SIGART NEWSLETTER Number 41 August 1973 1

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SIGART NEWSLETTER 1b

The SIGART Newsletter is a bimonthly publication of the Special Interest Group on Artificial Intelligence of the Association for Computing Machinery. The Newsletter reports on projects being conducted by the artificial intelligence research community and generally reviews current progress in the state-of-the-art. Correspondents report news from local SIGART Chapters and other AI Centers.

SIGART CHAIRMAN: Bob Balzer

USC Information Science Institute
4676 Admiralty Way
Marina del Rey, California 90291
Telephone: 213-822-1511

NEWSLETTER EDITOR: Steve Coles ASSOCIATE EDITOR: Rich Fikes

Artificial Intelligence Center
Stanford Research Institute
Menlo Park, California 94025
Telephone: 415-326-6200 ext. 4601, 4620

ASSISTANT EDITOR FOR ONLINE OPERATIONS: Kirk Kelley

Augmentation Research Center
Stanford Research Institute
Menlo Park, California 94025
Telephone: 415-326-6200 ext. 3630

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The Editors encourage contributions from authors, including Letters to the Editor (AI Forum), Technical Contributions (1 to 6 pages), Abstracts (preferably 100-200 words), Book Reviews, Bibliographies of Special Topics in AI, News Items (Conferences, Meetings, Course Announcements, Personals, etc.), Advertisements (New Products or Classified Advertising), Puzzles, Poems, Cartoons, etc. Material may be reproduced from the Newsletter for non-commercial purposes with credit to the author and SIGART.

Anyone interested in acting as editor for a special issue of the Newsletter devoted to a particular topic in AI is invited to contact the Editor. Letters to the Editor will be considered as submitted for publication unless they contain a request to the contrary. Technical papers appearing in this issue are unrefereed working papers, and opinions expressed in contributions are to be construed as those of the individual author rather than the official position of SIGART, the ACM, or any organization with which the writer may be affiliated.

You are invited to join and participate actively. SIGART membership is open to members of the ACM upon payment of dues

of $3.00 per year and to non-ACM members upon payment of dues of $5.00 per year. To indicate a change of address or if you wish to become a member of SIGART, please complete the form on the bottom of the last page of this issue. 1b4

Copy deadline for the October Issue: September 21st. 1b5

CHAIRMAN'S MESSAGE 2

In the last issue George Ernst thanked all of the officers of SIGART for the excellent job they have done. I know of no better way of starting my term then by adding my thanks to these same people and to add George to the list for the fine job he has done in tying all the activities together. 2a

During my term, I would like to accomplish three goals: 2b

1. Help continue the steady expansion of the benefits of SIGART to the members by encouraging more participation in and contributions to our newsletter and the sessions and symposia we sponsor. 2b1

2. Increase our contacts with other disciplines and with practical applications of AI. 2b2

3. Use SIGART as a forum for examining the field of AI. 2b3

Let me expand on the last point. Recently, AI has come under critical review, most notably by Sir James Lighthill in a report to the Science Research Council in Britain (see the SCIENCE article reprinted in this issue, pp. 6-8 for a short summary). Such criticism gives us an excellent opportunity (though perhaps for the wrong reasons) to step back from our day-to-day activities and evaluate the accomplishments of AI and consider its goals. 2c

I hope to expand on each of these themes in following issues. 2d

R.M.B. 7/24/73 2e

EDITOR'S ENTRY 3

1. CONGRATULATIONS TO PROF. ALLEN NEWELL 3a

A remarkable coincidence has just been called to my attention: the immediate past Chairman, George Ernst, the current Chairman, Bob Balzer, and the current Editors of the Newsletter, Rich Fikes and yours truly, were all at one time (seven or eight years ago) simultaneously students of Prof. Newell at Carnegie-Mellon. Even though we have all

subsequently moved to other areas of the country, I am sure that I speak for all of us when I say that his inspired teaching continues to influence our approach to AI even today. 3a1

2. CARNEGIE TO SIMULATE HUMAN PROBLEM SOLVING 3b

I have recently been informed that John R. Hayes and Herbert A. Simon of the Psychology Department at Carnegie-Mellon University have been awarded a $56K NSF grant to test and refine a tentative model of how the human mind takes a problem that it has never encountered before and puts it into a form that it can recognize and deal with. The ultimate goal of the project is to develop a computer program that can simulate this process, so that a computer can understand and define a problem directly from written instructions. The end result will be "a program that will tell itself what the problem is, rather than having to be told." Dr. Hayes has been an Associate Professor of Psychology at CMU since 1965. He was published extensively on the topics of cognitive development and problem solving. Dr. Simon has been at CMU since 1949, serving as the Richard King Mellon Professor of Computer Science and Psychology since 1966. 3b1

3. BBC DEBATE 3c

Last July 4th in London, Sir George Porter moderated a controversial panel discussion on the subject "The General Purpose Robot is a Mirage." The program, one of a series of six, was run in conjunction with The Royal Institution for the BBC. Participants included Sir James Lighthill, Prof. Donald Michie of Edinburgh, Prof. Richard Gregory of Bristol University and our own Prof. John McCarthy, representing U.S. AI. The program will probably be screened on August 20th and will last about one hour. We hope that Nils Nilsson will be able to obtain a video tape for showing at IJCAI-73. 3c1

4. MORE ON THE LIGHTHILL REPORT 3d

Although I had originally planned to use this space to make an editorial statement about the adverse impact of the "General Survey of Artificial Intelligence" by Sir James Lighthill,* commissioned by the British Science Research Council, on the field of AI generally and especially on our British counterparts, I find that the subject has by now been extensively treated in other sources. The July, 1973 article in SCIENCE reported by Allen L. Hammond, has been reprinted on pp. 6-8 of this issue for the benefit of those who may have missed it. I especially recommend an article by Pat Hayes (now at Essex University) in the current issue of the AISB European

Newsletter,** since it covers virtually all of the criticisms I planned to make and more. Firbush News 3 has reprinted the complete text of the Lighthill Report and contains a useful comment on the Report by Prof. Bernard Meltzer.*** 3d1

Prof. Flowers, Chairman of the SRC, says in his preface to the Report that "the Council would welcome readers' comments on the importance of artificial intelligence research, and the extent of the support the Council should plan to give to it." If you feel you would like to make your opinions regarding the Report and related matters known the SRC, we would be happy to receive them first, so that the U.S. AI community could have an opportunity to formulate a joint response to Prof. Flowers. 3d2

L.S.C. 7/26/73 3d2a

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* As mentioned in the preceding issue, copies of the report including followup comments by Profs. N. S. Sutherland, R. M. Needham, H. C. Longhet-Higgins, and D. Michie may be obtained by writing to the Public Relations Unit; Science Research Council; State House; High Holborn; London WCIR 4TA, England. 3d4

** Pat Hayes, "Some Comments on Sir James Lighthill's Report on Artificial Intelligence," AISB European Newsletter, ed by A. Bundy and M. Liardet, pp. 36-54, Issue 19, July 1973. 3d5

*** B. Meltzer, "Comments on the Lighthill Report: Extracts from a Letter," Firbush News 3, pp. 44-46, March 1973. 3d6

ARTIFICIAL INTELLIGENCE:
A FASCINATION WITH ROBOTS OR A SERIOUS INTELLECTUAL ENDEAVOR? by
Allen L. Hammond
SCIENCE Magazine
June 29, 1973 4

In early 1972 Sir James Lighthill of Cambridge University undertook to survey the field of Artificial Intelligence (AI) for the Science Research Council of Britain. His report was sufficiently controversial that the Council held up its release for over a year until last month, when a somewhat sanitized version was published (along with comments from several other scientists) in an AI newsletter edited at the University of Edinburgh. Ironically enough, funding for AI research at Edinburgh, heretofore the largest center in Britain, was also cut back last month--in part due to the criticisms leveled by the Lighthill report against AI research in general and against the Edinburgh project in particular. 4a

The report questions whether artificial intelligence is a coherent field of research or whether it is really two diverging kinds of investigations linked in a makeshift way by a fascination with robots. The report is cautiously optimistic about the future of research on particular aspects of AI (automation and computer studies of neurobiological functions), but downgrades work on robots as having, at best, discouraging prospects. 4b

Researchers in artificial intelligence, for their part, have been quick to criticize the report as betraying a lack of understanding as to what the field is all about. They dispute not only the report's assessment of prospects in AI but also the division of what they see as a coherent field into artificial and misleading categories. 4c

The ABC's of artificial intelligence, as Lighthill styled them, amount to 4d

(A) Advanced automation, including pattern recognition, speech recognition, and automation of industrial processes; the emphasis, according to Lighthill, is on practical problems and on efforts oriented toward new hardware. 4d1

(B) Building robots, including coordination of eye and hand functions, use of natural languages for communicating with computers, automated analysis of visual scenes or environments, and problem solving techniques; Lighthill describes this category of research as forming an imperfect bridge between the practical area of advanced automation and the more basic research of category C. 4d2

(C) Computer-based research on the central nervous system, including associative recall, functioning of the cerebellum, psycholinguistic studies, and other theoretical (modeling) investigations related to neurobiology and psychology. 4d3

It is particularly the work on robots that Lighthill sees as having little future in itself and as being of marginal value to other areas of AI. He goes even further, suggesting that those who work on robots may be fulfilling "pseudomaternal" urges or catering to popular interest. Researchers on AI are understandably irked at these slurs on their motivations and, more substantively, do not see the rationale for Lighthill's ABC's. They believe that his description is limited and arbitrary, that it includes some subjects such as neurobiology which have little to do with AI, and that it excludes others central to the field. As one U.S. scientist put it, neither artificial intelligence nor neurophysiology is advanced enough to have anything to contribute to the other discipline. 4e

Lighthill is a well-known scientist respected for his work in applied mathematics and hydrodynamics, and his criticisms, as one observer described them, "do not have the religious character" of earlier attacks on AI. But he is admittedly an outsider to AI research and he qualifies his report as a "highly personal view." It is thus not impossible that his report, based on a 2-month survey, does misconstrue the field and that his view of its prospects is, as AI researchers claim, seriously misguided. 4f

Lighthill's main criticism boils down to the claim that work on robots is not an intellectually important endeavor. Those working on artificial intelligence reply that robots are not their primary goal, but merely research tools. Marvin Minsky, of the Massachusetts Institute of Technology, believes that research on AI is important because it is really research on theories of intelligence, and that work with robots, with computer vision machines, and with other similar devices--whatever their practical applications--aids the unraveling of ideas about possible "intellectual mechanisms." Even the process of developing these devices and the computer programs that control them is leading, in his view, to deep insights into the nature of learning. 4g

John McCarthy of Stanford puts it somewhat differently--nobody knows any mechanism that can carry out the coordination of vision and manipulation, that can distinguish objects against a background, and that can perform a number of tasks as effectively as humans and animals routinely do. Investigation of these mechanisms, he believes, is a valid intellectual goal. And it is not a trivial problem, in his view, to try to formalize a description of the intellectual structure of the world. 4h

Researchers on AI do not claim to have made much progress in understanding the details of specifically human thought processes, but they do believe that they have made a start on discovering how intelligence might work. They point to a new interest among cognitive psychologists in the vocabulary for discussing thought processes and in a variety of simple cognitive phenomena developed by AI researchers. More concrete, if preliminary, results include a computer-directed hand-eye machine developed at Stanford which can assemble a simple pump from parts randomly placed on a table. Researchers at Bolt Beranek and Newman Inc. in Boston have developed a natural language question-answering program which, when combined with a data bank of information on moon rocks (as a demonstration), proved so irresistible and accessible to geophysicists that they soon forgot it was the program, not the data base, that was being demonstrated. In contrast to earlier presuppositions that the use of computer languages to describe cognitive phenomena would result in oversimplification, there is

growing recognition that work on artificial intelligence has provided a lot of new ideas. 4i

Even granting that AI is an intellectually important area for research, it is fair to ask whether the field is using its resources wisely. The Lighthill report suggests that, in the United States especially, little attention has been given to this question, in part because there has been a relatively assured source of funding. As is true for computer science in general, research on AI is predominantly supported by the Defense Advanced Research Projects Agency (ARPA), which provides about $4.5 million a year. Another $1.5 million comes from the National Science Foundation (NSF). The bulk of the ARPA money goes for work on robots and natural language programming at a few large centers, while smaller, more widespread research projects on pattern recognition, pattern processing, and automation make up the core of the NSF funding. There has been no overall evaluation of the field for some years, researchers admit, and there are substantial disagreements as to which of several lines of research will prove most fruitful. But while conceding the need for some reexamination, what concerns many AI researchers is that the Lighthill report will be used as ammunition by budget-conscious administrators looking for reasons to eliminate funding entirely. They report that ARPA is getting nervous about supporting basic research, and also point to a lack of U.S. research on automated manufacturing techniques comparable to the $115 million effort launched by Japan in 1971. 4j

The term artificial intelligence was initially chosen by Minsky and McCarthy so that they and their colleagues could work on the nature of problem-solving processes without competition from psychologists. The field has outlived the excess optimism that characterized its early years, although it continues to be judged, unfairly many believe, in the light of promises made during that period. Even ardent proponents of AI admit that it still does not have any well-agreed-upon theoretical basis. Nonetheless, they are optimistic. Work on natural language programming alone, one admittedly partisan research administrator told SCIENCE, will greatly affect how people interact with computers. "We are looking," he said, "at a science in its infancy which will have an enormous impact." But as the Lighthill report makes clear, that impact is not yet obvious to everyone. 4k

SRC THREATENS BRITISH ROBOT RESEARCH by Alan Cane
Science Correspondent
The London Times
June 1, 1973 5

University Research in constructing "thinking robots" which mimic

human activities, a field in which Britain is an acknowledged world leader, is threatened by a controversial new report from the Science Research Council. 5a

The report, entitled Artificial Intelligence, is a personal review by Sir James Lighthill, Lucasian Professor of Applied Mathematics at Cambridge University, but also contains criticisms and comments by other scientists. 5b

It is seen as a further threat to the survival of the only team of university scientists in Britain which builds robots. 5c

The future of the team, led by Professor Donald Michie, head of the Department of Machine Intelligence at Edinburgh University, has already been prejudiced by the failure of the SRC--which has financed Professor Michie's work since 1963--to renew his chief source of support. 5d

Only funds from the Continent are keeping the team together. It is living "from hand to mouth" according to Professor Michie, and if more support is not forthcoming by the end of the year, the team will break up and its best members will be lost to British science. 5e

"Artificial Intelligence" is described by the SRC as a paper symposium. In an introduction, Sir Brian Flowers, SRC Chairman, explains: "It did not appear to me to be possible to assemble a dispassionate body of experts to review the field as is our usual practice. I therefore asked Sir James Lighthill FRS, to make a personal review of the subject." 5f

