VOL. 1/ NO. 1 FEBRUARY 1974

CSCSI/SCEIO NEWSLETTER

AN OCCASIONAL PUBLICATION OF THE CANADIAN SOCIETY FOR COMPUTATIONAL STUDIES OF INTELLIGENCE/SOCIETE CANADIENNE DES ETUDES D'INTELLIGENCE PAR ORDINATEUR

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"(GRASP KING-KONG BANANAS)" conceived by Ray Reiter, drawn by Cathy Smith

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A FEW WORDS FROM THE EDITOR

This being the first issue I suppose it appropriate to define what I think the newsletter's objectives should be.

With Canada as large and sparsely populated as it is, communication has traditionally been a problem. In the past A.I. researchers here have suffered from this lack of communication; there has been no sense of a Canadian A.I. community. As a result the tendency has been to look to the ACM's Special Interest Group in Artificial Intelligence (SIGART) for items of general interest to A.I. researchers and there is no doubt that SIGART has played, and will continue to play an important role in this respect. Nevertheless, there are a number of areas of particular concern to Canadians which can only be dealt with by Canadians. Among these are government funding, education, and the possibilities for a Canadian computer network. All of these concerns require active participation by the society and, in turn, a newsletter for keeping the membership informed of current developments.

I would also like the newsletter to emphasize AI education in Canada, in particular course offerings at various universities. I hope to include items like detailed course descriptions, course projects, discussions of different approaches to teaching AI etc. The newsletter will hopefully facilitate the exchange of course oriented software, printed class notes, and possibly even students. Theses, in progress or completed, will be described in some detail.

Ongoing, or recently completed research in Canada should be emphasized. I would particularly like to see fairly detailed descriptions of research projects focussing on their objectives and the fundamental difficulties being encountered. The newsletter welcomes abstracts of technical reports and papers, as well as reviews, surveys, bibliographies etc.

The membership of CSCSI/SCEIO consists of computer scientists, psychologists, linguists and philosophers. This it seems to me, is a healthy situation which the newsletter should exploit. I would hope to encourage as much cross disciplinary talk as possible, and welcome position papers, expository articles clarifying the role of AI in a given discipline and vice versa, criticism of methodology or implicit assumptions, etc.- anything that might lead the specialist to a broader perspective of his work.

And finally an appeal. Do send me any items which you feel might be of interest to other readers of the newsletter. Course descriptions, abstracts, research in progress, gossip, cartoons, all are grist for my mill. And if anyone has a suggestion for a snappy name for the newsletter, please let me know.

CSCSI/SCEIO - A Brief History

In May of this year, the AI group at the University of Western Ontario organized an informal workshop which was attended by some 30 Canadian researchers. It quickly became apparent that there was more interest in AI in Canada than any of us had imagined, and moreover, that geographical dispersion and a lack of any substantial centres of research prevented any kind of reasonable communication or collaboration. Accordingly, it was decided that some sort of professional society should be formed,

(a) to act as an umbrella organization to facilitate communication among individuals with respect to AI research and teaching,

(b) to approach appropriate federal agencies in order to encourage funding for AI research in Canada,

(c) to set up study groups which will report on major issues relevant to the interests of the Society.

A steering committee was established, with the following members:

Chairman : E. W. Elcock

Secretary/Treasurer : J. F. Hart

Members : G. Baylor, W. Davis, J. Gascon, M. Levine, J. Mylopoulos, T. Pietrzykowski, R. Reiter, R. Rosenberg, Z. Pylyshyn.

It was also decided that the society should publish an occasional newsletter - this primarily to inform the Canadian AI community of ongoing research and teaching across the country.

Indeed, the only difficulty which the workshop encountered was in choosing a name for this new society. In deference to the psychologists and philosophers present, it was agreed not to use the term "Artificial Intelligence" since "natural intelligence", or "intelligence" is what it is all about. On the other hand, everyone was agreed on the computer as a methodological tool. Hence, the Canadian Society for Computational Studies of Intelligence/Societe Canadienne des Etudes d'Intelligence par Ordinateur. Clumsy, but a faithful description of the society's objectives.

AI Workshop - a Description

On May 23-25, 1973, under the auspices of the AI group at the University of Western Ontario, a workshop was held for Canadian researchers in AI. The technical program is outlined below:

CONFERENCE SCHEDULE

Wednesday Morning 9.15 - 12.00

Mathematical Studies

Chairman : T. Pietrzykowski, University of Waterloo

Discussant : R. Reiter, University of British Columbia

Wednesday Afternoon 2.00 - 5.00

Psychological Modelling

Chairman : Z. Pylyshyn, University of Western Ontario

Discussants : G. Baylor, J. Gascon, Univ. de Montreal

Thursday Morning 9.30 - 12.00

Image Processing, Pattern Recognition, and Vision

Chairman : E. W. Elcock, University of Western Ontario

Discussants : W. A. Davis, University of Alberta

M. Levine, McGill University

Thursday Afternoon 2.00 - 5.00

Languages for A.I.

Chairman : J. Mylopoulos, University of Toronto

Discussant : E. W. Elcock, University of Western Ontario

A.I. Education

Chairman : R.S. Rosenberg, Univ. of British Columbia

Friday Morning 9.30 - 12.00

Applications in Teleconferencing, Image Processing

Chairman : B. Bridgewater, Department of Communications

Discussant : P. Allard, Department of Communications

Status of the Society's Brief to NRC

One of the objectives of the society is to encourage funding for AI research in Canada. Accordingly, Ted Elcock and John Hart have initiated discussions with NRC. The following exchange of correspondence indicates the objectives and present status of these discussions.

THE UNIVERSITY OF WESTERN ONTARIO, LONDON 72, CANADA

Faculty of Science
Department of Computer Science

June 6, 1973

Dr. D.J. LeRoy,
Vice-President (Scientific)
National Research Council of Canada,
OTTAWA, Ontario K1A 0R6

Dear Sir:

The enclosed note has been written after consultation with Mr. F.R. Park for consideration by the Grants & Scholarship Committee of the Council. It was prepared by members of the newly formed Canadian Society for Computational Studies of Intelligence which met at the University of Western Ontario, May 22-25.

A provisional statement of the aims of the Society, its steering committee and a list of those who attended its formative meeting and who supported the note, is attached.

Yours faithfully

E.W. Elcock,
Chairman
Steering Committee,
C.S.C.S.I.

EWE/jm

Canadian Society for Computational Studies of Intelligence

Societe Canadienne des Etudes d'Intelligence par Ordinateur

The development of digital electronic computers has provided a new framework and methods for experimental studies of cognition. The experiments are embodied in computer programs which exhibit cognitive performance. The motivation is to exploit the formal structure of these programs to reach an abstract understanding of cognitive activity as such.

