or complexity results are available. Of particular interest are distributed systems, where limitations on information flow can cause uncertainty in the approximate solution of problems. Topics include: distributed computation, approximate solution of hard problems, signal processing, computer vision, remote sensing.

All appropriate papers for which abstracts are contributed will be scheduled. To contribute a paper send title, author, affiliation, and abstract

on one side of a single 8½ by 11 sheet of paper. Abstracts *must* be received by 15 January 1985.

The program schedule for invited and contributed papers will be mailed by about March 15, only to those responding to this call for papers. If you have any questions, contact traub@Columbia-20.ARPA by electronic mail, or write to Joseph Traub at the address above.

Rewriting Techniques and Applications

20–22 May 1985

Dijon, Burgundy, France

This First International Conference on Rewriting Techniques and Applications is planned in response to the growing interest in the theory and applications of term rewriting techniques. Papers will be solicited concerning issues in Term Rewriting Theory as well as in applications of term rewriting in any area.

Each submission should include 11 copies of a one-page abstract and 4 copies of a full paper of no more than 15 double spaced pages. Submissions are to be sent to one of the Co-Chairmen by 10 December 1984.

For Europe:
Jean-Pierre Jouannaud, RTA-85
Centre de Recherche en Informatique de Nancy
Campus Scientifique, BP 239
54506 Vandoeuvre-Les-Nancy Cedex, France
ARPANET: Jouannaud@SRI-CSL

Elsewhere:
David Musser, RTA-85
General Electric Laboratories
Research and Development Center
Schenectady, NY 12345, U.S.A.

In addition to selected papers, a few invited lectures will be given by well-known researchers who have made major contributions to the field.

For further information, contact the Chairman for Europe.

Functional Programming Languages and Computer Architecture

16–19 September 1985

Nancy, France

Sponsored by The International Federation for Information Processing, Technical Committees 2 and 10

This conference has been planned as a successor to the highly successful conference on the same topics held at Wentworth, New Hampshire, in October 1981. Papers are solicited on any aspect of functional or logic programming and on computer architectures to support the efficient execution of such programs.

Authors should submit five copies of a 3000- to 6000-word paper (counting a full page figure as 300 words), and ten additional copies of a 300-word abstract of the paper to the Chairman of the Programme Committee by 31 January 1985. The paper should be double-spaced, and the names and affiliations of the authors should be included on both the paper and the abstract.

Papers will be reviewed by the Programme Committee with the assistance of outside referees; authors will be notified of acceptance or rejection by 30 April 1985. Camera-ready copy of accepted papers will be required by 30 June 1985 for publication in the Conference Proceedings.

For more information, and for submission of papers:
Joseph Stoy
Balliol College
Oxford OX1 3BJ, England
ARPANET: jestoy@ucl-cs

Special Issue of *SIGART Newsletter* on Reasoning about Structure and Function

A special issue of *SIGART Newsletter* is planned devoted to representing, and reasoning about, structure, behaviour and function of devices and systems. This has recently become a topic of increasing importance in giving expert systems capabilities for causal reasoning to support diagnostic and other tasks. Work in this area has been in the domains of simple machines, electronic circuits, mechanical systems and medicine.

Our aim is to cover the spectrum of work that is going on in this general area. We expect that the special issue will be followed by a special issue of some appropriate journal containing fuller version of selected papers from the former.

Submissions are invited from researchers summarizing their approach, results, problems, and plans. The submissions should be under five typewritten pages, and should be sent to Rob Milne at the address below. The deadline for submissions is 15 January 1985.

Rob Milne
Department of Electrical Engineering
AFIT/ENG
Air Force Institute of Technology
WPAFB, OH 45433, U.S.A.
Phone: 513-255-3576
ARPANET: milne@wpafb-afita

Sociology of AI

The Genealogy of Artificial Intelligence Research

Peter F. Patel-Schneider
Schlumberger Palo Alto Research Center,
3340 Hillview Ave
Palo Alto, CA 94304, U.S.A.

David S. Johnson of AT&T Labs has gathered together a genealogy of theoretical computer science along intellectual, rather than biological, bloodlines. That is, the parent-child relationship has been replaced by the more significant PhD advisor-advisee relationship. A report that he produced contains 672 of these entries and several genealogical trees taken from the data, and I think it would be a nice idea to produce a similar listing for Artificial Intelligence. These data could show how AI has spread from its initial centres to its current broad coverage.

One problem with such a genealogy is collecting and organizing all the data. Therefore I am asking for anyone who can contribute data about AI advisor-advisee relationships to send it to me. To make the organizing process easier, electronic mail would be preferred—my addresses are:

CSNET: pfps@sri-kl
UUCP: . . .decwrl!flairvax!pfps

—and I would like all respondents to follow the strict format detailed below:

Each entry should be one line, containing the following information separated by '#':
- Advisee name with surname first;
- Advisor name with surname first;
- Institution where degree granted (in a short format);
- Year in which degree granted (all four digits);
- Type of degree (PhD, MSc, or other graduate degree);
- Field of research (AI, Physics, Mathematics, etc.);
- Area of research (natural language, expert systems, etc.);
- Current affiliation of advisee (in a short format).

Unknown values should be indicated by '?', and null values indicated by empty fields. Include two separate entries if there were two advisors; indicate an unofficial advisor by a '*' after the name.