Sir James's review suggests that artificial intelligence as a field of research--it includes the construction of machines to replace humans in difficult or dangerous circumstances and basic research in the theory of thought and intelligence--has failed to live up to expectations, but that building robots has proved especially valueless. 5g

He wonders whether robot buiders are driven by an urge to give the public the kind of science-fiction devices that create attention, and wonders whether male robot builders are compensating for their inability to give birth by creating mechanical children. 5h

American scientists, who undoubtedly lead the world in artificial intelligence research, regard the Lighthill comments and the threat to Edinburgh's survival as a direct attack on the integrity and quality of research in robotics. A letter signed by 11 eminent American artificial intelligence scientists, has been sent

to Sir Brian Flowers declaring their admiration for the Edinburgh team. 5i

It reads: "In our opinion the Edinburgh work is well up in the main wave of progress in this field and should be regarded as technicaaly comparable with the leading U.S. projects both in level of attainment and in style of approach." 5j

The experts are also disconcerted by their belief that Professor Lighthill gave the wrong advice that led to Britain losing the initiative in fusion research, an area of great importance for energy supply in which Britain held an early lead. 5k

Dr. Michie said this week that he was maintaining a "useful and cordial dialogue with the SRC", and was examining the possibility of giving his robotics work an industrial slant. He was engaged in discussions with Professor W. E. Heginbotham, Head of the Department of Production Engineering at Nottingham University, where a good industrial robotics group is already at work. 5l

He hoped that the SRC would eventually accept the recommendations of its Computing Science Review Panel which almost a year before the Lighthill Report was published recommended that about L500,000 should be given to machine intelligence and at least one new major center established. 5m

Artificial intelligence groups are in existence at Edinburgh, Essex University, and Sussex University, but only Edinburgh, with 50 staff and half as many technicians, is big enough to take on the large American groups. 5n

THE EDINBURGH VERSATILE LAYOUT AND ASSEMBLY PROGRAM

by A. Patricia Ambler
Department of Machine Intelligence
University of Edinburgh 6

A computer-controlled versatile layout and assembly system has recently been programmed at the School of Artificial Intelligence, University of Edinburgh. The equipment used, locally known as Freddy, consists of a moveable table, a mechanical hand suspended over the table and two fixed TV cameras, all connected via an 8K Honeywell 316 to a timeshared 128K ICL 4130 running POP-2 programs. The hand is fixed above the table but can be raised and lowered, and rotated about a vertical axis. It has two palms, with force sensors, which are parallel to each other, and can be tilted about a horizontal axis, and moved together and apart. There is an obliquely mounted, wide-angle TV camera which is used to scan the table, and a vertically mounted one which is used to examine in detail smaller areas of the table (See Figure 1). 6a

The layout and assembly program enables one to tip a boxful of toy parts into a heap on the table (Figure 4), and to leave the robot, unattended, to sort out the parts, choose those which are needed to make a particular toy, lay them out neatly on the table, and then assemble them into a completed toy. It takes about 1 1/2 hours per toy. In order to do this the robot has to be taught (a) how to recognize individual parts, and how to handle them and (b) how to assemble the toy. These two teaching processes both take 2-3 hours of interactive time. The heap smashing and layout program is able to deal with things going wrong. Sometimes a part is dropped when it is being moved, and sometimes an even worse than usual TV picture leads to the non-recognition of an object. The robot is able to recover. However, the assembly part of the system is not able to recover from unforeseen events. 6b

Finding Objects on the Table 6c

The table top is searched with the oblique camera. Objects on it are seen as white blobs on a black background. The robot works out their location on the table, using some arbitrary figure for their height. Objects seen in subsequent pictures are put into correspondence with the map so formed using not only their absolute positions, but also their relative positions. To do this, a graph matching program is used. This program is also used in object recognition when matching segments and holes. 6c1

Object Description and Recognition 6d

An object lying by itself on the table will be in one of several possible mechanically stable states. The robot is taught, by example, the appearance, under the vertical camera, of the object in each of these stable states. The learned description is hierarchical, and includes, at the region level, details of the white blob on the black background of the table; at the hole level, the number and shape of any holes; at the outline level, the number, shape, and relations between curved and straight-line segments that have been fitted to the outline of the blob (Figure 6). 6d1

Having learned a visual description of an object lying on the table, the robot is shown how to handle it when it is in such a position. Freddy is shown, by example, how to grasp the object, how to turn it over into a standard stable state, and where to lay it on the table ready for assembly. 6d2

Recognition of an object involves matching the hierarchical description of the object as seen under the vertical camera (the actual description), with the learned description (the

model description). Once it has been recognized as an object in a particular stable state, the robot will be able to work out how to pick it up and how to lay it out. 6d3

Heap Smashing 6e

If an object seen under the vertical camera is not recognized then it is treated as a heap, and the hands are used to break up the heap. The robot does not try to recognize individual objects in a heap, but tries to lift something out so that it can be put down on a clear part of the table and examined without interference. When breaking a heap, Freddy first tries to see a protrusion which can be grasped by the palms. If he can't find one, then he tries a blind grab at the heap, and if this fails to get anything, then he sweeps his hands through the heap to spread it over the table, and then tries to pick something up again. Objects which have not been recognized because of a poor TV picture will be treated as heaps and picked up and put down again and re-examined, so that they have a good chance of being properly recognized. 6e1

Assembly 6f

The assembly part of the program works blind, using only hand sensing. It is written interactively at instruction time using some basic moving and sensing operations and two higher-level ones. The higher-level operations are: constrained move--i.e., move in some particular direction until some opposing force is felt, while at the same time keeping in contact with the surface; and hole fitting--i.e., use a spiral pattern search to fit some protrusion into a hole. 6f1

The assembly of a toy car from a kit consisting of four wheels, two axles and a car body usually takes about 1/2 hour. A workbench is used, fixed to a corner of the table. It has a "vice" for holding wheels while axles are being fitted, and a wall to hold the car against while the second wheels are being fitted onto the axis (Figure 5). 6f2

A paper describing the system is to be presented at IJCAI-73 (Ambler, Barrow, Brown, Burstall, and Popplestone, "A Versatile, Computer-Controlled, Assembly System"). Two films have been made--one showing the robot sorting out and assembling a toy car, and the other showing the robot sorting a mixed heap of car and ship parts, and then assembling both the car and the ship. 6g

REPORT ON THE SIGART MEETING AT THE NCC by Ranan Banerji
Case Western Reserve University
Cleveland, Ohio 7

SIGART met on June 6, during the National Computer conference as announced. This reporter met a number of people the next day who were disappointed to miss it, and said they did not know about it. Perhaps the SIG meetings should have been somewhat better publicized by the NCC Committee itself. Need we punish so severely those members who do not read their newsletters or those sympathizers who are nct members? 7a

That's all for the comment. The business part of the meeting consisted mostly of Chairman George Ernst introducing the new chairman, Robert Balzer. There was some discussion of the ACM and SIGART finances. The Chairman answered some questions regarding the mechanism of selection of officers of SIG's under ACM bylaws. 7b

The highlight of the evening was Saul Amarel's talk on present AI activities at Rutgers University. What follows is this reporter's recollection and understanding of what he said. 7c

The three areas of work that he discussed at some length were: 7d

1. A work on automated individualized teaching, where the students' specific shortcomings are analyzed and attended to. As a major example of the analysis of errors, he quoted their work on the guessing of grammar modification. The work differs from those of Solomonoff, Gold, Fu and others in the major respect that the program is not made to guess at grammar about which no information is known except for the example sentence. Instead, it is known that the sentences come from a grammar which is similar in many respects to a given known grammar. Computer-aided teaching of programming has been a major vehicle of this research. 7d1

2. A model of a belief system and its use in automatic interpretation of social interactions. This involves explaining motives and goals of people by analysis of how they interact. Such analysis is based on assumptions of a person's belief system about the world, which includes a model of belief systems of other people--among them a model of the initial person's belief system. Some of the interesting problems involve modes of changing belief systems under interaction. The problem of interpreting sequences of actions on the basis of beliefs about rules of action is approached by the same method of 'parsing', which is used in (1) to analyze deviation from normal linguistic behavior. Indeed the same parser is used in both cases. 7d2

3. Computer aids to medical consultation. The most extensive and successful work done along these lines has been on Glucoma. A whole book on the interactions of cause and effect in the

prognosis of Glucoma is now available as a computer data base. The system can suggest additional tests for the establishment of diagnosis and has done so in real-life cases. After establishing a plausible diagnosis, the system also formulates recommendations for treatment. At present, the main data base is in the form of a causal network whose nodes are physiological states. A more elaborate process control model--which underlies the phenomena in the causal network model--is being studied. The interesting AI problems are how to best use the models at two levels of resolution in diagnostic and treatment decisions; how to abstract useful information from the high-resolution model into the low-resolution model; and how to form, update, and validate (part of) the models. 7d3

As usual, the meeting lasted late into the night and continued informally in a coffee shop into the early hours of the morning. Your reporter established two non-technical facts while he was there: 7e

1. The Rutgers mailing list is very informal at this moment--so the place needs a reporter very badly.* 7e1

2. The work at Rutgers is so interdisciplinary that Dr. Amarel and his colleagues have had to expend a lot of effort and planning in order to open communication channels between the various disciplines. Therefore, they have some useful hints to give about the sociological, political, and economic techniques involved. 7e2

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*[Ed. Note: Prof. Bertram Bruce has recently agreed to act as a Newsletter reporter from Rutgers.] 7e3

EFFICIENT UTILIZATION OF ALGORITHMS THROUGH HEURISTIC LEARNING

by
Tamio Shimizu
Department of Electrical Engineering
Polytechnic School
University of Sao Paulo, Brazil 8

1. Introduction 8a

In the study of problem solving methods, problems have been classified into two broad categories: 8a1

Structured Problems - for which it is possible to formulate one or more algorithms to find a solution of the problem. 8a1a

Ill-Structured Problems - in which, finding a solution is

only possible through the application of a set of general rules and strategies. 8a1b

Both Newell [1] and Minsky [2] have analyzed the nature of general problem solving methods and the resolution steps for such problems. They suggested many rules and strategies for general problem solving, such as hill-climbing, recognition, learning, heuristic search, planning, and induction. These techniques have been applied by artificial intelligence workers in the solution or simulation of various types of ill-structured problems (game-playing, pattern-recognition, theorem-proving, question-answering, etc.). In particular, a program named GPS [3] has been considered to be one of the most general and suitable for solving a large variety of problems, once they have been represented in an appropriate form. 8a2

In this work, a more efficient approach for solving structured problems is suggested. Because, in practical cases, existing algorithms for many types of problems may be more or less efficient due to a variety of factors (truncating-errors, rate of convergence, number of sub-functions, and so on). Another difficulty is the case of multidimensional problems, for which new problem-solving techniques must frequently be formulated [4,5]. 8a3

Thus, it is reasonable to expect that better results could be obtained for structured problems if a strategy were applied for automatic selection of algorithms through a heuristic learning approach. There is, of course, a trade-off problem to be solved. 8a4

This approach is based on the concept of learning by the creation of a table of connections between strategies (different algorithms) and stimulus features, as used by Newell et al in GPS and later by Huesman [6]. 8a5

2. Summary of Problems Being Testing 8b

Through the following problems, the strategies and some stimulus features used in the table of connection are presented. 8b1

(a) Global Optimization Problems 8b2

These are examples of ill-structured problems discussed by Newell [1]. 8b2a

Strategies used: 8b2b

Zeutendyck Method
Random Sampling
Stratified Random Sampling
Bayes Decision Algorithms used by Shimizu and Hill [7,8]. 8b2b1

Stimulus features: 8b2c

Time consumed or number of feasible solutions generated. 8b2c1

Depth in solution (Initial, Intermediate, or Final phase of the searching process). 8b2c2

Variance of the mean value. 8b2c3

Some test problems (Rosen and Suzuki [9], Fletcher-Powell [10]) have been successfully solved. Presently, problems with more then ten variables are being tested. 8b2d

(b) Numerical Solution of Ordinary Differential Equations 8b3

Strategies used: 8b3a

Runge-Kutta's Methods
Predictor - Corrector Methods
Polynominal - Extrapolation 8b3a1

Stimulus Features: 8b3b

Truncation - Errors
Stepsize
Depth in Solution
Number of points used to generate the next point in the curve. 8b3b1

A recent comparative study of methods due to Fox [11] may suggest better ideas for the choice of strategies and stimulus. The same scheme could be used for numerical integration, matrix inversion, and eigenvalue problems for ill-conditioned matrices. 8b3c

(c) Use of Variance Reducing Techniques in Simulation and Monte-Carlo Problems. 8b4

These are several variance reducing techniques used for the improvement of simulation and Monte Carlo Methods (Hammersley and Handscomb [12]). However, the performance of such techniques depends on the type and condition of the simulated problem. Thus, an automatic selection schema for such techniques would be desirable. 8b4a

The problems tested are: simulation of the Traveling-Salesman Problem, multiple integration, and matrix inversion by the Monte Carlo Method. 8b4b

Strategies: 8b4c

Stratified Sampling
Importance Sampling
Antithetic Variates
Regression Analysis 8b4c1

Stimulus Features: 8b4d

Variance of the Mean Value
Depth in Solution
Time Consumed 8b4d1

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PROGRESS REPORT FROM CASE WESTERN RESERVE UNIVERSITY by Ranan B. Banerji 9

The work last year continued along the three areas of pattern recognition, theorem proving, and theory of problem solving. I believe that the new work on Theorem Proving is best described in terms of one of the abstracts referenced below. The work on pattern recognition has continued along the lines of "simulation for evaluating the effectiveness of generalization." Theoretical and experimental results are being collected on how large a sample size one needs during the training phase to ensure good generalization. The answer seems to be, "a huge lot, unless there are very few significant parameters or (almost equivalently) there is strong clustering of the classes." 9a

The work on theory of problem solving has progressed sufficiently to allow some case studies in automatic heuristic discovery. We have been very pleasantly surprised to find that a uniform set of heuristics have been useful in discovering good differences for a diversity of problems, leading to considerable search reductions. The initial results are being written up as a report. 9b

This summer "yours truly" is away to Schenectady, where he and some colleagues at General Electric are trying to develop a syntactic recognition method for fixed-font characters. The purpose is to reduce time and bandwidth for facsimile transmission. 9c

The abstracts for papers and reports that have come out recently are included in the Abstracts section beginning on p. 46. 9d

PAJARO DUNES WORKSHOP ON AUTOMATIC PROBLEM SOLVING by Nils J. Nilsson

Stanford Research Institute 10

1. Introduction 10a

Stanford Research Institute recently organized an informal workshop on Automatic Problem Solving, under the sponsorship of the Information Systems Branch of the Office of Naval Research (Contract No. N00014-73-C-0245). The workshop took place at Pajaro Dunes, California on May 14-16, 1973. In this report we shall present a brief summary of the workshop proceedings. 10a1