The aim of the Society is to promote development and applications of research using this methodology by:

1. Forging and maintaining informed links with Government and Industry.

2. Setting up study groups which will investigate and report on major issues relevant to the interests of the Society.

3. Organizing both professional and tutorial meetings.

4. Publishing a regular bulletin as a means of communication between members.

NOTE TO: The N.R.C. Grants & Scholarship Committee

FROM: The Canadian Society for Computational Studies of Intelligence

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During the formative meetings of the Society, the participants expressed deep concern about the attitudes to and development of the subject area in Canada. Through the Society they asked that the attention of the Committee be drawn immediately to the following specific points:

1. Quite apart from its intellectual significance, applications stemming from Computational Studies of Intelligence are of considerable potential technological and sociological importance to Canada.

2. The level of grant support for such studies is too low certainly in the context of (1) and also in relation to the current needs of scientists who would like to work in this study area.

3. Development is greatly hampered by the lack of an agency whose clear responsibility covers support of and policy in this currently interdisciplinary study.

4. There are no centres of excellence which have the critical mass to support a balanced program in these studies, and which in particular could effectively support postgraduate studies. As a result of this, Canada has produced many scholars only to have them leave for a more supportive environment.

5. The Society has set up study groups to prepare reports, for inclusion in a fuller document to the N.R.C., which will address these and other points in detail. The Society considers this investigation of such importance, that they ask the Committee to consider partial funding of the study by a grant of $2,000.

LIST OF PARTICIPANTS

ALLARD, Dr. Paul
Communications Research Centre, Ottawa

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Computer Science Department

BAYLOR, Dr. George
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BERNDL, Walter
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University of Western Ontario A.I. Group

DEWDNEY, Kee

DIXON, Dr. Tony

ELCOCK, Dr. Ted
(Group Project Leader)

HART, Dr. John
(Department Chairman)

KUEHNER, Dr. Donald

McCALLUM, Dr. John

PYLYSHYN, Dr. Zenon

Department of Computer Science,
University of Western Ontario,
May 22, 1973

CABLE ADDRESS
"RESEARCH"
ADDRESS TELEGRAPHIQUE
PLEASE QUOTE FILE No 1550-147
No DE DOSSIER A RAPPELER

NATIONAL RESEARCH COUNCIL OF CANADA

CONSEIL NATIONAL DE RECHERCHES DU CANADA

OTTAWA, CANADA
K1A OR6

June 13, 1973

Dr. E.W. Elcock
Chairman
Steering Committee, C.S.C.S.I.
The University of Western Ontario
London 72, Ontario

Dear Dr. Elcock:

I would like to thank you for your letter of June 6 regarding the wish of the newly formed Canadian Society for Computational Studies of Intelligence to undertake a study, with partial assistance from the National Research Council, relating to the development of viable research programs of the Society.

Before reaching a decision on your request for a study grant of $2,000., it will be necessary to have further consultations with you. Mr. F.R. Park, Director of the Office of Grants and Scholarships, or one of his colleagues will be getting in touch with you in the near future.

Yours sincerely,

D.J. Le Roy
Vice-President (Scientific)

DJL:wm

cc: Dr. B.A. Gingras
Mr. F.R. Park

NATIONAL RESEARCH COUNCIL OF CANADA

CONSEIL NATIONAL DE RECHERCHES DU CANADA

OTTAWA, CANADA

K1A 0R6

BUREAU DES SUBVENTIONS ET BOURSES
OFFICE OF GRANTS AND SCHOLARSHIPS

NOTRE DOSSIER
OUR FILE 1550-147
July 4, 1973.

Mr. E.W. Elcock, Chairman,
Steering Committee, C.S.C.S.I.,
Faculty of Science,
Department of Computer Science,
University of Western Ontario,
London, Ontario. N6A 3K7

Dear Mr. Elcock:

I am writing to acknowledge your letter of June 6 to Dr. D.J. LeRoy, in which you provided additional information concerning the Canadian Society for Computational Studies of Intelligence.

The information you provided concerning the structure of the new Society (C.S.C.S.I.) and the people who attended the meeting on May 22-25 at the University of Western Ontario is interesting and useful but it is not what I expected to receive as a result of my conversation with Dr. John Hart a few days before the meeting.

Since neither Dr. LeRoy, Dr. Gingras or I was able to attend and take part in your discussions because of other commitments, I invited Dr. Hart to put the Society's case, i.e. its concerns, ambitions and a clear description of its area of interest, in a brief addressed to us. I suggested that in such a communication you might wish to indicate in what way you consider our granting function as being adequate or inadequate to your needs and who the people are who would consider NRC as an appropriate source of research support. It was agreed by Dr. Hart that the preparation of such a brief might be more appropriate to your purpose than would our attendance at your meeting.

Your application for a contribution to a study by a grant of $2,000 was not sufficiently documented for consideration by any of our grant selection committees or the Committee on Grants and Scholarships which met the day following receipt of your letter. If you wish to apply for a grant to support a study you will need to provide the following information:

1) Title of the study
2) Clear and precice description of the purpose of the study
3) Who will conduct the study
4) How it is proposed to conduct the study, i.e.: visits, questionnaires, etc.
5) Length of time required to conduct the study
6) Total cost of the study - with itemized budget
7) Contributions from all sources
8) Amount requested from NRC
9) Date of submission of report on results of the study

We would be pleased to provide further information or discuss the matter with you at any time.

Yours sincerely,

F.R. Park,
Director.

JVL:FRP:nbb

C.c.: Dr. H.W. Baldwin, University of Western Ontario
Dr. D.J. LeRoy, Vice-President (Scientific), NRC

October 10th, 1973

Dr. F.R. Park
Director
Office of Grants and Scholarships
National Research Council of Canada
Ottawa, Ontario

Dear Dr. Park:

I apologize for the extreme delay in replying to your letter of July 4th. I have been away from Canada all summer and unfortunately your letter, by error, was not forwarded to me.

Your valid comments about expectations of a fuller and more precise brief seem to indicate that we could be in a circularity since, as I indicated in my letter to Dr. LeRoy, it was decided at the Society's inaugoral meeting that this full brief was important enough to merit careful preparation by an appropriate study group of members of the Society. My own letter merely sketched the area that such a brief would elaborate and asked for financial help in conducting the requisite study.

However, following the suggestion in your letter, we intend to make a formal application for a study grant along the guidelines you lay out in your last paragraph.

This application should reach you in the next few weeks.

Yours sincerely,

W. W. Elcock
Chairman
Steering Committee
Canadian Society for Computational
Studies of Intelligence.

Cc. Dr. H. W. Baldwin, University of Western Ontario

/cc

THIRD INTERNATIONAL JOINT CONFERENCE ON ARTIFICIAL INTELLIGENCE
AUG. 20-23, 1973. STANFORD, CALIFORNIA.