Here are two sample entries (with lines broken to fit the printed column):

Cohen, Robin#Perrault, Ray#Toronto#1984
#PhD#AI#natural language#Waterloo

Patel-Schneider, Peter F.#Mylopoulos, John#
Toronto# 1978#MSc#AI#knowledge representation#FLAIR

For institution names try to use the shortest name in common use which is unique. For example, use *Toronto* for the University of Toronto, *FLAIR* for Fairchild Laboratory for Artificial Intelligence, and other well-known short forms such as *Berkeley* and *MIT*; but NOT *UofT* for the University of Toronto or the University of Texas. Fields of research include AI, Computer Science, Physics, Mathematics, Philosophy, Psychology, and Chemistry. The idea here is to find out the backgrounds of AI people which is why AI is separated from Computer Science. Areas of research are most important when the field is AI and areas within AI include but are not limited to natural language, knowledge representation, expert systems, theorem proving, learning, and vision.

To keep the amount of data within reasonable limits I am really only interested in people who are in AI (preferably doing research) or who have advised (directly or indirectly) someone in AI. So if you are in AI the data concerning you that I am interested in are your thesis advisor(s), their advisors, and so on as far back as can be traced. Of course, you can also include other relevant data if you so wish.

I will collect all information sent to me and do as much error correction and redundancy elimination as possible. If enough responses are generated I will send out periodic lists of the information generated; otherwise I will reply only to the respondents. □

AI in the media

JEALOUS COMPUTER KILLS TOP SCIENTIST

Old machine electrocutes owner—after he buys a more advanced model.

'It was cold-blooded murder' says grieving wife.
—*Weekly World News*, 10 July 1984

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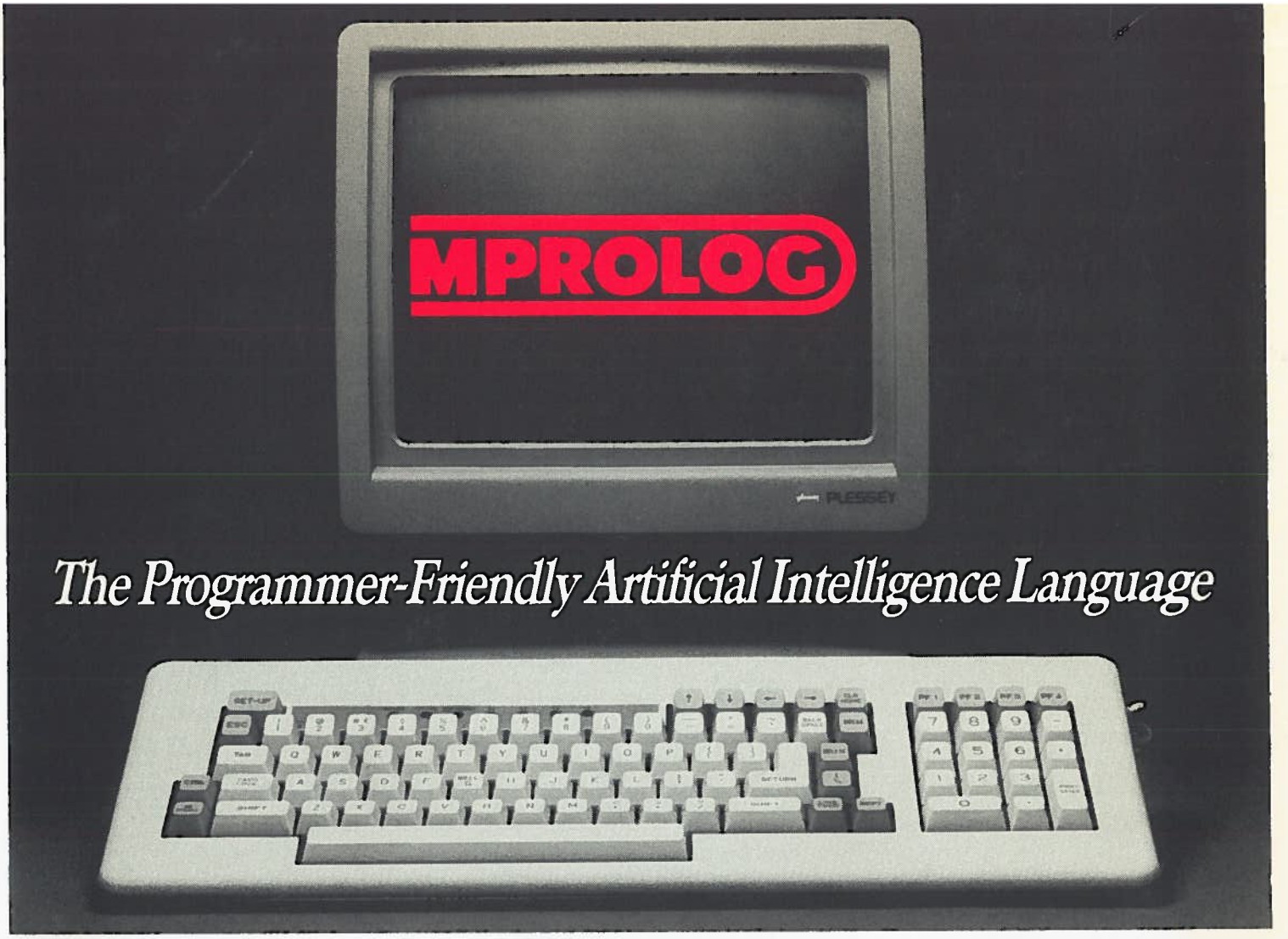

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> The Financial Times, London (U.K.)
> November 13, 1983

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