Participants in the workshop included: Bruce Anderson, Cordell Green, and Arthur Thomas from Stanford University; Robert Balzer from Information Sciences Institute, University of Southern California; Harry Barrow, Robert Boyer, Robert Kowalski, and Donald Michie from University of Edinburgh; Ted Elcock from University of Western Ontario; Richard Fikes, Peter Hart, Nils Nilsson, Bert Raphael, Earl Sacerdoti, and Richard Waldinger from Stanford Research Institute; Michael Foster from the Royal Radar Establishment; Gordon Goldstein from the Office of Naval Research; Carl Hewitt and Gerald Sussman from Massachusetts Institute of Technology; and Jeff Rulifson from Xerox Palo Alto Research Center. 10a2

2. Summary of Talks 10b

The following summary gives a few paragraphs outlining the substance of each talk and some of the discussion topics. 10b1

Proving Theorems about LISP Functions--Robert Boyer 10b2

This talk was based on recent work by R. Boyer and J Moore. A paper of the same title will be presented at IJCAI-73 in August at Stanford. The authors' abstract to this paper is as follows: 10b2a

> We describe some simple heuristics combining evaluation and mathematical induction which we have implemented in a program that automatically proves a wide variety of theorems about recursive LISP functions. The method the program uses to generate induction formulas is described at length. The theorems proved by the program include that REVERSE is its own inverse and that a particular SORT program is correct. APPENDIX B contains a list of the theorems proved by the program. 10b2a1

QLISP--Earl Sacerdoti 10b3

QLISP is an extension of LISP that incorporates many features of the QA4 language including pattern matching, associative retrieval of expressions, pattern-directed function invocation, backtracking, and demons. A version is now available at SRI. Future versions will make use of the Bobrow-Wegbreit control structure to implement "processes." QLISP allows easy mixing of conventional LISP and QA4-like programs and, in addition, gives the user the full power of the editing and assistance features of BBN-LISP (now called INTERLISP). Sacerdoti's presentation raised the issue of whether it is better to design completely a new language with all of the desired features well-integrated in a consistent fashion or to follow the QLISP approach of adding new features to an existing language, thus complicating the syntax. Most participants felt that there have been so many years of effort put into BBN LISP, that it would be unwise to try to build a brand new language with QA4-like features. 10b3a

New AI Language Features for Robot Planning and Automatic Programming--Richard Waldinger 10b4

Waldinger discussed some proposed features that would be desirable additions to new AI languages. One is the "world-splitting" feature. Here a context is split into two contexts differing only in that there is a different assertion or goal in each. Waldinger distinguishes between an AND split and an OR split. In an AND split, the goal in each of the two contexts must both be established; in an OR split, only one of the goals need be established. Such a feature builds right into the language the capability of setting up AND/OR search trees. If accompanied by a feature that enables the programs to run in the different contexts as processes, then the supervision of search is also automatic. There are, of course, the usual problems of communication between contexts. 10b4a

Waldinger also discussed the desirability of having an automatic "protect" mechanism for maintaining the truth of goals already established during attempts to establish others. 10b4b

Predicate Calculus Programming--Robert Kowalski 10b5

The author's advance abstract of this talk follows: 10b5a

> The interpretation of predicate calculus as a programming language is a recent development made possible by two advances in the field of automatic theorem-proving. The first is the advent of more efficient theorem-proving

systems, such as SL-resolution. The second is a new appreciation for the dependence of problem-solving efficiency upon the form of the axiomatic representation of the problem. This observation, stated in terms of the programming language interpretation of predicate calculus, is just a statement of the familiar fact that different programs for solving the same problem can be equivalent in meaning but very different in computational efficiency. 10b5a1

The programming language interpretation of predicate calculus involves regarding an axiomatization of a problem domain as a program for solving problems within that domain. The theorem to be proved represents the input associated with a given problem. The theorem-prover acts as an interpreter, running the program for a given input. Proving that the theorem is implied by the axioms amounts to computing a solution for the problem represented by the theorem. That theorem-provers can be used for computation has been observed before, notably by Cordell Green. What is new is our thesis that, when well-written predicate calculus programs are run by an efficient theorem-prover, then the resulting search for a solution is done in a manner similar to, or more intelligent than, that which would be done by a more conventional programming language interpreter. 10b5a2

Kowalski also showed some examples of the isomorphism between the predicate calculus and programming paradigms. These ideas are discussed fully in a forthcoming memo to be entitled "Predicate Logic as a Programming Language." 10b5b

Discussion centered mainly around the question "Is AI semantics or pragmatics?" Some in the audience felt that the real content of AI is pragmatics, namely information about what to do next, how many solutions to find, and the like. Kowalski acknowledged the importance of pragmatics but was unwilling to say that it exhausted the subject matter of AI. Since Kowalski's formalism ignores pramatics, he is unable to give any instructions in the language about the order in which things are to be done. This lack was felt to be fatal by the pragmatics-is-all school. Nevertheless, Kowalski's formalization has an aesthetic appeal, and we should remember that yesterday's pragmatics is today's semantics is tomorrow's syntax. 10b5c

Actor Formalisms--Carl Hewitt 10b6

From the people who brought us PLANNER, we now have ACTORS. Hewitt's goal is to establish a programming formalism in which programs can be written that both run and use existing technology and, in addition, are extendable. Thus he wants strong modularity. 10b6a

Each module is an ACTOR. It is a piece of code that runs and is to be regarded as a black-box. Its insides cannot be tampered with. It is not easy for people to understand exactly what is going on with ACTORS. ACTORS do not call programs or return to other programs as in conventional formalisms; instead they pass messages. Hewitt showed how the ACTOR formalism can be used to do all the conventional things one wants a formalism to be able to do such as iteration, and he gave some examples of ACTOR-based programs. 10b6b

There was not enough time for Hewitt to describe ACTORS sufficiently for us all to understand them, and it was agreed to hear more of this later in the program, which we did. The ACTOR formalism is discussed in more detail in a paper to be presented at IJCAI-73 entitled "A Universal modular ACTOR Formalism for Artificial Intelligence," by Carl Hewitt, et al. 10b6c

Freddy Assembles a Car--Harry Barrow 10b7

As part of his presentation, Barrow showed a film in which the Edinburgh robot system, FREDDY, assembled a toy car starting with a heap of parts. The system consists of a gripper arm, a television camera, and a platform that is movable under the arm and camera. The system is described in a paper to be presented at IJCAI-73 entitled "A Versatile Computer--Controlled Assembly System," by A. Ambler, et al (see pp. 11-14). 10b7a

The AI Situation
Britain--Donald Michie
U.S.A.--Bert Raphael
Canada--Ted Elcock 10b8

Michie reported on the study by Sir James Lighthill that was commissioned by the Science Research Council to appraise AI research (see pp. 5-10). Lighthill's report is a criticism generally of the attempt to make a separate science of AI, and specifically, of attempts to build robots. The report can be faulted on several grounds, but it has led apparently to the cessation of SRC funding of the robot work being done under Michie's leadership at Edinburgh. Michie discussed

the probable consequences of the Lighthill report on AI research in Britain. 10b8a

Raphael described briefly the current ARPA attitude that AI research should be conducted according to soundly developed management plans. 10b8b

Elcock is attempting to get an AI Council together in Canada and will soon send a report to SIGART describing a recent Canadian AI workshop. 10b8c

Automatic Programing--Robert Balzer 10b9

As a first step toward automatic programming, Balzer has implemented a system called the Programmer's Interface. It is an interface between the BBN programming environment and other languages, such as EL/1. Whenever an evaluation is to be done, it is done in the user language. The system uses the ARPA Network to get routines evaluated at centers having the language in which the routine is written. The system now works with PL/1, EL/1, and COBOL. 10b9a

Balzer described a dozen or so features that he thought would be useful and currently implementable in a software production facility. These include: programmer's interface, perturbation detectors, interface specifiers, structured objects (like ACTORS), machine exercizers (to simulate a machine), code testers (path analysis programs), scaffolding (for testing unwritten code), and documentation aspects. Useful program verification and man-machine code generation facilities would probably not be available until somewhat later. 10b9b

Balzer's approach toward automatic programming seems to be to anchor in current technology one end of a spectrum of features and then to proceed gradually along this continuum toward more exotic facilities. 10b9c

HACKER--Gerald Sussman 10b10

HACKER is a program, written in CONNIVER, that automatically generates debugged code to perform robot tasks in the MIT BLOCKS world. Starting with a library of documented routines (that can initially be as large or as small as you please), HACKER uses various sorts of programming knowledge--including the documentation contained in the routines--to construct a program to perform a task. In constructing the program, HACKER tries for the simple kill first using a "maybe-this-will-work" approach. Tentative

programs are then tested, and if bugs occur (typically they will), more detailed programming knowledge is used to find the reason for the bug and to eliminate it. 10b10a

HACKER really is an attempt to simulate how a programmer (specifically Sussman) programs. It is thoroughly described in a forthcoming MIT dissertation by Sussman. 10b10b

Modelling, Question-Answering and Route Finding in a Robot World--Richard Fikes 10b11

Fikes discussed some new retrieval routines he has added to QA4. These allow deduction processes to be called to attempt to prove statements not explicitly found in the QA4 data base. Such routines will be quite useful in question-answering systems. 10b11a

A hierarchical modelling scheme was also described. As applied to a robot world, the hierarchy contains several levels of detail of various locations in the robot world. Fikes then described a special route-finding package for robot navigation to be used in conjunction with the hiearchical model 10b11b

Automatic Programming Research at Stanford--C. Cordell Green 10b12

In the absence of Jack Buchanan (formerly a student at Stanford), Green described the problem-solving system constructed by Buchanan and David Luckham. An abstract of the talk Buchanan was to have given follows: 10b12a

> The objectives of this research project have been to develop methods and to implement a system for automatic generation of programs. The problems of writing programs for robot control, symbol manipulation, and simple numerical computations have been studied and some elementary programs generated. A particular formalism, i.e., a Semantic Frame, has been developed to define the programming environment and permit the statement of a program. A Semantic Frame includes a particular representation of the world in the form of axioms, a set of fully instantiated literals, and rules for manipulating the state of the world. Rules may define atomic operators (i.e., operator rules), iterative processes (i.e., iterative rules), or situations defined as equivalent to the achievement of a set of goals (i.e, definitional rules). A Semantic Frame may be translated into a particlar set of programs used in a sub-goaling system which involves backtracking from the goal to be

achieved to the initial state. The system is interactive, i.e., responds to some simple advice and allows incremental and "stepwise" program development. The output program or solution will transform the initial state into one in which the desired goal is true. The program constructs used are procedure calls, assignments, "while" loops, and conditional statements. Some elements of the underlying logical theory for such a system will be described; the basic problem solving algorithm will be shown to be correct; and methods for implementing the various system features will be discussed. 10b12a1

Green also discussed some of the approaches being taken toward automatic programming by him and by his students at Stanford. Of particular interest is a study in how to generate a program from a trace of its execution. 10b12b

ABSTRIPS--Earl Sacerdoti 10b13

A problem domain may be represented as a hierarchy of abstraction spaces, in which successively finer levels of detail are introduced. The problem solver ABSTRIPS, a modification of STRIPS, can define an abstraction space hierarchy from the STRIPS representation of a problem domain and can use the hierarchy in solving problems. 10b13a

The ABSTRIPS program is the subject of a paper presented at IJCAI-73 entitled "Planning in a Hierarchy of Abstraction Spaces," by E. Sacerdoti (see p. 49). 10b13b

Hierarchical Planing and Execution--Nils Nilsson 10b14

Nilsson described a program for hierarchical robot plan generation and execution. The system is further described in a note entitled "A Hierarchical Robot Planning and Execution System," by Nils J. Nilsson, Stanford Research Institute Artificial Intelligence Center, Technical Note 76, April, 1973 (see p. 49). 10b14a

Harry Barrow mentioned that some similar work was being performed at Edinburgh by a student, Philip Hayes. Hayes' work concerns the hierarchy of planning and execution performed by a travel agent in arranging trips. 10b14b

The discussion then focused on a sample planning and execution task used in a Stanford University seminar in AI languages. Some controversy ensued over whether these kinds of problems could be studied adequately with robot

simulations or, instead, required robot (particularly vision) hardware. 10b14c

"Small Talk"--J.F. Rulifson 10b15

"Small Talk" is a programming language being developed by Alan Kay and Jeff Rulifson at Xerox Palo Alto Research Center for use in teaching children about computing. It shares several ideas with the ACTOR formalism, and Rulifson spent most of his time talking about the similarities and differences between ACTORS and "Small Talk." 10b15a

Robotic Equipment--Nils Nilsson 10b16

Nilsson briefly reviewed the preliminary conclusions of an SRI study on robotic equipment. These are contained in an interim report being written for the National Science Foundation entitled "Study of Equipment Needs for Artificial Intelligence Research," by N. J. Nilsson, et al. (See p. 45) 10b16a

3. CONCLUSIONS 10c

At the end of the workshop, it was the general consensus that such informal get-togethers provide an extremely valuable means for learning about and discussing each other's work. At this workshop, many of us were surprised to see that so many problem-solving issues are now being discussed as issues of AI language design. Since this trend of incorporating problem-solving strategies directly into AI languages will probably continue, we concluded that any future workshop on automatic problem-solving ought to include, as this one did, specifically recent work in AI languages. 10c1

Most of the participants agreed that much the same group should meet again for another workshop next year. Donald Michie suggested that perhaps the next one could again be in Scotland, possibly immediately preceeding or following IFIP-74. 10c2

CHESS 11

FOURTH UNITED STATES COMPUTER CHESS CHAMPIONSHIP
from
ACM-73 NEWS RELEASE 11a

A record field of between twelve and sixteen teams will participate in the Fourth United States Computer Chess Championship. The tournament will be held as a Special Event at the ACM's Annual Conference in Atlanta, Georgia. The first

two rounds of play will be held on Sunday, August 26, the third round on the evening of August 27, and the final round on the evening of August 28. 11a1

Returning to defend their title is the team of Larry Atkin, Keith Gorlen, and David Slate. Their program has won the previous three tournaments without the loss of a game. Their program, called Chess 4.0, uses a CDC 6400 on the Northwestern University campus. Also entered are programs written by Jim Gillogly (PDP-10), George Arnold and Monty Newborn (Data General Supernova), Dennis Cooper and Ed Kozdrowicki (UNIVAC 1108), Ken Thompson (PDP-11/45), and Al Zobrist, Fred Carlson, and Charles Kalme (IBM 370/155). Many of the programs were developed at America's leading universities; included are Georgia Tech., MIT, Carnegie-Mellon, USC, U. Cal-Berkeley, Dartmouth, Texas A&M, and Columbia. 11a2