A REVIEW - BY R.S. ROSENBERG

To put this conference in some perspective I shall first characterize the previous conferences. The first conference was held in Washington, D.C. in May of 1969. The dominant theme was theorem proving and the dominant figure was probably Cordell Green of Stanford. It appeared that theorem-proving, more specifically resolution theorem-proving, would provide the answer to many A.I. problems in robot problem-solving, in natural language processing and in mathematics itself.

The second conference was held in London, England in September of 1971. Without a doubt the dominant figure was Terry Winograd of M.I.T. whose thesis on natural language understanding seemed to be a long awaited breakthrough. The words "procedural", "PLANNER", and "Hewitt" were frequently heard. Winograd also gave the 1971 "Computers and Thought" public lecture.

Now we are in 1973, and in contrast to the previous two conferences no single figure or work is dominant. Although the 1973 "Computers and Thought" public lecture was given by Pat Winston of M.I.T. and although his work on learning is important, the atmosphere was significantly different from that of London in 1971. The important areas of research seemed to be in programming languages and formalisms for A.I. In this respect, the names most frequently heard were Daniel Bobrow, Ben Wegbreit and Carl Hewitt associated with such notions as actors, control structures, LISP70, CLISP, MLISP2 and SMALLTALK.

The conference as a whole was organized around seven invited tutorial papers, a large number of refereed contributed papers, and several so-called free sessions. The outstanding tutorial lectures were Bobrow and Raphael's "Languages for Artificial Intelligence", Winograd's "Natural Language Understanding", Papert's "Artificial Intelligence and Education", and Manna's "Automatic Programming".

In terms of number of talks, level of the talks and quality of the people giving them, the most important areas in the conference, in descending order of importance were:

1. A.I. Languages and formalisms
2. Natural language processing including speech understanding
3. Automatic programming and theorem-proving
4. Social concerns
5. Robotics including computer vision
6. Psychology and A.I.

Some indication of the changing nature of current research in A.I. is that there were no sessions on pattern recognition - in distinct contrast to previous conferences. The organizers were thereby saying that much of current work in pattern recognition really lies outside the mainstream of A.I. research, directed as it is towards statistical and hardware approaches. Other areas receiving much less emphasis were heuristic search and general problem-solving.

Perhaps some discussion about the heading "social concerns" would be in order. There were two special sessions entitled "Social Implications: A Look at Some Immediate Issues" and "AI: A Discussion of its Impact on Science, Technology and Society", as well as a public panel discussion titled, "How Much of Human Intelligence Could and Should Computers be Made to Equal or Excel?" There seemed to be a genuine concern, mainly among the younger people, about the possible effects on society of research in A.I. This was coupled with an uneasiness that so much research was being funded by various agencies of the Department of Defense in the U.S. although at times, this uneasiness seemed to be inverted into a desire to know how contract applications should be drawn up in order to improve their chances for approval. There is something singularly uncomfortable about these mixed emotions of researchers in A.I. which is probably an omnipresent aspect of all current scientific and technological research.

A ghost that would not stay hidden was Prof. Lighthill author of the report on A.I. commissioned by the Science Research Council of England. This report, which was very unfavourable towards A.I. research, especially robotics, prompted the frequently heard question "What effect will it have on A.I. support in Britain? In the U.S.?" A debate held in England earlier in the year whose participants were Lighthill himself, John McCarthy, Richard Gregory, and Donald Michie was taped by the B.B.C. and this tape was shown at the conference. Its showing just added to an underlying feeling that the future of A.I. research was not at all assured.

Aside from the work on programming languages for A.I. research some of the most important specific research endeavours reported were the work on speech understanding by Woods and his colleagues at BBN, and by Reddy and his colleagues at Carnegie-Mellon, the work on natural language by Shank and his students at Stanford, and the interface between psychology and A.I. as represented in the work of Newell and Waterman at Carnegie Mellon, and Norman and Rumelhart at the University of California at San Diego, and finally, the work in automatic programming by Manna at the Weizmann Institute, and Wegbreit at Harvard.

In addition to the scholarly pursuits, there was a reception at the Faculty Club at Stanford on the eve of the conference, and a wine and cheese party at the Stanford A.I. Laboratory on the first night.

Instead of trying to characterize the overall mood of the conference as either optimistic or pessimistic, the term "realistic" is perhaps more appropriate. There appear to be some difficult times ahead in terms of funding but an increasingly realistic analysis of the accomplishments and potential of A.I. is emerging. Much of this outlook has been forced upon the discipline by outside critics, but nevertheless the effect can only be salutory.

IJCAI 73: A PSYCHOLOGIST'S VIEW

by

Zenon Pylyshyn

The extent to which psychology and AI (as well as linguistics) have become fused can be seen by scanning titles of this conference and trying to guess which department or disciplines their authors are formally associated with. Apart from the mathematical sessions (theorem proving, formalisms) and sessions devoted to AI techniques (hardware, search techniques, programming languages, automatic programming) the number of reports that could have been produced in psychology departments is quite large. (My guess is that, nearly half of them are directly relevant to problems in psychology). An outstanding pattern was that papers which were most psychological in spirit were almost all devoted to some aspect of language comprehension (with one or two on each of game playing, motivation, and reasoning). This is not very different from the IJCAI 71 pattern although there were a few more papers then on problem solving. It is in marked contrast, however, with the situation a decade or more ago (e.g. in "Computers and Thought") when problem solving and perception occupied much more attention among psychologically-oriented workers. It is of some interest to ask why these areas (especially work on vision) has moved away from its psychological orientation while language comprehension has grown closer. For example the names Schank; Collins and Quillian; Rumelhart, Norman and Lindsay; Colby; Winograd, Waterman and Newell, Woods and Kaplan are reasonably well known among psychologists whereas Winston, Binford, Clowes, Huffman, Mackworth, Shirai, Waltz are virtually unknown. I believe that it is no accident that language systems are considered to be more psychologically relevant than vision systems. For one thing psychology believes itself to be in much poorer state with respect to theories of language comprehension than theories of vision since in the latter case there are at least some known physiological mechanisms. For another, AI work on language has been moving much more into semantics and internal models in recent years whereas much vision work is still concerned with fairly local schemes for isolating lines and regions. In fact the vision work seems to be in a state more analogous to current work in speech recognition than language comprehension. Perhaps when some of the "lower level" problems are solved vision will take on more psychological relevance. My own feeling is that this is not what is holding up vision work but reasons for this are best left for other occasions.

While it would be misleading to suggest that psychologists are scrambling to get into AI there are nevertheless a few signs that more psychologists are reading and doing AI and vice versa. Psychologists Rumelhart, Norman, Schmidt, Eisenstadt, Kareev and others have produced good AI while AI types Moran, Charniak and many others reported on good theoretical psychology at this year's IJCAI. The tradition has been established at a number of major centres (e.g. San Diego, Stanford, Carnegie-Mellon, Edinburgh, Sussex, etc.) for breaking down the distinction between cognitive psychology and AI. Both the AI Journal and Cognitive Psychology have demonstrated their willingness to drop the distinction. And, if those who were at our founding meeting will recall, (many, I'm sure will be unable to recall much) the name of CSCSI was chosen to emphasize the fusion of these fields.