David Levy, an international Chess Master from England, will serve as tournament director. A panel discussion, moderated by Ben Mittman, is also scheduled during the ACM's conference. The tournament is being sponsored in part by Control Data Corporation, International Business Machine Corporation, Sperry-UNIVAC, and National Data Industries. 11a3

Tournament Participants 11a4

RESEARCH PROGRESS REPORT IN COMPUTER CHESS* by Richard J. Cichelli
901 Whittier Drive
Allentown, Pennsylvania 18103 11b

This working paper describes a developing brute-force middle-game chess program. New concepts are clarified and comparisons with existing programs are made. The mechanisms described are sufficient to enable information collected during search to be used for dynamic search ordering and dynamic forward pruning. The suggested mechanisms replace the static plausible move generators in existing programs. 11b1

Background 11b2

Brute force chess programs are characterized by their large game tree searches and simple evaluation functions. In addition, little of their computational time is spent in computations involving chess specific knowledge. James Gillogly's TECH [1] is an example of such a program. TECH searches as many as 500,000 end nodes, uses only material for evaluation, and spends less than 5% of its time applying chess specific knowledge. 11b2a

More sophisticated programs such as CHESS 3.6 (the currently reigning world champion) and the Greenblatt program manage to search effectively by using highly developed plausible move generators. These routines embody much of the chess program's chess knowledge; at each depth, at move listing time, they order and forward prune the legal move list. A good ordering increases the probability of alpha-beta cutofis; forward pruning further limits the game tree size and hopefully keeps it manageable while still including the analysis tree (i.e., the tree a Grandmaster would search in the same position). The Zobrist [2], CHESS 3.6 (Slate) [3], and Greenblatt [4] programs have game trees with fewer than 20,000 end nodes. 11b2b

Dr. Zobrist's program is an attempt to produce the ultimate plausible move generator by giving much chess knowledge to the program. Alternatively, my approach is to gather information during search and to use this position-specific data to guide further search. 11b2c

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*[Ed. Note: Mr. Cichelli has indicated that he welcomes responses (questions, rebuttals, etc.) on this paper from interested readers. 11b2e

Overview 11b3

The brute force chess program I am currently developing uses two types of information to order searchable plies and to forward prune. Refutation data is global to the tree and DEPTH-minus-two data is local to move pairs (1 move = two plies). 11b3a

Refutation Data 11b4

Given a ply "A" such that making "A" leads to a non-terminal position, then some ply "B" is the best reply to "A". In short, B refutes A. Should a ply A' which is similar to A (i.e., same piece, same square-to) be made subsequently in the game tree then should B' exist, it will probably be a good ply to try first. To implement this and its logical extension, best (and possibly, second best) refuters against moving the piece of A and moving to the square-to of A, simply requires an array indexed by side, piece, and square-to containing the refutation piece, square-to, and its value (i.e., the backup value B got when refuting A). 11b4a

Refutation data is continuously updated with superior

refuters encountered during search. Since A - B pairs are not considered in the context of a particular game tree node but span the entire search tree, refutation data collection is said to be global to the tree. 11b4b

DEPTH-Minus-Two Data 11b5

If one visualizes a depth first game tree being grown down and from the left, then backup values pass up and to the right. Thus, for nodes at depths greater than three, there are plies in lists at DEPTH-2 which are similar (i.e., same piece and square-to) to plies at the current DEPTH. Each ply at the current DEPTH will lead to a node which will receive a backup value and will probably receive this value before the node for the similar ply at DEPTH-2 is reached and evaluated. Plies which do well at DEPTH+2 should be searched earlier at DEPTH, and those which do poorly at DEPTH+2 may not need to be searched at all at DEPTH. Significantly, previously accumulated DEPTH-2 data can be used in a preliminary ordering of plies at DEPTH. The following diagrams illustrate the two types of game tree information gathering. 11b5a

To implement this DEPTH-minus-two heuristic, the program needs to maintain, at each depth, a list of plies with storage with each ply for three backup value data elements (a total, count, and average). After listing the plies at DEPTH, a seaach of the DEPTH-2 plies is made and back pointers are set for similar plies. Preordering can be accomplished by setting initial counts of 1 and setting the total and average equal to the previous average at DEPTH-2.* 11b5b

By listing the opponent's moves at DEPTH 0 and making "no move", the program can provide storage for DEPTH-2 values for DEPTH=2. Searching the ply lists is speeded by listing plies, by piece, in the same order at each move, as implemented in Bell's algorithm [5]. 11b5c

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*After the initialization of move values with DEPTH-2 data, refutation ordering data can be applied to those refuters of the previous move by adding N times the refutation value to the total, increasing the count by N, and calculating the new average. (I have used the values 3,2,1,2,1 for N when applying refutation values to the best refuter, best and second best against moved piece, and best and second best against moved square-to). 11b5d

Forward Pruning 11b6

Since one can expect more than 80% of the plies at any two successive moves to be the same, plies at DEPTH will have counts about 11b6a

With a width of 7, one would expect a count of nearly 300. The contention here is that the average, generated for high counts, approaches the backup value of that ply's successor node, i.e., predicts the backup value. 11b6b

Within this information framework a ply selector would function by referencing the ply list at current DEPTH and picking the best unsearched ply (by its average) and passing it to the MAKEMOVE routine if there existed some ply in the ply list whose count was below the threshold for the current DEPTH and/or whose average was not worse by some factor than the DEPTH's current alpha-beta value. Note: a feedback mechanism is hereby created, for heavy pruning at some DEPTH will result in lower counts at predecessor DEPTHs and thus broaden search at predecessor levels. 11b6c

I am experimenting with broad, shallow searches (3 ply to capture-promote-check quiessence) to initialize the refutation and ply 0 and 1 values followed by a much deeper, narrower search. The evaluation function is material (Pawn = 100) and mobility (1 for each legal ply). 11b6d

Implementation 11b7

My program is approximately 1500 short lines of PASCAL code [6] and performs nearly all of the functions described above. It also includes an extensive user interface. So far, it has been a part-time four week effort and will probably be ready for actual games in two more weeks. Batteries of searching strategies are being compared; this is easily accomplished because the SELECTMOVE routines are parameters to the SEARCH routine. 11b7a

With the PASCAL assignment checking feature negated and ply records packed for optimal use of storage, the program [including the 5K (octal) PASCAL operating system] will probably run in less than 25K (octal) 60 bit words on the CDC 6400. 11b7b

Conclusion 11b8

The mechanisms described here present methods for using information gathered during search to dynamically order and prune plies in a depth-first game tree. Though the example problem space is chess, the concepts and methods are not in

any way chess dependent. I suspect, however, that the methods may not be applicable to games like GO (too large a potential search space) or Kalah (too large a change between plies). 11b8a

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RECENT PAPERS ON CHESS 11c

SKILL IN CHESS by Herbert A. Simon and William G. Chase
Psychology Department, Carnegie-Mellon University
Pittsburgh, Pennsylvania
In AMERICAN SCIENTIST, Vol. 61, No. 4, pp. 394-403
July-August 1973 11c1

Experiments with chess-playing tasks and computer simulation of skilled performance throw light on some human perceptual and memory processes. 11c1a

COKO: THE COOPER-KOZ CHESS PROGRAM by Edward W. Kozdrowicki
University of California at Davis
and
Dennis W. Cooper
Bell Telephone Laboratories
Whippany, New Jersey
Communications of the ACM, Vol, 16, No. 7, pp. 411-427
July 1973 11c2

COKO III is a chess player written entirely in Fortran. On the IBM 360-65, COKO III plays a minimal chess game at the rate of .2 sec cpu time per move, with a level close to lower chess club play. A selective tree searching procedure controlled by tactical chess logistics allows a deployment of multiple minimal game calculations to achieve some optimal move selection. The tree searching algorithms are the heart of COKO's effectiveness, yet they are conceptualy simple. In addition, an interesting phenomenon called a tree searching catastrophe has plagued COKO's entire development just as it troubles a human player. Standard exponential growth is curbed to a large extent by the definition and trimming of the Fischer set. A clear distinction between tree pruning and selective tree searching is also made. Representation of the chess environment is described along with a strategical preanalysis procedure that maps the Lasker regions. Specific chess algorithms are described which could be used as a command structure by anyone desiring to do some chess program experimentation. A comparison is made of some mysterious actions of human players and COKO III. 11c2a

CONFERENCES 12

ACM SYMPOSIUM ON PRINCIPLES OF PROGRAMMING LANGUAGES
Copley Plaza Hotel October 1-3, 1973
Boston, Massachusetts 12a

The following papers will be presented at the conference: 12a1

Mechanical Parser Generation for Ambiguous Grammars
Alfred V. Aho and Stven C. Johnson, Bell Laboratories, and
Jeffrey D. Ullman, Princeton University 12a1a

Strict Deterministic Vs. LR(C) Parsing
Matthew M. Geller and Michael A. Harrison, University of
California, Berkeley 12a1b

Labeled Precedence Parsing
Mario Schkolnick, Carnegie-Mellon University 12a1c

Top Down Operator Precedence
Vaughn Pratt, Massachusetts Institute of Technology 12a1d

Practical Syntactic Error Recovery in Compilers
Susan L. Graham and Steven P. Rhodes, University of
California, Berkeley 12a1e

Analysis of a Simple Algorithm for Global Flow Problems
Matthew S. Hecht and Jeffrey D. Ullman, Princeton University 12a1t

Transitions in Extendable Arrays
Arnold L. Rosenberg, IBM T.J. Watson Research Center 12a1u

Large Scale File Processing - POGOL
Gloria J. Lambert, National Security Agency 12a1v

On the Decision Problems of Program Schemas with Commutative and Invertible Functions
Ashok K. Chandra, Stanford University 12a1w

For further information contact: 12a2

Professor Michael J. Fischer
MIT Project MAC
545 Technology Square
Cambridge, Massachusetts 02139
617-253-5880 12a2a

SEVENTH HAWAII INTERNATIONAL CONFERENCE ON SYSTEM SCIENCES
and a special subconference on COMPUTER NETS
University of Hawaii January 8-10, 1974
Department of Electrical Engineering
and Department of Information and Computer Sciences
Honolulu, Hawaii 12b

This is the seventh in a series of conferences devoted to advances in information and system sciences. The conference will broadly encompass the following areas: Information Sciences, Computer Sciences, Communication Theory, Control Theory, and System Theory. A special subconference, "Computer Nets," will have sessions on Computer Nets, Satellite Communications, and Computer-Communication. The objective of the subconference is to communicate present practices, new techniques, and future problems. A major feature of the subconference will be to lay the groundwork for a Pacific Education Computer Network. 12b1

Papers are invited in these and related areas. The summaries of all accepted papers will be published in the CONFERENCE PROCEEDINGS. This will not preclude publication of the full length paper in another scientific journal. Authors are encouraged to present preliminary results of their research since the conference is intended to have some of the aspects of a closed workshop. 12b2

INSTRUCTIONS FOR AUTHORS: Three copies of a one page,

single-spaced abstract must be submitted by SEPTEMBER 1, 1973. Authors will be notified of acceptance before October 15, 1973. Instructions for the preparation of accepted paper summaries for the PROCEEDINGS will then be sent to each author. The length of each summary will be limited to three pages, including figures. Please mail all abstracts to: 12b3

HICSS-7
Department of Electrical Engineering
University of Hawaii
2540 Dole Street
Holmes Hall, Room 488
Honolulu, Hawaii 96822 12b3a

EMPLOYMENT REGISTER Computer Science Conference
Detroit Hilton February 12-14, 1974
Detroit, Michigan 12c

The success of the first Computer Science Employment Register held in 1973 demonstrated the desirability and need for continuation of this service for computer scientists. Accordingly, it will be conducted again at the Detroit Computer Science Conference. The purpose of the Register is to bring employers and prospective employees together to aid in the employment process. It achieves this purpose by providing enough data about the open position, on the one hand, and the applicant, on the other, to determine the desirability for follow up. 12c1

The following policies and procedures will be in effect: 12c2

Two listings will be available at the conference: (a) prospective employees, and (b) employer openings (an employer may have more than one listing). 12c2a

Both prospective employees and employers must file their registration on official forms. These forms may be obtained from and completed forms should be returned to: 12c2b

Orrin E. Taulbee
Department of Computer Science
University of Pittsburgh
Pittsburgh, Pennsylvania 15260 12c2b1

Employers should request one form for each type of position available (only one form is needed in the case of several identical positions). Employers may use this opportunity to list summer positions. Forms must be typewritten since they

will be reproduced exactly as submitted. Photocopies will not be accepted. 12c2c

Closing date for acceptance of forms is February 1, 1974. The inclusion of a late listing cannot be guaranteed. 12c2d

Charges: 12c3

Prospective Employee 12c3a

(a) Student: No charge (must be certified as student at time of filing by Department Chairman). 12c3a1

(b) Non-student: $5.00 12c3a2

(c) Anonymous listing: $5.00 additional charge. 12c3a3

Employer: $15.00 per form submitted. 12c3b

A check for the appropriate amount (payable to Computer Science Employment Register) must be sent with the completed form. 12c3c

Multiple copies of employer and prospective employee listings will be available at the conference for review. A message desk will be operated at the conference by Employment Register Staff to facilitate making contacts. Actual arrangements for interviews will be the responsibility of the employer and prospective employee. 12c4

Information on the availability of complete copies of employer and prospective employee listings after the conference may be obtained by writing to the above address. 12c5

CONFERENCE STAFF CANNOT ASSUME RESPONSIBILITY FOR THE ACCURACY, COMPLETENESS, TIMELINESS, OR GOOD FAITH SHOWN IN THE PROSPECTIVE EMPLOYEE OR EMPLOYER LISTINGS. 12c6

NATIONAL CONFERENCE ON THE USE OF ON-LINE CCMPUTERS IN PSYCHOLOGY
Third Annual Meeting
St. Louis, Missouri October 31, 1973 12d

The National Conference on the Use of On-Line Computers in Psychology provides a forum for the exchange of information on all aspects of on-line computer applications in psychology. Sessions are intended to provide an opportunity for experienced users to exchange information on various aspects of on-line computing. In addition, tutorial sessions will be presented to potential users of such systems. 12d1

A one-day meeting of the National Conference will be held at St. Louis University, St. Louis, Missouri, on October 31, 1973, the day before the start of the annual meeting of the Psychonomic Society. The meetings will run from 8:30 a.m. to 11:00 p.m. Equipment manufacturers will exhibit and demonstrate their products throughout the day-long meeting. 12d2

The program will consist of: (a) three invited addresses on topics of general interest; (b) contributed papers; (c) contributed and invited symposia; and (d) any other functions proposed and organized by individuals, e.g. work shops, special interest groups, etc. 12d3

For further information on the conference, contact: 12d3a

Peter G. Polson
2690 Heidelberg Drive
Boulder, Colorado 80303 12d3a1

MICRO--THE SIXTH ANNUAL WORKSHOP ON MICROPROGRAMING
Louise H. Jones, Program Chairman
University of Maryland Conference Center September 24-25, 1973
College Park, Maryland 12e

Micro 6, the Sixth Annual Workshop on Microprogramming sponsored by the ACM Special Interest Group on Microprogramming (SIGMICRO), will be held at the University of Maryland Conference Center, College Park, Maryland on Monday and Tuesday, September 24 and 25, 1973. The Program Committee has received a number of good papers, and expects that Micro 6 will be one of the best workshops ever. There will be participants from France, Germany, and Italy as well as from various parts of the United States. 12e1

The general structure of the conference is as follows: Early Monday morning, Earl Reigel of Burroughs will give a tutorial session on what microprogramming is all about. This will be followed by a formal paper session chaired by Louise Jones of the University of Delaware. In the afternoon there will be two workshop sessions on the applications of microprogramming (chaired by Gary Kratz of IBM) and, concurrently with these, a session on architecture chaired by Bill Lidinsky of Argonne and one on graphics chaired by Andy van Dam of Brown University. The conference banquet (and social hour) will be held Monday evening; Bill McKeeman of the University of California at Santa Cruz will keynote the conference with a talk on "Mechanizing Bankers' Morality". On Tuesday, the first morning session will be on microprogramming languages (chaired by Ron Brody of Burroughs); this will be followed by a session organized by Y.