AI AT UBC

by

R. Reiter and R.S. Rosenberg

The Wares - Hard and Soft

The Computing Centre currently maintains a duplex IBM 360/67 with one million bytes of core, two high speed drums, and 16 ITEL 3101 disc packs (10^9 bytes). Peripheral devices include an ADAGE AGT-10 graphics terminal, 24 IBM 3270 display terminals and a variety of teletypes. The system operates under MTS (Michigan Terminal System).

In February 1974, the 360 will be replaced by an IBM 370/168, again operating under MTS.

The basic language for AI teaching and research is LISP/MTS, implemented at the University of Michigan. During the past year we have been extending the interpreter to a fully interactive LISP system along the lines of BBN-LISP, so that currently the system includes an editor, BREAK package, TRACE facilities etc. Ongoing developments include a LISP interface with the ADAGE and an error correcting package. MICROPLANNER is supported by the system.

The Department

There are 12 full time members of the Department of Computer Science, of whom three (R. Reiter, R.S. Rosenberg, and D.A.R. Seeley) are actively interested in AI. Beginning July 1974 Alan Mackworth (interests - Scene Analysis) currently at the University of Sussex will join the department.

The department offers a BSc., MSc. And Ph.D. Currently the number of graduate students (MSc. And Ph.D.) is small (about 35) and our intention is to keep it that way. There are 5 Ph.D. Students in AI.

Courses

All of the graduate courses are one semester - 13 weeks, 3 hours/week. CS502 509 and 522 are offered once per year while CS503 and 532 depend on student interest and faculty availability. Last year we gave CS502, 522 and 503. This year we shall offer CS502, 503, 509 and 522. Next year we also plan to introduce a course in scene analysis, to be taught by Alan Mackworth. There is one undergraduate course in AI, CS422 - a two term sequence at the senior level.

CS422 - INTRODUCTION TO ARTIFICIAL INTELLIGENCE

Lecturer: R.S. Rosenberg
Unit Value: 3 - Two Terms

This is a senior undergraduate course open to students who have taken 2 years of computing. The course has been taught for the past four years with enrollment increasing from 26 to 46. The textbooks are Computers and Thought, edited by E. Feigenbaum and J. Feldman, and Artificial Intelligence. The Heuristic Programming Approach, by James R. Slagle.

This course is an introduction to many of the major ideas of AI presented in both an historical and a thematic fashion. From the outset, several of the early streams are briefly traced. These are cybernetics, adaptive systems, heuristic programming, cognitive simulation, and artificial intelligence. An attempt is made to characterize these approaches in order to present a spectrum of viewpoints on the question of designing intelligent machines.

The first part of the course is mainly devoted to heuristic programming with a major emphasis on the following areas:

(1) Game-playing programs
  (a) Samuel's Checker Player
  (b) Chess programs
  (c) Slagle's Kalah program

(2) Tree and Graph Searching Techniques
  (a) Breadth and depth-first
  (b) Evaluation functions
  (c) Minimax
  (d) Alpha-beta tree-pruning algorithm
  (e) Plausibility move generation and forward pruning
  (f) Theoretical results on tree searching

(3) General Problem Solver - Newell, Shaw, and Simon
  (a) GPS as a psychological model
  (b) Nature of generality and power
  (c) Problem formulation and representation

(4) MULTIPLE - Slagle
  (a) Comparison with GPS
  (b) Nature of learning

(5) Mathematics and Computers
  (a) Logic - Logic Theorist of Newell and Simon
  (b) Geometry - Gelernter et al.
  (c) Calculus - Slagle

(6) Brains, Neural Networks and Perceptrons
  (a) Brain models
  (b) Hebb's theory of cell assemblies
  (c) Mathematical neurons
  (d) Neural network simulations
  (e) Rosenblatt perceptrons

(7) Pattern Recognition
  (a) Nilsson's formulation of the area
  (b) Uhr-Vossler program

(c) Minsky-Papert perceptrons

During the first term, students are required to answer two problem sets and to carry out a major project. The projects are usually done in groups of no more than three students. Almost all the projects involve game-playing programs such as QUBIC, GO-MOKU, hare and hounds, Bridgit, Racecourse, Grasshopper, Draw Poker. Many of these are quite sophisticated, employing such game-playing techniques as evaluation functions, alpha-beta pruning, plausibility move generation, tapered forward pruning as well as specialized data structures. The most commonly used programming language is ALGOLW which offers dynamic storage allocation, pointer structures, recursion and efficient execution.

The second term is concerned with more current issues in AI such as natural language processing, robotics, machine vision, and application areas. In somewhat more detail, the following areas are studied:

(1) Language Understanding
- (a) Role in AI
- (b) Formal models of natural language
- (c) Question-answering systems - BASEBALL, SAD-SAM, STUDENT, ELIZA
- (d) Belief structures - Abelson, Colby
- (e) Speech understanding
- (f) Winograd's SHRDLU system

(2) Machine Vision
- (a) Guzman's SEE
- (b) Winston's work - also a return to the problem of learning
- (c) Waltz's work on scenes with shadows

(3) Robotics
- (a) Representation of knowledge
- (b) World modeling - perceptual and functional representation
- (c) Problem solving - theorem proving, special languages

(4) Applications
- (a) DENDRAL - Automated physical chemist
- (b) Computer aided instruction
- (c) Industrial robots

(5) Social Questions
- (a) Implications of intelligent machines

In this term, as well as the first, students are required to answer two problem assignments and to carry out a project. The projects are usually simple question-answering systems, mainly inspired by such programs as BASEBALL and ELIZA, i. e. of the format matching variety. Some of the topic areas are hockey, travel agencies, flight schedules, and kinship relations.

Finally, it is important that the student be left with an appreciation of the origins and history of research in AI and an awareness of the nature of the research currently being carried out and the kinds of questions currently posed.

CS502 - ARTIFICIAL INTELLIGENCE 1

Lecturer: R.S. Rosenberg
Unit Value: 1 1/2 - Fall term

This is the first graduate course in AI. As such it must introduce the field to those students who have had no exposure as well as maintain and extend the interest of those students who have taken undergraduate courses in this area. The central theme of the course is heuristic programming. Some of the topics to be covered are given as follows:

1. General Survey of Early Work

This will be based on the material in Computers and Thought (E. Feigenbaum and J. Feldman (eds.), McGraw Hill, 1963) with special emphasis on game playing and programs to do mathematics and pattern recognition. The work of A. Newell and H. Simon is analyzed, especially their General Problem Solver.