S. Wu of NRL on microprogram-controlled signal processors and, concurrently, a session on microprogramming in computer science education. Tuesday afternoon will be devoted to a panel discussion, on "The Future of Microprogramming", Stu Tucker of IBM is in charge of this session. 12e2

Preprints of the papers presented at the workshop are currently being prepared and will be mailed to all advance registrants early in September. The preprints will include three types of papers: formal papers (30 minutes formal presentations), regular session papers (15-20 minutes, including questions), and brief reports (5 minutes). There should be ample opportunity to ask questions in all of the workshop sessions. The program committee hopes that preprints will provide the basis for much fruitful discussion. 12e3

In addition to the above program of technical papers there will be a tutorial session "Introduction to Microprogramming" presented by Dick Merwin to be given on Sunday evening from 8 to 9:30 p.m. This session, which will only be offered if there is sufficient interest, is planned for those attending a Microprogramming Workshop for the first time (over half the attendees at the Fifth Workshop were in this category) and is intended to help them appreciate the technical sessions described above. It will cover the basic fundamentals. 12e4

For additional information on the conference, contact: 12e5

Dr. Richard E. Merwin
SAFEGUARD System Office
1300 Wilson Blvd.
Arlington, Virginia 22209
202-694-5281 12e5a

ABSTRACTS 13

ROBOTIC EQUIPMENT by Nils J. Nilsson
Artificial Intelligence Center
Stanford Research Institute 13a

This report describes interim results of a project to specify special equipment for research in Artificial Intelligence. After surveying several potential users it was decided that there was a need for standardized equipment for robot research. Such equipment includes a vision subsystem, an arm subsystem, and a mobile cart subsystem. Some users desire a robot consisting of all three subsystems, while others need lesser combinations. Taking into account these user needs, and equipment cost and availability considerations, we recommend a

list of modular components that in total comprises a complete mobile robot system. Alternatively, subsets of the component list can be used to suit particular user needs. The recommended systems include a small minicomputer to be used for arm trajectory, vehicle navigation, and interfacing with the user's main computer. Use of the minicomputer provides needed research flexibility in that control algorithms can be easily revised and additional user sensor and effector equipment can be easily added. 13a1

The complete vehicle/arm/vision robot system will be controlled from the user's main computer over a radio link to the on-board minicomputer. The robot will be able to operate in an office or laboratory environment, and will be powered by rechargeable storage batteries. Television pictures from the vehicle will be sent back to the main computer over a video-bandwidth radio link. Cost estimates for both the prototype equipment and future copies are given. 13a2

SOME RESULTS CONCERNING THE SITUATION CALCULUS* by Olga Stepankova
Institute for Computation Techniques
Czech Technical University
and
Ivan M. Havel
Institute for Information Theory and Automation
Czechoslovak Academy of Sciences
Prague, Czechoslovakia 13b

In the present paper we introduce the concept of an image space as a basis for a formal logical counterpart to state-space problem solving. This concept is motivated by the ideas used in STRIPS. Our main result is the establishment of mutual correspondence between solutions of problems formalized in the image space and formal proofs of certain formulas in the situation calculus. The result suggests a possibility of using all the advantages of one approach in the other, and conversely. We treat the problem in considerable generality assuming solutions in the form of branching programs and not only linear ones. We also suggest how a solution of the frame problem, similar to that of Hayes, can be incorporated into the image space. 13b1

* Proceedings of the Symposium "Mathematical Foundations of Computer Science," The High Tatras, Czechoslovakia, September 1973. 13b2

A DEFINITION-DRIVEN THEOREM PROVER by George W. Ernst
Report No. 1124
Department of Computer and Information Sciences

Case Western Reserve University
Cleveland, Ohio 13c

This paper describes a theorem prover, running on a PDP-10-TENEX system, that can prove some theorems whose statements involve a relatively large number of definitions. Such theorems require special methods because (1) their statements have a large number of clauses, and (2) their proofs are quite long, although straightforward. 13c1

A theorem is proven by first subdividing it into "simple" subgoals and then using a standard resolution theorem prover to prove the subgoals. The first part of this process involves the substitutiion of definitions for defined quantities and the use of logical simplifications. This process, which is more similar to a natural deduction system than a resolution system, is shown to be complete when restricted to first-order logic. However, the theorem prover can deal with some interesting higher-order theorems as is shown by an example. 13c2

A CLASS OF BINARY RELATIONS: APPLICATIONS TO TWO-DIMENSIONAL ARRANGEMENTS by R. B. Banerji
Proceedings of the 1973 Princeton Conference
on Information Science and Systems 13d

Minsky once suggested a method for describing two-dimensional arrangements of figures by a tree-structure. The method was actively investigated, and it was found that the method loses some information. Certain modifications to the method have been suggested since, and it has been found that for a restricted class of arrangements, the modified method does not lose informaton. The restrictions have been discussed in terms of a formal theory of a class of binary relations. 13d1

STRATEGY CONSTRUCTION USING HOMOMORPHISMS BETWEEN GAMES by R. B. Banerji and G. W. Ernst
ARTIFICIAL INTELLIGENCE, 3, 223 (1972) 13e

One reason for changing the representation of a game is to make it similar to a previously-solved game. As a definition of similarity, people have proposed homomorphism-like structures. Two such structures are discussed in this paper and it is proven that they "preserve" winning strategies. They are incomparable in their strength and areas of applicability, i.e, neither of them is a special case of the other. 13e1

The games to which these homomorphisms have been applied are positional games and decomposable games. The reason for concentrating on these two classes is that powerful methods for

playing these games are known. For motivation, these methods are briefly described in the paper. The two homomorphisms discussed in this paper effectively extend the methods for playing positional and decomposable games to a much larger class of games. For several specific games which are neither positional nor decomposable, it is shown how they can be played as though they were positional or decomposable by using the homomorphisms. 13e2

A METHOD FOR THE EASY STORAGE OF DISCRIMINANT POLYNOMIALS by R. B. Banerji
Proceedings of the 1973 National Computer Conference 13f

It has been illustrated how the use of the theory of finite fields enables one to express any polynomial as an integral power of a given polynomial in some polynomial field. When the polynomials to be stored have many variables (as in the case with usual discriminant polynominals in pattern recognition), this necessitates the storage of certain auxiliary polynomials--one for each variable involved and of a degree one more than the largest power to which the variable is raised. A rough estimate is given of the memory saved and the computation involved. 13f1

LIMITATIONS IN PATTERN RECOGNITION AND PROBLEM SOLVING by R. B. Banerji and G. W. Ernst
Proceedings of the 1972 ACM Conference 13g

This paper discusses the "standard" techniques used by problem solving and pattern recognition programs. It is pointed out that evaluation functions (often called discriminant functions) lie at the heart of these programs. Simplicity appears to be an important property of evaluation functions because those that are both relatively accurate and efficient, are in some sense simple. In addition, simple evaluation functions are easier to learn because there are fewer parameters to estimate. The real difficulty is that no general method exists which extracts a good set of features for a particular problem. Even if this were possible, one is still faced with the task of combining these features to obtain the "answer." In the case of pattern recognition this combination takes the form of connectives such as arithmetic operations and Boolean operations. However, in the case of problem solving, things are much more complicated since features are at the bottom of a search procedure which looks at many different problem states. This presents the difficulty of making good use of such a large volume of information. 13g1

PLANNING IN A HIERARCHY OF ABSTRACTION SPACES by Earl D. Sacerdoti

Artificial Intelligence Center
Technical Note 78
Stanford Research Institute 13h

A problem domain can be represented as a hierarchy of abstraction spaces in which successively finer levels of detail are introduced. The problem solver ABSTRIPS, a modification of STRIPS, can define an abstraction space hierarchy from the STRIPS representation of a problem domain, and it can utilize the hierarchy in solving problems. Examples of the system's performance are presented that demonstrate the significant increases in problem-solving power that this approach provides. Then some further implications of the hierarchical planning approach are explored. 13h1

This paper will be presented at the 1973 IJCAI. 13h2

A HIERARCHICAL ROBOT PLANNING AND EXECUTION SYSTEM by Nils J. Nilsson
Artificial Intelligence Center
Technical Note 76
Stanford Research Institute 13i

This report describes a robot control program consisting of a hierarchically organized plan generation and execution system. The program is written in QA4 and makes use of several features of that language. The usually sharp distinction between robot plan generation and execution is intentionally blurred in this system in that planning and execution phases occur intermixed at various levels of the hierarchy. The system currently exists as a running program that clearly illustrates the concepts involved; major additions and refinements would be necessary if the system were to be used to control an actual robot device. 13i1

A PARSER FOR A SPEECH UNDERSTANDING SYSTEM by William H. Paxton and Ann E. Robinson
Artificial Intelligence Center
Technical Note 79
Stanford Research Institute 13j

This paper describes a parsing system specifically designed for spoken rather than written input. The parser is part of a project in progress at Stanford Research Institute to develop a computer system for understanding speech. The approach described uses as much heuristic knowledge as possible in order to minimize the demands on acoustic analysis. 13j1

This paper will be presented at the 1973 IJCAI. 13j2

AUTOMATED LANGUAGE PROCESSING by Donald E. Walker
Artificial Intelligence Center
Technical Note 77
Stanford Research Institute 13k

This paper reviews a substantial amount of the literature on automated language processing written or published during the years 1971 and 1972. The major emphasis of the review is on computational linguistics; research is considered under the following headings: linguistics and computational linguistics; parsing and question answering; semantics, logic, and representation; psycholinguistics, sociolinguistics, and performance; speech understanding; mathematical models. Also discussed are studies in text processing that involve augmentation systems, document analysis, document retrieval, dictionaries and lexicons, and automatic and machine-aided translation of languages. The reference list contains 325 citations. 13k1

The paper was prepared for inclusion in Volume 8 of the Annual Review of Information Science and Technology, edited by Carlos A. Cuadra, which is to be published by the American Society for Information Science in October 1973. 13k2

SPEECH UNDERSTANDING THROUGH SYNTACTIC AND SEMANTIC ANALYSIS by Donald E. Walker
Artificial Intelligence Center
Technical Note 80
Stanford Research Institute 13l

Stanford Research Institute is participating in a major program of research on the analysis of continuous speech by computer. The goal is the development of a speech understanding system capable of engaging a human operator in a natural conversation about a specific problem domain. The approach being taken is distinctive in the extent to which it depends on syntactic and semantic processing to guide the acoustic analysis. This paper provides a description of the first version of the system, emphasizng the kinds of information that need to be added for effective results. 13l1

This paper will be presented at the 1973 IJCAI. 13l2

SEMANTIC ANALYSIS OF ENGLISH TEXT BY COMPUTER by Anne-Louise Guichard Radimsky
Ph.D. Thesis
Department of Electrical Engineering and Computer Sciences
University of California at Berkeley
20 May 1973 13m

The purpose of this research is to develop an adequate representation for the semantic analysis of simple English sentences such as are found in a grade school text book. The approach is based on a semantic theory of language developed by W. L. Chafe. The SPEC system, a computer program embodying this approach and written in SNOBOL IV, calls on both syntax and semantics for the parsing of sentences. The sentences are taken from an actual text used in elementary school entitled "Mathematics Enrichment." This source provides an unbiased set of sample sentences. For each sentence a "semantic structure" is created. This structure could then be used inside a Question-Answering System, dealing with simple mathematical facts at the level of such an elementary mathematics text book. Much attention has been paid to concentrating contextual information into a small number of tables, thereby facilitating the possible conversion of the system to another universe of discourse. 13m1

Chapter 1 compares this system with previous work done in the same area. The semantic structures are described at length in Chapter 2 and in Appendices A through D. The following three chapters present the process of analysis of the input and the construction of these structures. Possible extensions and further developments of the present system will be found in Chapter 6. 13m2

A HOLE IN GOAL TREES: SOME GUIDANCE FROM RESOLUTION THEORY by D. W. Loveland and M. E. Stickel 13n

The representation power of goal-subgoal trees and the adequacy of this form of problem reduction is considered. A number of inadequacies in the classical form are illustrated, and two versions of a syntactic procedure incorporating extensions are given. Although the form of the corrections are suggested from resolution theory results, and the value of this connection emphasized, the paper discusses the goal tree format and its extensions on an informal level. 13n1

MOTIVATION SYSTEM FOR A ROBOT by Jack Koplowitz and David Noton
Department of Electrical Engineering
University of Colorado
Boulder, Colorado 13o

A motivation system for a robot consists of a set of general goals and prohibitions which guide the robot's actions. The necessity of a motivation system presents itself when the robot has a complex task structure and hence must interact with the real world. A linear polynomial is suggested as a means of evaluating choices based on these motivations. Procedures to

adjust the polynomial are given. An example is offered to illustrate that reasonable and consistent decisions can be made in situations of moderate complexity. 13o1

This paper appeared in the IEEE Transactions on Systems, Man, and Cybernetics, Vol. SMC-3, No. 4, pp. 425-428, July 1973. 13o2

INTRODUCTION TO ENT 2210 AND ENT DATABASE 2201 by David B. Benson
CS-73-006 Computer Science Report
Department of Computer Science
Washington State University
Pullman, Washington 13p