2. Tree Searching Procedures

Some of the specific works to be examined are Samuel's second paper on the checker-playing program, results on tree-searching by Slagle and Dixon, the Graph Traverser of Michie and Doran, bi-directional search and error in heuristic search by Pohl, and the theoretical results of Hart, Nilsson and Raphael.

3. Other Topics

These include Shen Lin's heuristic solution of the travelling salesman problem for near optimal solutions, a brief survey of Minsky and Papert's Perceptrons and Waterman's work on the learning of heuristics represented by production systems.

The textbook for the course is N.J. Nilsson, Problem-Solving Methods in Artificial Intelligence - McGraw-Hill, 1971. The first two-thirds of this book is covered with the remaining one-third on theorem-proving, covered in CS522.

Students are required to carry out a major project and the use of LISP as the programming language is encouraged where appropriate. In the past projects have been done on game-playing programs (e.g. QUBIC, GO-MOKU), pattern recognition (e.g. a variant of the Uhr-Vossler approach), and tree-searching experiments.

CS503 - COMPUTATIONAL LINGUISTICS 1

Lecturers: R. Reiter and R.S. Rosenberg
Unit Value: 1 1/2 - Spring

We have only given this course once - in the Spring of 1973. We decided at the outset that it would differ from "traditional" courses in CL. It would avoid formal language theory and statistical approaches to language, and most important, it would not be survey-oriented. Our conviction was that students learn far more by doing than by absorbing and so we oriented the course around a single ongoing project. The class was divided into 3 groups of 3, and each group was to present a working natural language system by the end of term.

The domain of discourse consisted of arbitrary LISP programs. The user was to be able to interrogate and modify this data base using English as a command language. Typical inputs might be:
What functions are called by FOO?
Evaluate FOO on argument 7.
Of those functions called by FOO, how many are NEXPRs?

The choice of a LISP data base turns out to be particularly convenient. Since the final systems were implemented in LISP, they were used to interrogate themselves, thereby obviating the need to build in a domain of discourse.

The paradigm for the project was the work of William Woods. Syntactic processing was based on the Augmented Transition Network parsing model of [1,4], and the semantics was procedural, as described in [2,3,4]. The gross system design is this:
First parse to produce a deep structure tree representation of the input sentence, then map this tree onto a procedure call in some retrieval language which is then EVALed to return information or change the data base.
This, of course, is very like the design of a compiler and so is a natural conceptual framework for students of computer science. We decided that questions of syntactic and semantic ambiguity were too complex to deal with in a one term project, and so the systems were designed to expect a unique parse and unique semantic interpretation. Nevertheless, the students quickly discovered for themselves that ambiguities do arise, and that there are deep problems here.

The structure of the lectures was a mixture of introductory linguistics (Most of the students had no prior exposure to linguistics.) and the technical aspects of ATNs and procedural semantics. The goal of the linguistics was to introduce the basic notions of contemporary linguistic theory including morphemics and phrase structure and transformational grammars. As soon as a relevant topic had been covered, the students were asked to implement the corresponding subsystem for the project. These were, in order , a dictionary, a morphemic analyzer, a basic phrase structure grammar for simple English, a transformational grammar for "arbitrary" English, a retrieval language and its associated retrieval functions, and a "compiler" mapping deep structure parse trees to retrieval programs. With the exception of a simple ATN parser which was provided, the students implemented all of the software based upon their reading of Woods. Naturally, no one produced a full grammar for English. Nevertheless the grammars written were impressive. Typical of the syntactic complexity handled were: the passive voice, relative clauses including reduced relatives, verb tenses, verb complements, declaratives, imperatives and simple interrogatives. It is a tribute to the clarity and power of the ATN model that such fairly complex grammars could be so easily implemented. It is also worth commenting that computer science students find "programming" ATNs remarkably natural. We are convinced, based on this experience, that ATNs provide an excellent means for teaching the basics of transformational grammars to students of computer science.

As might be expected, the procedural semantics phase of the project was the most difficult and, for the students, the least satisfying. The universal complaint was that the semantics had to be highly "tuned"; beyond a certain level of complexity, the introduction of new semantic templates overly perturbed the system. A useful side effect of these difficulties was that the students were open to alternative approaches to semantics. As a result we discussed several other approaches, among them Winograd's SHRDLU system, Thomson's DEACON and REL, and Quillian's semantic memory.

Notably lacking in the project design were the following topics: the role of inference, processing text as opposed to single sentences, resolution of anaphoric references, co-ordinate clauses, retrieval efficiency, syntactic and semantic ambiguity. On the other hand, everyone discovered these problems for himself, leading to a much more forceful awareness of the complexities underlying natural language.

Although the amount of work was considerable (The largest project was a 60K program) all groups completed quite respectable projects. The modularity of the design allowed individual members of each group to focus attention on a significant subsystem of the overall system. The fact that all were working on the same project led to considerable in-class and out-of-class discussion. This created an ongoing climate of enthusiasm which, for us, was very rewarding.

This year we plan to run the course along the same lines, but with a different problem domain. We have decided to have them implement a version of Winograd's BLOCKS world, but still use the ATN model for parsing. The basic difference then will be that deep structure parse trees will map into MICROPLANNER instead of some retrieval language. This domain should emphasize some of the problems ignored by the LISP domain project, notably the inference problem, and dialogue. It should also motivate the class towards a deep understanding of Winograd's work.

References:

[1] Woods, W. Transition network grammars for natural language analysis. CACM 13, Oct. 1970.
[2] Woods, W. Procedural semantics for a question-answering machine. FJCC, 1968.
[3] Woods, W. Semantics for a question-answering system. Ph.D. Thesis, Harvard University, 1967.
[4] Woods, W. et al. The Lunar Sciences Natural Language Information System: Final Report. BBN Report No. 2378, June 1972.

CS509 - LIST PROCESSING

Strictly speaking, this is not a course in AI although it is required of students planning to do AI. The goal of the course is not simply to turn out profficient LISPers but also to accent LISP's intrinsic qualities as a programming language and environment, its origins in the Theory of Computation, and its use as a basis for extentions like PLANNER and CONNIVER. The following course description is that provided to the students:

Lecturer: R. Reiter
Unit Value: 1 1/2 - Fall '73.

Course Description:

LISP has traditionally been the principal programming language used by Artificial Intelligence researchers. Outside this esoteric band of devotees its elegance, power and flexibility have been little appreciated. LISP differs from the usual algebraic languages in many respects:

1. LISP is designed for symbolic, rather than numeric computations.
2. It is a recursive, functional language. This encourages - indeed demands- that one write structured programs.
3. It runs interpretively. Its interpreter is itself a system function available to the programmer.
4. LISP is type free. Its basic data type is called an S-expression. Both programs and data must be S-expressions. As a result there is no distinction between program and data. Programs may be manipulated as data. Data may be evaluated as programs.
5. LISP/MTS is a fully interactive system with complete editing and debugging facilities.