ENT is an IBM 360 program for writing natural language question-answering programs and other artificial intelligence uses. It is an extensible programming language system with base capabilities oriented toward symbolic processes. In the proper environment, a virtual machine or large storage-configured computer, it is interactive. 13p1

This report combines the following documentary uses: an introduction to the capabilities of ENT version 2200 using the ENT Database 2201, an instructional guide to this version of ENT. However, this report does not include the internal documentation necessary to make corrections, changes, or additions to the program. Nor does it include the documentation necessary to install ENT at a computer center. 13p2

Send requests to: 13p3

Kathleen Edwards, Librarian
Johnson Hall, C-119
Washington State University
Pullman, Washington 99163 13p3a

A FRENCH LANGUAGE REPRESENTATION IN FIRST ORDER PREDICATE-CALCULUS IN ORDER TO CONVERSE WITH A COMPUTER by Robert Pasero
Thesis
3rd cycle
Groupe d'Intelligence Artificielle
U.E.R. de Luminy, France 13q

The framework of this research is the realization of a question-answering system in natural language. This system is based on automatic theorem-proving. In the programming language we use, PROLOG, each statement is a first-order predicate-calculus formula and, so, the execution of a program consists of proving a theorem. This language affords one the ability to program: 13q1

- a "translator" which translates a tree representation of a text, and questions about it, called "syntaxic structure", into a set of simple logic formula, which allow an easy retrieval of the information contained in this text; 13q1a

- a "deductor" which infers from the previous logical formula and produces the answers to the various questions. 13q1b

Following a semantic analysis of the French language, we can bring out some general mechanisms which afford the ability to axiomatize the translation of a text into a set of simple statements. This translation is essentiaaly based on the meaning of the quantifiers which precede the noun phrases and on the way the sentences are embedded. 13q2

AUTOMATIC NOVEL WRITING: A STATUS REPORT by Sheldon Klein, J.F. Aeschlimann, D.F. Balsiger, S.L. Converse, C. Court, M. Foster, R. Lao, J.D. Oakley, and J. Smith
Technical Report No. 186, July 1973
Computer Sciences Department & Linguistics Department
University of Wisconsin
Madison, Wisconsin 13r

Programmed in FORTRAN V on a Univac 1108, the system generates 2100 word murder mystery stories, complete with semantic deep structure, in less than 19 seconds. The techniques draw upon the state of the art in linguistics, compiler theory, and micro-simulation. The plot and detailed development of events in the narrative are generated by a micro-simulation model written in a specially created, compiler-driven simulation language. The rules of a simulation model are stochastic (with controllable degrees of randomness) and govern the behavior of individual characters and events in the modelled universe of the story. This universe is represented in the form of a semantic deep structure encoded in the form of a network--a directed graph with labelled edges, where the nodes are semantic objects, and where the labelled edges are relations uniting those objects. The simulation model rules implement changing events in the story by altering the semantic network. Compiler or translator-like production rules are used to generate English narrative discourse from the semantic deep structure network (the output might be in any language). The flow of the narrative is derived from reports on the changing state of the modelled universe as affected by the simulation rules. 13r1

Nodes of the semantic network may be atoms, classes, or complex predicates that represent entire subportions of the network. Atom nodes and relations are linked to expression lists that

may contain lexical stems or roots that are available for insertion into trees during the generation process. (Low level transformations convert the roots into appropriately inflected or derived forms. High-level transformations mark the tree for application of the low-level ones.) These expression lists may also contain semantic network expressions consisting of objects and relations which may themselves be linked to expression lists, thereby providing the generator with recursive expository power. An atom node may also function as a complex predicate node with status that may vary during a simulation. 13r2

Class nodes may refer to lists of object nodes, and the complex-predicate nodes can be linked to pointers to sub-portions of the network that includes themselves, allowing them to be recursively self-referential. (This would permit generation of sentences such as "I know that I know that - <sentence>"). 13r3

We are also testing a natural-language meta-compiling capability--the use of the semantic network to generate productions in the simulation language itself that may themselves be compiled as new rules during the flow of the simulation. Such a feature will permit one character to transmit new rules of behavior to another character through conversation, or permit a character to develop new behavior patterns as a function of his experiences during the course of a simulation. This feature, combined with the complex-predicate nodes helps to give the system the logical power of at least the 2nd-order predicate calculus. 13r4

Theoretical motivations include an interest in modelling generative-semantic linguistic theories, including case grammar and presuppositional formulations. The dynamic time dimension added to the semantic deep structure by the simulation makes it possible to formulate more powerful versions of such theories than now exist. 13r5

RECENT NOVELS reviewed by Dewayne Hendricks
Mental Health Research Institute
The University of Michigan 14

In case you haven't read it yet, may I call your attention to Robert Heinlein's new book TIME ENOUGH FOR LOVE. I think SIGART Newsletter readers would like to know about it, since it has a novel treatment of intelligent machines which is similar to that of Heinlein's previous book, THE MOON IS A HARSH MISTRESS. The computer this time is called Minerva and what happens to it by the end of the tale, is much more interesting, I think, then what happened to HAL. The publisher is Putnam. 14a

Another book of note is David Gerrod's, WHEN HARLIE WAS ONE, which deals with another intelligent machine and how it learns to assert itself in man's world. The plot again presents an interesting slant on just what a machine will require to act in an "intelligent" fashion, and what men will have to do to learn to live with their creation. It is available in paperback. 14b

INTERESTING FILMS TO ARRIVE IN 1974 15

Note that the future is not being neglected. John Boorman is writing and directing "Zardoz," starring Sean Connery, about the planet Vortex where eternal life turns out to be a mixed blessing, while "Westworld" will explore a Disneyland for adults controlled by robots. 15a

SIGART NEWSLETTER Number 41 August 1973

(J21207) 26-DEC-73 15:51; Title: Author(s): L. Stephen Coles, Richard E. Fikes/LSC REF; Sub-Collections: NIC ; Clerk: KIRK;
Origin: <SIGART>AUG73.NLS;23, 10-OCT-73 15:32 KIRK ;

SIGART NEWSLETTER Number 42 October 1973 1

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SIGART NEWSLETTER 1b

The SIGART Newsletter is a bimonthly publication of the Special Interest Group on Artificial Intelligence of the Association for Computing Machinery. The Newsletter reports on projects being conducted by the artificial intelligence research community and generally reviews current progress in the

state-of-the-art. Correspondents report news from local SIGART Chapters and other AI Centers.

1b1

SIGART CHAIRMAN: Bob Balzer 1b1a

USC Information Science Institute
4676 Admiralty Way
Marina del Rey, California 90291
Telephone: 213-822-1511 1b1a1

NEWSLETTER EDITOR: Steve Coles ASSOCIATE EDITOR: Rich Fikes 1b1b

Artificial Intelligence Center
Stanford Research Institute
Menlo Park, California 94025
Telephone: 415-326-6200 ext. 4601, 4620 1b1b1

ASSISTANT EDITOR FOR ONLINE OPERATIONS: Kirk Kelley 1b1c

Augmentation Research Center
Stanford Research Institute
Menlo Park, California 94025
Telephone: 415-326-6200 ext. 3630 1b1c1

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The Editors encourage contributions from authors, including Letters to the Editor (AI Forum), Technical Contributions (1 to 6 pages), Abstracts (preferably 100-200 words), Book Reviews, Bibliographies of Special Topics in AI, News Items (Conferences, Meetings, Course Announcements, Personals, etc.), Advertisements (New Products or Classified Advertising), Puzzles, Poems, Cartoons, etc. Material may be reproduced from the Newsletter for non-commercial purposes with credit to the author and SIGART. 1b2

Anyone interested in acting as editor for a special issue of the Newsletter devoted to a particular topic in AI is invited to contact the Editor. Letters to the Editor will be considered as submitted for publication unless they contain a request to the contrary. Technical papers appearing in this issue are unrefereed working papers, and opinions expressed in contributions are to be construed as those of the individual author rather than the official position of SIGART, the ACM, or any organization with which the writer may be affiliated. 1b3

You are invited to join and participate actively. SIGART membership is open to members of the ACM upon payment of dues of $3.00 per year and to non-ACM members upon payment of dues of $5.00 per year. To indicate a change of address or if you wish to become a member of SIGART, please complete the form on the bottom of the last page of this issue. 1b4

Copy deadline for the December Issue: November 26th. 1b5

CHAIRMAN'S MESSAGE 2

In this issue Steve and I have included a questionnaire (pp. 5-6) designed to supply information needed to provide guidelines in the expansion of our current activities. It focuses on the role of conferences and on the Newsletter. There will be many opportunities for us to sponsor conferences (or sessions at conferences) in the next few years. As the field continues to grow and proliferate, the need for such actvities to keep ourselves up-to-date becomes more important. The information you provide in the questionnaire will help determine how we use these opportunities. Accompanying these opportunities is the responsibility of organization and participation. I hope that our future activities will not be limited by a lack of participation. Included in the questionnaire is a section eliciting such partcipation. 2a

The second major issue in the questionnaire is the role of the Newsletter. It was conceived of and has continued to function, highly successfully, as a quick response centralized source of activities in the field, such as the activities of various centers, summaries of recent conferences, abstracts of current papers, etc. Because of this success, suggestions have been raised to include discussions of controversial topics and the entire texts of refereed papers (e.g., see ACM President Anthony Ralston's recent editorial in the COMMUNICATIONS, p.459, August 1973). We are limited by our budget from materially expanding the size of the Newsletter without increasing our revenue. This might be done either by raising dues or by attaching a charge to an optional supplment. These and related choices are covered in the questionnaire. 2b

The questionnaire represents a major attempt to assemble the information required to plan the activities and functions of SIGART for the next few years. I urge each of you to aid us by taking a few minutes of your time right now to fill it in, tear it out, and return it promptly. 2c

R.M.B. 9/25/73 2c1

QUESTIONNAIRE 3

NAME ADDRESS

ORGANIZATION

3a

(Please Circle Response) 3a1

1. CONFERENCES 3b

Would you like to have national SIGART-sponsored conferences?
Yes No 3b1

A. Type of sessions desired (indicate preference by percent)-- 3b2

(1) Technical Papers . . . . . %
(2) Tutorials. . . . . %
(3) Panel Discussions . . . . . %
(4) Working Sessions . . . . . %
(Invited participants only) 3b2a

B. Scope (Circle one or order preferences)-- 3b3

(1) Separate conference (e.g., as a supplement to IJCAI-75).
(2) As part of Natinal ACM.
(3) As part of NCC.
(4) Joint Conference with another SIG (e.g., SIGPLAN). 3b3a

C. Time of year (describe best time period as month or season)-- 3b4

D. Frequency (such as alternate years with IJCAI)-- 3b5

E. Location (specify city if desired)-- 3b6

(1) East Coast
(2) Mid-America (e.g., Chicago, St. Louis, Dallas)
(3) West Coast 3b6a

F. Would you be willing to help organize such conferences? Yes
No 3b7

If yes, could you serve as 3b7a

(1) General Chairman

(2) Session Chairman
(3) Local Arrangements
(4) Referee
(5) Other (please specify) 3b7a1

2. NEWSLETTER 3c

A. Do you read the Newsletter? 3c1

(1) Just Browse
(2) Certain types of articles in detail (Circle which types)-- 3c1a

Chairman's Message	Progress Reports	Abstracts	
Editors' Entry	Chess		
Advertisements			
News Items	Conferences	Cartoons	3c1a1

(3) Cover-to-cover 3c1b

B. Is the On-line Newsletter important to you? Yes No 3c2

Have you used it? Yes No 3c2a

C. Is the SIGART Newsletter an appropriate forum for controversial issues (or should we restrict ourselves to publishing abstracts, etc.)? 3c3

Appropriate Inappropriate 3c3a

D. Would you like to see a more formal newsletter with refereed articles? (Because of budget restrictions we cannot substantially increase the size of the newsletter; inclusion of long articles [such as the full text of the Lighthill Report], whether refereed or not, is not possible under the present arrangement). Yes No 3c4

(1) If yes, would you accept a dues increase of $5.00 to finance the publication of refereed articles? Yes No 3c4a

(2) Would you accept an optional charge of $5.00 to finance the publication of a supplement containing refereed articles? Yes No 3c4b

(3) Would you be willing to serve as a reviewer? Yes No 3c4c

(4) Would you be willing to allow money to be used to commission a professional technical writer or pay an honorarium to one of our own members to write a definitive

survey article on some aspect of AI?
Yes No 3c4d

(5) As an added incentive, should money be used to offer a prize award for the best paper in any given year? Yes No 3c4e

3. COMMENTS 3d

At the same time you return this questionnaire, you may wish to enclose an additional sheet either to comment on recent developments in your own AI research, or for suggestions for improving the Newsletter, or anything else you feel is constructive and relevant to SIGART. 3d1

Please mail completed questionnaire to 3d2

Steve Coles, Editor
SIGART Newsletter
Artificial Intelligence Center
Stanford Research Institute
Menlo Park, California 94025 3d2a

EDITOR'S ENTRY 4

1. New Conventions for Footnote, Bibliographic, and Page References. 4a

To establish greater consistency between the on-line and hard-copy versions of the Newsletter, we are instituting a new format for footnote, bibliographic, and page references starting with this issue. This will help us avoid the considerable effort needed for page layout in the hard copy version as well as facilitate direct access to references by on-line users using the link command in NLS. 4a1

Instead of appearing at the bottom of their respective pages, footnotes will now be accumulated at the end of the articles to which they pertain. The format of a reference will be an asterisk followed by N, followed by an integer, all contained in angular brackets. For example, <*N3> designates the third note. Bibliographic citations will be similar except that the letter 'R' will be used instead of the letter 'N'. 4a2

References to page numbers in the same issue will now be replaced by references to NLS statement numbers, those funny number/letter combinations you've been seeing in the right hand margins. The format of a statement reference will be 's.(<integer> <letter>)'. Thus, "see s. (5h)" will refer to statement 5h. 4a3

2. IJCAI-73 4b

The recently-held International Joint Conference on Artificial Intelligence at Stanford University was our most successful conference ever. Attendance numbered over 730 registrants <*N1> and a small profit was accumulated. It would be impossible to summarize in a few paragraphs the enormous number of technical activities and events that took place, so I won't even try. I believe it would be fair, however, to say that for those who attended, the spirit of the conference was permeated by an infectious atmosphere of intellectual excitement. Perhaps the greatest frustration at the conference was in deciding at each point which session to attend while interesting papers were being presented simultaneously in three parallel sessions. 4b1

Copies of the formal proceedings (Advanced Papers of the Conference) are available postpaid for $15.00 (a superb value) by writing to... 4b2

Stanford Research Institute
Publications Department
333 Ravenswood Avenue
Menlo Park, California 94025 4b2a

For the benefit of those who could not attend, a listing of papers scheduled for presentation at the Free Sessions with author names and addresses is given at s. (5c) of this issue. Copies of these papers may be obtained by writing to the authors directly. Summaries of the Special Sessions, SS1-SS4, appear starting at s. (5b) of this issue. A number of video tapes were also made during the Conference of special events such as the invited Tutorial Lectures, the Panel Discussions, and the Computers and Thought Lecture delivered by Patrick Winston of MIT. These tapes are now available from Stanford University (See s. (5a)). Depending on demand, these tapes may be made available in the near future in the form of 16mm standard movie films. Please write to Nils Nilsson of SRI if you have interest in the films (it appears that the cost of a one-hour lecture on film might be $125 and rentals would be correspondingly less). 4b3

Through the efforts of Warren Teitelman and Phil Jackson of Xerox Parc, several AI computer programs (obtained over the ARPA Network) were demonstrated live during the Conference near the main registration desk on a TI terminal obtained for that purpose. These programs included PIVOT (Deutch), SCHOLAR (Carbonell and Warnock), CHESS (Greenblatt), DOCTOR

(Weizenbaum), INTERLISP (Teitelman), and ENGROB (Coles and Robinson). 4b4

**A special word of thanks must go the International Conference Committee who worked so hard to make IJCAI-73 a successful meeting. Deserving of special praise for a job well done are Nils Nilsson, who worked long hours as Program Chairman, and Les Earnest, who successfully unraveled the labyrinth of local arrangements. 4b5

3. IJCAI-75 4c

As was decided by the Executive Committee, the next IJCAI will be held in Leningrad, U.S.S.R. The General Chairman will be Dr. Erik Sandewall of Uppsula University, Sweden; the Program Chairman will be Prof. Patrick Winston of MIT. 4c1

4. Report on the BBC TV Lighthill Debate 4d

As we speculated in the preceding issue (Item 4 of the Editor's Entry), a copy of the color video tape (transcribed to meet American TV standards) of the controversial debate "The General Purpose Robot is a Mirage" was obtained from BBC television and had five showings at the IJCAI introduced by Professor Donald Michie of the University of Edinburgh. 4d1

To review briefly, the 2 1/2 hour debate was filmed in London at the Royal Institution on July 4th, and an 80-minute edited version was aired in Britain on BBC-2 on August 30th. The debate, moderated by Sir George Porter (a Nobel laureate and Director of the Royal Institution), was a part of the BBC's excellent "Controversy" Series. After intoducing the panelists, consisting of Professors Donald Michie of the University of Edinburgh, John McCarthy of Stanford University, and Richard Gregory of Bristol University, Sir Goerge began with a short review of AI while Shakey, the SRI robot, was flashed on the screen. 4d2

After this, Sir James Lighthill was introduced. In sharp contrast with the other panelists, he emerged from behind large wood-panelled doors to the sound of considerable applause from the audience. I don't really know whether this was an obligatory gesture by the British audience out of respect for Sir James's title, but I can say that it was not well received by the American audience watching the tape at IJCAI. His animated presentation, which lasted some 15 minutes, defined AI as a subject attempting to bridge studies of the brain on the one hand with industrial automation on the other, and generally followed the argument he espoused in his "Lighthill Report."

<*N2> He urged continuing support for the legitimate areas of brain investigation as well as studies of industrial robots, but predictably condemned the "bridge" part of AI as doomed to failure. His main line of attack centered on the "combinatorial explosion," which he claimed would permanently render the goals of AI unattainable. In subsequent discussions he conceded that AI goals might be achievable in principle, but ultimately he dismissed them, with a characteristic wave of his hand, as being beyond the range of our lifetimes. 4d3

Prof. Michie in reply showed a film of the Edinburgh Versatile Assembly Program building a toy car and defended the whole purview of AI as an independent field of meritorious scientific investigation. Both he and John McCarthy politely suggested that Sir James was not very well informed. Prof. McCarthy then went on to list a series of major scientific and engineering accomplishments by the field of AI. In my judgement he was at his best when he said, "I certainly do know why this field is called 'Artificial Intelligence'. It was I who invented that phrase back in the mid '50s..." Later Prof. Michie challenged Sir James to double the stakes in an existing wager <*N3> if he so genuinely believed in the force of his argument, but he graciously declined. Later still Prof. Gregory, whose specialty is the physiology of perception, stressed the substantial benefits of AI research and generally supported the position set forth by Profs. Michie and McCarthy. 4d4

In contrast to earlier programs in the Controvery series, the audience present for this debate was an unusually prestigious group, including such distinguished professors as Needham of Cambridge, Thring of Queen Mary College, London, Strachey of Oxford, and Lederberg of Stanford (a Nobel laureate who just happened to be passing through). Many of the audience contributions which stressed the importance of intelligent robots for industry and the value of AI research in general were edited out of the final tape. 4d5

In conclusion, many observers, including Prof. Michie, felt that Lighthill had lost the battle, and so did I. But I am less certain how the general British TV audience may feel about the arguments presented. They may respond more to sweeping generalities than tc the more technical and sometimes academic details brought up during the discussion. Also, when the format requires that three persons are independently charged with responsibility to refute the position of one other person, and each has in principle only one-third the time of the first, and none of them is given explicit authority to summarize and to speak on behalf of the other two, it is difficult for the three to do more than separately chip away at local weaknesses,

thereby diluting the force of their rebuttal. Therefore, the audience never has a single individual with whom they could identify in assessing a global and systematic refutation of the original argument. There may always be the lingering doubt that the first man may really have had something worthwhile to say, and he just didn't do a good job at presenting it. Perhaps a more important question is how the Science Research Council (British AI's principal supporting agency) will view these arguments when they allocate resources in the future. This remains to be seen. 4d6

5. Natural-Language Memory Structures Studied In Seminar Series At Stanford AI Project 4e

Professor Ken Colby of the Stanford University AI Project has organized a series of seminars expected to meet approximately every two weeks during the coming year to examine and contrast different approaches to natural-language memory structures. Regular attendees have been Horace Enea, David Smith, Terry Winograd, Chuck Reiger, Gordon Bower, Yorick Wilks (all from Stanford), Lotfi Zadeh (Berkeley), Steve Coles, Sharon Baranofsky (SRI), Dan Bobrow, Sharon Kaufman-Diamond (Xerox), as well as a half dozen Stanford graduate students interested in computational linguistics. 4e1

Thus far Chuck Reiger has presented his work on MARGIE (a graph-oriented system in collaboration with Roger Shank) and Horace Enea has presented is work on PARRY (a production-oriented system in collaboration with Ken Colby). At the next meeting Steve Coles will discuss the ENGROB System (predicate calculus oriented). Since there are many scientific persuasions represented among the participants (ranging from dependency graphs tc procedural representations) as well as motivations (ranging from psychiatry to speech understanding to children's stories), the seminar should prove to be very interesting. 4e2

6. Change in Newsletter Reporters 4f

Rob Kling has recently moved to the University of California at Irvine and will thus become their reporter. To replace him at the University of Wisconsin will be Norman Sondheimer, a graduate student in the Computer Sciences Department. 4f1

7. New Policy for On-Line Newsletters 4g

We have archived the October 72 Newsletter in the on-line SIGART Directory at SRI-ARC to conserve disk space and subsequently will maintain on disk only one year's worth of

Newsletters. Procedures for retrieving older On-Line Newsletters are available in <SIGART, NEWS, ARCHIVED:w>. 4g1

We have recently inaugurated a statistics package to gather data on the frequency of use of the On-Line Newsletter. We expect to publish these figures perodically in future issues. 4g2

8. Two New Programs Available on the Network 4h

A. Stanford University's AI Project has recently made available an Associated Press wire service program <*N4> allowing one to access current news stories on-line, using boolean combinations of key words derived from a dictionary of 1200 words. For example, 4h1

```
@TELNET<CR>
#SU-AI<CR>
 LOGINNET/GUE<CR>
.RAPE<CR>
.(NIXON+TAPES)*WATERGATE-AGNEW
```
4h1a

will itemize stories in reverse chronological order, if there are any, that have to do with either Nixon or his tapes in relation to watergate, but which do not mention the vice president. Typing a number will show you the Nth latest stories on that list, while a <CR> will list all of them. 4h1b

```
.RHOT<CR>
```
4h1c

will list news stories as they are generated by AP. 4h1d

B. "#BBN21<CR>" will provide a random quotation by a famous person or well-known computer scientist. For example, 4h2

"I've been rich and I've been poor. Rich is better."
-- Mae West 4h2a

If anyone has or knows of other programs of general interest, or of particular interest to the AI community, please let us know. 4h3

9. Slagle's Book Published in German 4i

Jim Slagle's book, ARTIFICIAL INTELLIGENCE: THE HEURISTIC PROGRAMMING APPROACH, is being published by Verlag Moderne Industrie, Munich. 4i1

10. Error in Header 4j

We regret the systematic error in the date of the header portion of each page in the last issue. However, the outside cover correctly reads August 1973. 4j1

L.S.C. 10/1/73 4k

NOTES 4l

<N1> For reference, about 600 attended the first IJCAI in Washington in 1969, while about 400 participated in the second London IJCAI in 1971. 4l1

<N2> Public Relations unit; Science Research Council; State House; High Holborn; London WCIR 4TA, England. 4l2

<N3> For details of the bet, regarding computer chess, see the SIGART Newsletter, No. 36, October 1972, p.26, Item 1. 4l3

<N4> For more details see "Reading the Assocated Press News" by Martin Frost, Stanford Artificial Intelligence Laboratory, Operating Note 72, July 23, 1973. 4l4

FOLLOW UP ON IJCAI-73 5

A. VIDEO TAPES OF TUTORIAL LECTURES AVAILABLE THROUGH STANFORD UNIVERSITY 5a

The Stanford Instructional Television group is offering for sale IJCAI-73 black-and-white video tapes in various formats. The tapes are of lectures recorded live at IJCAI-73. Certain of the 1/2" tapes are also available on a rental basis. All tapes are in NTSC (525 scan line) format. A price list is given below (rental prices are given in parentheses for a two-week rental period). 5a1

The attached purchase and rental forms may be used in ordering the tapes. All orders should be accompanied by full payment. Tapes will be sent air mail. 5a2

Besides the regular technical sessions, listed in the last issue, IJCAI-73 had two other types of sessions: Special and Free Sessions. 5a3

B. SUMMARY OF SPECIAL SESSIONS AT IJCAI-73 5b

Four special sessions were organized by individuals who wished to explore certain specialized topics in an informal setting with the help of invited panelists and any interested conference attendees. 5b1

SS1
Social Implications: A Look at Some Immediate Issues
Chairman: Andee Rubin, USC Information Sciences Institute and MIT 5b2

The discussion, based on a carefully prepared three-page list of questions, focused on issues in the area of social implications of AI which are relevant in the immediate future--specifically short range applications, funding agencies, and in particular the relationships between them. In other words: Who is funding current artificial intelligence research, and what are their reasons? 5b2a

Steve Crocker of ARPA, Val Tareski and John Pasta of NSF, and Tom Wachowski of AFOSR were present, and the first part of the session consisted mainly of the audience asking them questins about the amount of money available for such research, the criteria by which it is distributed, the future outlook, and differences among the agencies in such policies. 5b2b

After a while, when the audience felt satisfied that they were aware of the basic issues and facts in that discussion--and were becoming somewhat impatient with mere fact-finding--talk turned to the reasons different agencies proposed for funding AI and what uses they envisioned for specific projects, such as speech-understanding systems, sophisticated vision systems, or automatic programming systems. In particular, participants were interested in what effect they might have on the decision-making process if they weren't satisfied with the directions of certain agencies. 5b2c

The discussion eventually moved to an even more abstract level dealing with the differences between basic and applied research, with issues concerning the possible good and bad applications of pure research and their relevance in deciding whether to follow a certain line of work. Quite a number of people expressed interest in remaining involved in at least talking to other AI researchers about these issues; SICCAS (Coomputers and Society), SESPA (Science for the People) and CPP (Computer People for Peace) were mentioned as possible organizations through which to work. I also collected a list of interested people during the following two days. Anyone who did not sign that list and is interested in being included in a list which will be distributed to everyone on it and which may serve as an informal communication mechanism, please send your name and address to: 5b2d

Ms. Andee Rubin
AI LAB
545 Technology Square
Cambridge, Mass. 02139 5b2d1

or use the ARPA-NET to ANDEE@MIT-AI. At some reasonable interval after this Newsletter has been distributed, I will compile that list and send it out. The attendees' general reaction to the session was favorable, due mainly to the high degree of audience participation and the presence of some of the people who really make the decisions. The discussion was lively and often heated, but its primary virtue was that people felt that they could ask pointed, specific questions and get some kind of answer. In addition, though the discussion finally did move to those more abstract issues of pure/applied research with which many such discussions start out, it did so from the "other direction," so to speak...that is, from the more specific issues of money and priorities. 5b2e

SS2
Formalisms for Artificial Intelligence
Chairman: Carl Hewitt, MIT A.I. Laboratory 5b3

Formalisms for artificial intelligence were discussed by four speakers at this session. Allen Newell began by discussing both the use of production languages for representing problem solving processes and the structure of his MERLIN knowledge net. Richard Weyhracuch followed with a discussion of some work that is based in the predicate calculus and considers the generation of a style of informal proofs that people use and find convincing. Carl Hewitt elaborated on his ACTORS talk of the previous day; his comments stressed the modularity of ACTOR based systems and the elegance obtained from the simplicity of their structure. Finally, Alan Kay gave a brief presentation describing his SMALL TALK language which is similar in spirit to the LOGO language and is implemented using ACTORS. 5b3a

SS3
A.I.: A Discussion of its Impact on Science, Technology, and Society
Chairman: Robert H. Anderson
USC Information Sciences Institute and RAND 5b4

This special session was formed because of the relative paucity of papers being presented at IJCAI-73 dealing with the relationship between A.I. and real-world problems. It was held during the last morning of IJCAI so that the

state-of-the-art in A.I., as defined in the presented papers, could form a background for the discussion. 5b4a

The main question addressed was: Why hasn't more attention been paid, to date, to real world applications of AI? Potential answers discussed were: 5b4b

It would be a diversion from the main research goals and interests of AI. 5b4b1

(The consensus was that this was not a significant factor.) 5b4b1a

We don't have easy access to people who have a deep understanding of relevant problem areas. 5b4b2

(A consensus also thought this was not a significant factor.) 5b4b2a

The power of AI is in the knowledge of the application area which is applied, but we don't yet know how to formalize a significant body of knowledge. 5b4b3