The course will focus on the following topics:

1. Syntax and semantics of LISP.
2. Intellectual origins of LISP in the Theory of Computation.
3. Programming "style". Structured programming.
4. LISP implementation.
5. LISP based problem-solving languages (QA4, PLANNER,

CONNIVER). Nonstandard control structures: automatic back-tracking, recursive co-routines, pattern directed procedure invocation.

This course is designed as a companion to CS502, but is not intended exclusively for students interested in AI. Rather, the emphasis will be on LISP as a programming <u>environment</u> and as a <u>way of thinking</u> . Examples and class exercises will involve natural language processing, pattern matching, tree searching, problem-solving, theorem-proving etc. Students will be expected to complete regular programming exercises in LISP and MICROPLANNER.

<u>Texts</u> : NIL. Full documentation of LISP/MTS and MICROPLANNER will be provided.

<u>Prerequisites</u> : A general background in computing but little or no knowledge of LISP, or permission of instructor.

CS522 - ARTIFICIAL INTELLIGENCE 2

Lecturers: R.S. Rosenberg and R. Reiter
Unit Value: 1 1/2 - Spring

<u>Part 1</u> (R.S. Rosenberg)

The first part of this course is devoted to what might be called "The MIT Approach". This will involve the analysis of research carried out at MIT over the last several years as well as related work elsewhere. Some of the major topics discussed are the representation of knowledge and the use of descriptions and procedures for this purpose, the role of learning in intelligent systems, the nature of hierarchical and heterarchical approaches, and selected topics in machine vision and robotics.

Some of the specific works studied are:

T.G. Evans, A Program for the Solution of Geometric Analogy Test Questions
A. Guzman, Computer Recognition of Three-Dimensional Objects in a Visual Scene
P.H. Winston, Learning Structural Descriptions from Examples
T. Winograd, Procedures as a Representation for Data in a Computer Program for Understanding Natural Language
D.L. Waltz, Generating Semantic Descriptions from Drawings of Scenes with Shadows

Students may be required to carry out a limited programming project as well as a survey of some specific area in Artificial Intelligence.

<u>Part 2 - The Role of Logic in AI</u> (R. Reiter)

This half of the course introduces fundamental concepts from mathematical logic and illustrates their relationship to topics like information retrieval, mathematical theorem-proving, robot logic, inferencing problems in natural language etc.

Basic Logical Concepts:

- syntax and semantics of first order logic
- a brief introduction to proof theory and the Godel Completeness Theorem
- the resolution principle

Students are expected to complete a number of exercises which involve axiomatizing various simple domains and giving resolution proofs in these systems. I am now beginning to rethink this part of the course. In particular, I am not very enthusiastic about teaching resolution (Slagle and Nilsson's books to the contrary). Although the students seem quite capable of absorbing and working with this material, they do find it strange, unnatural and unmotivated. Moreover, there is the pragmatic consideration that resolution fails to work very well on even mildly interesting theorems. Finally there is the ethical consideration that I don't believe in it as a practical tool. In the future, I plan to introduce proof theory via Gelernter's Geometry Machine. This, of course, is a much more natural form of logic which readily admits semantics (the diagram) as a tree pruning device, and which introduces the fundamental principle of backward chaining for problem-solving systems. It is easy to see that Gelernter's logic is incomplete. Once this is pointed out, we can proceed to generalizations in the work of Bledsoe and in my work on semantics in natural deduction systems.

The remainder of the course is devoted to the frame problem, robot logic and MICROPLANNER. The clumsiness of first order logic for expressing the side effects of actions in a causal universe is demonstrated. This motivates MICROPLANNER as an appropriate language for dealing with the frame problem. As an exercise, students are expected to implement a robot functioning in a simple universe.

RESEARCH

A. Automatic Theorem Proving (Brian Funt, Ray Reiter and Greg Shannan)

The major thrust here is in the design and implementation of a natural deduction type logic. Our basic design philosophy is that the deductive syntax be distinct from, and interface smoothly with, whatever domain dependent semantics the user cares to provide. The goal, therefore, is a completely general theorem proving system whose search for a proof is guided by user-provided semantics. The deductive system is an extension of that reported in [1]. It differs in having a number of additional rules of inference which provide for restricted forward deduction, proof by contradiction, more powerful equality rules, and a more general notion of semantics. The system provides for the following semantic considerations:

1. Typed variables
2. Algebraic simplification
3. The symbolic solution of equations
4. Models and the rejection of false subgoals
5. Commutative and/or associative operators
6. Non logical representations
7. Counterexamples

Currently Greg Shannan is implementing an interactive version of the system. Our objective is to experiment with this system in set theory, plane geometry and a large kinship data base, with the intention of progressively refining away its interactive facilities. One guiding methodological principle is that we shall work with large data bases of axioms and previously proved theorems. For set theory we envisage more than a thousand such facts. What we hope to learn by dealing with non-toy domains is how such knowledge should be organized, and the ways in which semantics intervenes to make proof discovery possible in such rich domains.

Brian Funt has been working on ruler and compass construction problems in plane geometry, and has implemented a MICROPLANNER program which is moderately successful on the usual problems found in high school texts. Typical of the problems on which his program succeeds is the following:
Given two lines L1 and L2, and a point P on L1, construct a circle tangent to L1 at P, and tangent to L2.
His program contains a number of "locus specialists". These are invoked in order to determine an unknown point as the intersection of two known loci, where the loci are extracted from the constraints of the problem. His work is described in a recent technical report which is abstracted under "Recent Abstracts" in this issue of the newsletter.

Reference:

[1] Reiter, R. A semantically guided deductive system for automatic theorem proving, Proc. 3rd Int. Joint Conf. on Art. Intell., Aug 20-23,1973, Stanford, Calif.

B. Natural Language, Heuristic Search, Learning (Mike Kuttner, Gordon McCalla, Rich Rosenberg, Peter Rowat)

There are two predominant areas with which we are concerned. These are natural language processing and the complex problem of learning. The specific topic we are concentrating on is the development of models for man-machine dialogue. There has been extensive work in the literature on question-answering systems which usually involve the processing of a single sentence at a time. The problem of dealing with dialogue is of considerable interest (and difficulty) for it is really in the process of continuous communication where much of the complexity of natural language lies. Our work is influenced most by Fillmore, Chafe, Schank, and Winograd. One of the most noteworthy aspects of their work is the breakdown of sharp distinctions between syntax and semantics. What follows is the abstract for a progress report titled "A Model for Man-Machine Dialogue", written by Gordon McCalla in November 1973.

"A computer model is proposed which will take part in a conversation about classical music with a human conversant. To accomplish this task, the model not only must handle informal English statements, but must also have a "will of its own" so that it can hold up its end of the conversaticn. The conversant's utterances are translated, via various syntactic and semantic procedures, into an internal network format which, along with various inferences, is then added to an intermediate level of memory. Structures in this intermediate level of memory are examined and compared to concepts in the model's more permanent network memory (in which is stored its knowledge of the world, its beliefs, and its procedures). These comparisons are then used to modify the model's intermediate memory structures and also form the basis for the model's response. Eventually the response is translated from network form into English surface structure and is printed out. At the conclusion of the conversation, the intermediate memory is merged with the permanent memory, necessitating appropriate modifications to both levels. Finally, the model occasionally peruses its permanent memory to improve its representations of knowledge."

As part of this work, we hope to look at the question of inference in language understanding. There appear to be many different forms of inference ranging from questions of anaphoric reference to questions of complex associations between words and concepts. One current viewpoint holds that the underlying representation of the meaning of a sentence is a logical form and therefore inferencing is a logical process. An opposing opinion is that there is no logical representation but whatever it is, inferencing involves processing in this representation which may, in part, be logical. We will investigate some aspects of inference in the domain of the man-machine dialogue. Because the currently proposed representations are of network form it is expected that much of the inferencing will be non-logical but will involve procedures to search the networks.

The question of a significant learning component in problem-solving has recently received revived interest. We are using our robot simulation (See abstract by Peter Rowat in this issue of the newsletter.) to investigate this question for the particular problem of moving objects around in a restricted environment. The following is taken from a Ph.D. research proposal by Peter Rowat written in May of 1973:

"The main topic of my research will be the learning of new knowledge and concepts by machine. Way back in 1958, in proposing the Advice-Taker program, McCarthy stated that "Our ultimate objective is to make programs that learn from their experience as effectively as humans do." We are still a long way from this goal. Current programs are able to learn to play a good game of checkers (Samuel), can accept advice in a restricted manner (PLANNER), and can be taught the concept of an arch in the restricted domain of childrens' building blocks (Winston). However it is not known how, for example, a program might discover for itself the principle of opposition in checkers, the neat solution of the deformed checker-board problem, or one of the more abstract formulations of the missionaries and cannibals problem which make the problem's solution exceptionally easy (Amarel).

I propose to approach the problem of learning procedures in the context of a simulated toy world containing a mobile robot which can sense its surroundings through touch and a limited form of vision, and which can move rectanguloid objects around in a rectanguloid environment. I implemented a two-dimensional version of this in which the robot could create and execute plans to go from room to room etc. for my master's thesis.

As an example of what I expect to be quite feasible: the robot starts with the basic concepts and descriptions of an open rectangular space and the concept of a rectangular object, and through experience gained in many attempts, learns how to move complex shaped objects around, and learns what descriptions of objects are appropriate for this kind of environment and task. It may well be necessary to give the robot some clues by means of some well chosen examples. My standard example here is the problem of moving an "L" shaped object through an offset doorway.

I shall build on the ideas of McCarthy and Minsky, T.G. Evans (use of descriptions), P. Winston (teaching of structural descriptions), and of G.J. Sussman (teaching of procedures through debugging). Another apealing idea which may prove useful is to approach a new complex problem to be solved or new procedure to be learned via a network representation, and view the formation of a new concept as finding an appropriate homomorphism from one complex (and thus "opaque") network to another simpler (and thus "clear" or solvable) network.

Of course there are many points I have omitted or skated over. One important aspect of a robot simulation which I shall not be able to avoid is dealing with the vision-perception-action loop, an essential part of any autonomous organism. The implementation will no doubt be in LISP, while the simulated world will be in FORTRAN. We shall probably write a display routine so that the user can watch the robot in action."

We have also been carrying out research in the domain of heuristic search focussed specifically on the role of look-ahead in one person games. Some recent work using a member of the class of sliding block puzzles called the 15-puzzle has stimulated efforts to determine the conditions under which the computational cost of applying an evaluation function can affect the overall computational costs of discovering a solution.

The other major problem in heuristic search which is usually taken as given is the question of problem representation. Clearly, the particular description used to represent a problem, which in effect defines the graph to be searched, is a crucial factor in determining the efficiency of the solution process. One doctoral student, Michael Kuttner, is very much concerned with this question and is beginning a study of appropriate representations for learning how to play a game well. His primary interest is chess but he intends to begin with simple games. His point of view has been influenced by de Groot, Simon and Chase. He would like to move beyond tree searching techniques to more complex pattern recognition procedures which can zero in on the crucial features of a game configuration. As this work is only beginning there is not much to report yet except for a forthcoming survey and analysis of chess-playing programs.

Finally, in a more philosophical vein, I am concerned with the effect of research in AI on certain traditional philosophical problems such as the mind-body problem and the nature of intelligence and consciousness. This effort promises to be rather long since there is a great deal of literature on these questions in both philosophy and AI. Hopefully, the first concrete result will be an extensive annotated bibliography.

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de Groot, A.D. Het Denken van den Schaker, Trans. as Thcught and Choice in Chess. The Hague, Mouton and Co., 1965.

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RECENT ABSTRACTS

AN INFORMATION PROCESSING THEORY OF ASPECTS OF THE DEVELOPMENT OF WEIGHT SERIATION IN CHILDREN (REV.)

George W. Baylor & Jean Gascon
July, 1973

Dept. Of Psychology
University of Montreal

Children varying in age from 6 to 11 years were video-tape recorded while trying to seriate seven blocks according to weight with the aid of a scale. The typical behavior patterns that Piaget first described for the stages of intellectual development on this task were observed. Our protocols are analyzed in terms of stage specific base strategies coupled with a mechanism for translating them into task specific production systems. The actual simulation programs, written as production systems in a specially constructed language, BG, are evaluated in terms of how well they regenerate the protocols.

To appear in Cognitive Psychology ,1974, 6 .

SIMULATION DES PROCESSUS DE CONSTRUCTION D'UNE STRATEGIE DANS UNE TACHE DE FORMATION DE CONCEPT

Aude Dufresne Bourque

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Faculte des Arts et Sciences
Universite de Montreal

(Memoire presente a la faculte des etudes superieures en vue de l'obtention du grade de Maitrise des Artes (Psychologie). Octobre 1973.)

La presente recherche vise a etudier les processus de creation de strategie. Dans le cadre des recherches sur la resolution de problemes de Newell et Simon (1972), elle cherche a simuler la creation de "l'espace du probleme". Le modele est elabore a partir de l'analyse detaillee du protocole d'un S de 10 ans, qui resout une tache de formation de concept. La tache, puis le S ont ete choisis pour mettre le plus possible en evidence la recherche de strategie: la tache peut etre resolue par diverses strategies, elle permet d'exterioriser la strategie employee, l'age du S rend la tache assez difficile pour que l'apprentissage en soit long et observable. Le modele elabore met en interaction deux mecanismes: le premier, qui en fonction des situations rencontrees, cree des elements de strategies a

partir de principes generaux, et le second, qui reunit ces elements de strategies en des regles de production, qui s'appliquent automatiquement. Cette distinction permet de mettre en evidence l'interaction de l'analyse et de l'experience dans la formation de la strategie.

A PROCEDURAL APPROACH TO CONSTRUCTIONS IN EUCLIDEAN GEOMETRY

Brian V. Funt

Department of Computer Science
University of British Columbia
Vancouver, B.C.

(A thesis submitted in partial fulfilment of the requirements for the degree of Master of Science in the Dept. of Computer Science, UBC, Oct. 1973.)

A problem solving program capable of handling high school level Euclidean geometry straight-edge and compass constructions has been written. Figures are constructed by discovering, for the points composing them, the loci which satisfy the given sets of constraints. The representation of geometric knowledge is procedural. The relation to theorem proving in geometry, and aspects of the language PLANNER, which was used in the implementation of the program, are discussed.

THE GAME OF PENTOMINOES

Michael Kuttner

Department of Computer Science
University of British Columbia
Vancouver, B.C.

(A thesis submitted in partial fulfilment of the requirements for the degree of Master of Science in the Dept. of Computer Science, UBC, Dec, 1972)

A study in game-playing programming is made using the game of pentominoes which has a very large branching factor and where there exists almost no precise, factual information to guide the conduct of the play.

The difficulties encountered imply that some apparent advantages of heuristic techniques are more heavily problem-dependent than is usually conceded.

A guiding device capable of learning is incorporated which significantly improves the program's play in competition with

versions lacking it and shows subjective improvement with human competition.

ROBOT SIMULATION STUDIES

Peter F. Rowat

Department of Computer Science
University of British Columbia
Vancouver, B.C.

(A thesis submitted in partial fulfilment of the requirements for the degree of Master of Science in the Dept. of Computer Science, UBC, March, 1972.)

The history of the robot as a concept and as a fact is indicated, and the current linguistic approach to robotology discussed. The problem of designing a robot-controller is approached by taking a simplified, computer-simulated, model of a robot in an environment, and writing programs to enable the robot to move around its environment in a reasonably intelligent manner. The problems of concept representation and the creation and execution of plans are dealt with in this simple system, and the problem of exploration is encountered but not satisfactorily dealt with.

The robot's environment consists of a rectangular grid in which squares are labelled as belonging to the boundary, to fixed or movable objects, or to holes, while the robot itself occupies a single square, can sense the labels of the eight surrounding squares, can turn, and can pickup, move, and drop movable objects. The boundary of a typical environment is thus a rectanguloid polygon, which can be compared to the floor-plan of a one-level house. After an initial exploration the basic representation of the environment is as a sequence of edge-lengths and turns, called the ring-representation. An algorithm is described which produces the set of maximal subrectangles of the environment (i.e. rooms, passages, doorways) from the ring representation. To make plans for moving within the environment, the robot first views the maximal subrectangles as the vertices of a graph, wherein two vertices are connected by an edge if and only if the corresponding maximal subrectangles overlap, and then uses a path-finding algorithm to find a path between two vertices of the graph. This path constitutes a "plan of action".

Whenever an isolated object or hole is found, its ring-representation is generated and its set of maximal subrectangles produced. Thus the shapes of objects and holes within the environment can be compared in various ways. In particular, an algorithm is described which compares the shape of a movable object with that of a hole to ascertain if the movable object could be moved to fit inside the hole without "physically" moving the object.

ROSS, an interactive computer program which simulates the robot-environment model, is described. A command language allows the user to specify tasks for the robot at various conceptual levels.

Several problems are listed concerning the ways in which a robot might explore, represent, and make plans about, its environment, most of which are amenable to direct attack in this simplified model. Finally, theoretical questions concerning two-dimensional rectanguloid shapes are raised.

B C L O G O

The Logo Project at the University of B. C. has produced an implementation of the Logo language for the IBM System/360/370. Logo is of primary interest to AI types as an easy language for introducing AI problems at a basic level. This implementation has a number of features to facilitate such an application:

* "Full list structures", identical to those of Lisp, have been introduced. Such structures permit easy creation of complex data structures, as well as multi-dimensional arrays.

* The system has been written in BCPL, a high level system programming language. It is very easy for anyone who knows BCPL to add new functions for special applications.

* "Dribble files", containing a record of each student's session, may be easily produced.

The language implemented is expected to be compatible with that in future versions of BBN Logo for the PDP-10. The current version operates under MTS/360, although an OS version will be available almost immediately. At present, BCLogo requires about 50K for the system,; additional storage is needed for each user's workspace.

Address enquiries to:

The Logo Project
Department of Computer Science
University of British Columbia
Vancouver, B.C.

ANNOUNCEMENT OF AISB CONFERENCE, 7-10 JULY 1974,

UNIVERSITY OF SUSSEX, BRIGHTON

C A L L   F O R   P A P E R S

Papers are requested from any of the following major research areas associated with Artificial Intelligence:

- Natural-Language Understanding (Text and Speech)
- Heuristic Problem Solving and Game Playing
- Automatic Programme Writing
- Computer Perception (especially vision)
- Artificial Intelligence and Psychology
- Robots
- Theoretical Foundations of Artificial Intelligence
- Special Hardware and Software for A.I.
- Applications of Artificial Intelligence
- Social Consequences of A.I.

(It has been decided not to accept papers dealing with statistical pattern-recognition techniques, clustering procedures, alphanumeric text recognition, and such like, since these topics seem to be adequately covered by their own special conferences.)

Complete manuscripts must be received by 1 February 1974. Authors should submit three copies in final draft form, typewritten, double-spaced, with a maximum of ten pages including figures (about 3000 words); a 100-word abstract and a set of descriptive terms characterising the content should be included.

Each paper will be reviewed; acceptable papers will be returned to the authors by March 30 1974 for recommended modifications and for retyping on special pages that can be reproduced photographically or by stencil. Final versions of accepted papers will be due by May 15 1974.

Besides submitted papers, the conference will feature tutorial talks on current topics in A.I., special informal discussion sessions, and films.

A preprint volume containing the papers to be presented at the conference will be distributed to attendees. There will be no hard cover volume of these papers published. The conference committee has no objections to conference authors submitting their papers for publication elsewhere provided that the paper contains a statement that it was previously presented at AISB.

General enquiries about the Conference should be directed to:

Dr K. Oatley
General Chairman, AISB Summer Conference, 74
Laboratory of Experimental Psychology
University of Sussex
Brighton, Sussex BN1 9QG,
England, U.K.

Manuscripts and enquiries about the program should be directed to:

Dr H.G. Barrow
Program Chairman, AISB Summer Conference, 74
School of Artificial Intelligence
University of Edinburgh
Hope Park Square, Meadow Lane
Edinburgh, EH8 9NW
Scotland.

Bookings to attend the Conference should be made by writing to:

Dr Margaret Boden
School of Social Sciences
University of Sussex
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England, U.K.

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