(This was felt to be an important consideration.) 5b4b3a

An important part of the panel discussion was a presentation by Ed Feigenbaum on 'The Nature of an Application of Heuristic Programming Techniques'. A partial list of considerations he raised as being relevant to particular applications in 1973 is as follows: 5b4c

Problem Formulation: Does there exist a generally agreed-upon best way to represent the problem domain, and a set of primitive solution elements out of which solutions will be discovered by combination and search? Can the generation of solutions be conceived as a combinatorial process? 5b4c1

Knowledge Base: Does a model exist which can provide the semantics behind the symbol manipulation? Is there an expert who is highly knowledgable, motivated, computer-oriented, through whom knowledge can be acquired? Is the universe of facts small, and almost uncoupled from other possible universes? 5b4c2

Problem Difficulty: Is the application too difficult or too simple? Can measurements be made to measure the progress of program solutions? Can progress be made

incrementally? Is it ill-structured enough to require heuristics? 5b4c3

Resources (People, Motivation, Money, Computers): Can they be obtained and sustained over long periods of time? 5b4c4

Members of the panel discussing these issues were: 5b4d

Prof. Saul Amarel, Rutgers University
Dr. Dan Bobrow, Xerox Parc
Mr. Stephen Crocker, ARPA-IPT
Prof. Ed Feigenbaum, Stanford University 5b4d1

SS4
Automatic Programming
Chairman: Robert Balzer, USC Information Science Institute 5b5

The session brought together participants from several different ongoing projects. The current activities of each were described and an attempt was made to identify the problems which must be faced in the future. 5b5a

As a way of establishing a common ground for discussion, I used the viewpoint established in "A Global View of Automatic Programming," [3IJCAI, p. 494]. In this view, there are four phases: (1) Problem Acquisition, in which the knowledge of a domain is acquired and structured for use in the problem solution; (2) Process Transformation, in which the domain knowledge is used to transform the problem statement into a detailed procedural form; (3) Model Verification, in which the structure and behavior of this procedural form is examined; and (4) Automatic Coding, in which the procedural form is converted into an efficient program. Using this structure we get the following breakdown (only some of these were represented at the special session and are summarized below): 5b5b

First 3 areas: ISI, Rutgers
Last 3 areas: IBM, MIT
Middle 2 areas: Winograd 5b5b1

Process Transformation:	Program Synthesis, CMU, Waldinger-Green
Model Verification:	Program Verification
Automatic Coding:	Earley, Darlington, Harvard 5b5b2

MIT (Bill Martin): Focus on building high performance knowledgeable application systems in the domain of management information systems. This domain has been

abstracted and described in relational terms. A method has been devised for translating from this relational level into PL/1 programs to perform the desired tasks. As part of this translation process, run-time cost figures for these generated programs are developed and used for either an interactive or heuristic search for an organization that minimizes these costs. A very large relational model (for inventory control) is being constructed which will be used to capture the user's problem definition by instantiation through a dialog jointly directed by the user and the system. 5b5c

IBM/Yorktown (Martin Mikelsons): This work is focused on the domain of business data processing and has two main parts. The first is a document flow language which describes an application in terms of the definition of, the movement of, and processing performed on a set of documents. A translator is being built to convert such descriptions into efficient running programs. The second component is attempting to construct these descriptions from a high level discourse by questionning the user. 5b5d

ISI (Bob Balzer): This project is investigating and attempting to define mechanisms necessary for dynamic acquisition of semantic models of a domain and for effectively using them to transform loose program specifications into a more precise form capable of being evaluated. A broad range of domains is being examined to determine requirements for this domain-independent approach. The focus in acquisition is on techniques for spotting inconsistencies or incompletenesses in a semantic model and directing dialog with the user toward correcting these problems. In transformation, a precise executable model for an arbitrary domain is being defined and techniques developed for transforming loosely specified, ill-defined, problems into precise form. These techniques include: filling in missing relationships between the objects of the domain, using type constraints to disambiguate statements, using information-retrieval techniques to determine the objects to be associated with an operation, determining how to handle override conditions and constraints, and spotting 'extra' information in an invocation statement which is not 'used up' and determining how it should modify the interpretation of invoked actions or subactions. 5b5e

CMU (Jack Buchanan) and Stanford (Dave Luckham): This project is concerned with verification and synthesis via a formal mechanism based on Hoare's logic system for describing programs. The programs to be written are

specified by formal input-output descriptions. Conventional problem-solving techniques are used to produce the program. The problem of representation and acquisition of the necessary programming methods has been a major research focus. Hoare's formalism for program semantics has been found suitable for describing programming methods. A new effort is underway to allow the user to present these methods informally and have the system translate a description into the formalism. The program synthesizer now running can write several-page programs and has some general programming knowledge built in. The programs written automatically have been robot control programs and arithmetic algorithms. Two difficult classes of program structures are handled: contingency programs (necessary for planning with unreliable operators) and complex loop structures. A more interactive problem-acquisition system using essentially "constructive" programming methods is under development. 5b5f

SRI (Waldinger) and Stanford (Green): This effort is concerned with program writing through use of "expert" built-in knowledge in the domain of list-processing, ranging from the fundamentals up to pattern matching, tree search, graph search, graph-matching, etc. Most of the knowledge is relatively "pure" programming knowledge with such domain-dependent knowledge as is necessary. The emphasis is on codification of the considerable body of list-processing programming knowledge. The target system is expected to have a deep understanding of programming as shown by its program-writing ability, by its line of reasoning in creating a program, and by its own discussion of why it made each choice and the factors involved. An interesting feature of this research effort is some emphasis on 'human' methods of program specification, such as example input-output pairs, generic examples, and annotated traces. Prototype systems have been developed that can write short (less than 7 line) programs, including sort, merge, reverse, flatten (a list), etc. The programs have been specified by several alternate methods. The best program written automatically to date is a square-root program, in which the system shows a good line of reasoning in producing the program. The tentative one-year goal of the project is the automatic synthesis of a six-page concept formation program that employs simple list-processing techniques. 5b5g

Stanford (Winograd): This effort is concerned with defining and ultimately building a smart assistant for programming complex problems. It might be considered an advanced bookkeeping system. The help it provides would be based on

built-in knowledge of programming, of functions available in the system, and extra comment-like information provided by the user about his program and data structures. From such knowledge, the system would be expected to perform error checking, be able to answer questions about the static or dynamic structure of the program interactively, and automatically select the appropriate function or method for simple operations. 5b5h

C. LISTING OF FREE SESSIONS AT IJCAI-73 5c

Session 9
PROBLEM SOLVING AND PSYCHOLOGY
Tuesday, August 21, 1973 9:00AM - 12:00 NOON 5c1

Mr. Gregory Gibbons
Department of Mathematics
Naval Postgraduate School
Monterey, California 93940
"The Q-Size Rule: A Method for Eliminating Redundancy in Heuristic Search" 5c1a

Professor Marco Somalvico and A. Vincentelli
Instituto di Elettrotechnica ed Elettronica
20133 Milano
Plazza Leonardo DaVinci, 32, Milan, Italy
"Theoretical Foundations of State-Space Approach to Problem-Solving" 5c1b

Dr. James M. Perry
Computer Science Group
The University of Connecticut
Storrs, Connecticut 06268
"Abstract Problems: A Formal Development for Automatic Problem Generation and Solution" 5c1c

Mr. Larry Rosen
Department of Psychology
University of California at San Diego
La Jolla, California 92037
"The Role of Similarity Relations in the Multi-Alternative Choice Process" 5c1d

Dr. George F. Luger and G. A. Goldin
Graduate School of Education
University of Pennsylvania
Philadelphia, Pennsylvania 19147
"The Use of Artificial Intelligence Techniques for the Study of Problem-Solving Behavior" 5c1e

Mr. S. Romani and A. Newell
Department of Computer Science
Carnegie-Mellon University
Pittsburgh, Pennsylvania 15213
"On Generating Problems" 5c1f

Session 12
FORMALISMS AND AUTOMATIC PROGRAMMING
Tuesday, August 21, 1973 1:30 PM - 5:00 PM 5c2

Mr. Robert Kling
The University of Wisconsin
Computer Science Department
1210 West Dayton Street
Madison, Wisconsin 93706
"Fuzzy Planner" 5c2a

Earl Sacerdoti and Rene Reboh
Artificial Intelligence Center
Stanford Research Institute
Menlo Park, California 94025
"QLISP" 5c2b

R. O. Anderson
Churchill College
Cambridge CB3 ODS, England
"A New Logic of Analogy" 5c2c

Dr. Robert Balzer
Institute for Information Science of USC
4676 Admiralty Way, Suite 522
Marina Del Rey, California 90291
"Language Independent Programmer's Interface" 5c2d

Jack R. Buchanan
Computer Science Department
Carnegie-Mellon University
Pittsburgh, Pennsylvania 15213
"An Automatic Programming System" 5c2e

Dr. Richard Waldinger and Karl Levitt
Artificial Intelligence Center
Stanford Research Institute
Menlo Park, California 94025
"Reasoning About Programs" 5c2f

Dr. Peter Deutsch
Xerox Palo Alto Research Center
3810 Porter Drive

Palo Alto, California 94304
"Recent Results in Automatic Program Verificiation" 5c2g

Session 16
VISION
Wednesday, August 22, 1973 9:00 AM - 12 NOON 5c3

Dr. Jerome A. Feldman
Computer Science Department
Stanford University
Stanford, California 94305
"Gunnar Grape's Dazzling Model-Based Line Fitter" 5c3a

Dr. Walton A. Perkins
Computer Science Department
Stanford University
Stanford, California 94305
"A Corner Finder for Visual Feedback" 5c3b

Professor Azriel Rosenfeld
Computer Science Department
University of Maryland
College Park, Maryland 20742
"A Report on the U.S.-Japan Seminar on Picture and Scene Analysis (Kyoto, July 23-27, 1973) 5c3c

L. F. Pau
The Institute of Math, Statistics, and Operations Research
The Technical University of Denmark
Lyngby, Denmark
"Confusion in the Vision of Simple Geometric Objects" 5c3d

Craig Cook and Tom Binford
Artificial Intelligence Laboratory
Stanford University
Stanford, California 94305
"Aspects of Automatic Camera Focusing" 5c3e

Dr. Alan R. Johnston
Jet Propulsion Laboratory
4800 Oak Grove Drive
Pasadena, California 91103
"Proximity Sensing for Manipulation and a Laser Range Finder for a Robot" 5c3f

Session 19
APPLICATIONS
Wednesday, August 22, 1973 1:30 PM - 5:00 PM 5c4

Mr. James Doran
Science Research Council
Atlas Computer Laboratory
Chilton, Didcot
Berkshire 0x11 OQY, England
"Heuristic Search Applied to Problems of Archaeo-Logical Inference" 5c4a

Dr. Tim O'Shea
Department of Computer Science
The University of Texas at Austin
Austin, Texas 78712
"Some Experiments with an Adaptive Self-Improving Teaching System" 5c4b

Professor Billy Claybrook
Virginia Polytechnic Institute
and State University
Blacksburg, Virginia 24061
"Experiments with Polyfact: A Learning Program that Factors Multivariable Polynomials" 5c4c

Dr. Saul Amarel
Department of Computer Science
Livingston College
Rutgers University
New Brunswick, New Jersey 08903
"AI Approaches to Diagnosis and Treatment of Glaucoma" 5c4d

Robert S. Engelmore, Research Associate
Computer Science Department
Stanford University
Stanford, California 94305
"Application of AI to Scientific Inference: Determining the Structure of Crystallized Proteins" 5c4e

Professor W. D. Maurer
Department of Electrical Engineering and Computer Sciences
University of California
Berkeley, California 94720
"Symmetric Floating Approximation and Program Correctness" 5c4f

Session 23
ROBOTS AND OTHER
Thursday, August 23, 1973 9:00 AM - 12 NOON 5c5

Dr. N. G. Zagoruiko
Institute for Mathematics

USSR Academy of Sciences
Siberian Division
Novosibirsk 90, U.S.S.R.
"Discovering of Empirical Regularities within the Frame of General Recognition Theory" 5c5a

Mrs. M. V. Aristova and Dr. M. E. Ignatiev
c/o Dr. S. I. Samoylenko
USSR Academy of Sciences
Moscow, U.S.S.R.
"The Concept of the Structure of Highest Levels Control by Robot-Manipulators" 5c5b

Dr. Laurent Siklossy and C. Dawson
The University of Texas
Austin, Texas 78712
"Automatic Generation of Hierarchies of Goals in Robot Worlds" 5c5c

John Birk and Donald Franklin
Department of Electrical Engineering
Kelley Hall
University of Rhode Island
Kingston, Rhode Island 02881
"Minimizing Robot Work Time for Pitching Objects" 5c5d

Professor Teuvo Kohonen
Department of Technical Physics
Helsinki University of Technology
SF-02150
Otaniemi, Finland
"New Analog Associative Memories" 5c5e

Dr. Alois Glanc
Department of Computer Science
Queens College
Flushing, New York 11367
"Design Considerations of the Golem System and Implied Problems in Robotologic" 5c5f

Session 26
NATURAL LANGUAGE
Thursday, August 23, 1973 1:30 PM - 5:00 PM 5c6

Dr. Sharon Kaufman-Diamond
Xerox Palo Alto Research Center
3406 Hillview Avenue
Palo Alto, California 94304
"On Story Understanding as a Task for AI" 5c6a

Dr. Nagib A. Badre
IBM Corporation
Thomas J. Watson Research Center
Yorktown Heights, New York 10598
"CLET--A Computer Program that Learns Arithmetic from an Elementary Textbook" 5c6b

Professor Adele A. Abrahamson
Department of Psychology
Rutgers College
New Brunswick, New Jersey 08903
"Deep Semantic Structures for Natural Language Processing" 5c6c

Dr. Perry L. Miller
20B-208
Massachusetts Institute of Technology
Cambridge, Massachusetts 02139
"Locally-Organized Parsing: For Spoken and Text Input" 5c6d

Mss. B. Nash-Webber and M. Bates
Bolt Beranek and Newman
50 Mouton Street
Cambridge, Massachusetts 02138
"Syntactic and Semantic Suport for a Speech Understanding System" 5c6e

NOTES ON THE SOCIAL IMPACTS OF ARTIFICIAL INTELLIGENCE by Rob Kling
Department of Information Sciences
University of California
Irvine, California 6

IJCAI-73 devoted three sessions to the aspects of AI funding, applications, and impact. In addition, one paper (Firschein, et al, 1973) described a Delphi study of plausible AI applications and their possible impacts. I'd like to share some of my reflections on this timely burst of attention devoted to these social concerns. 6a

Impacts of AI based Technologies 6b

The prediction, analysis, and assessment of technological impacts is a critical and frequently misunderstood area. It has been colored by a strong emphasis upon "philosophical" and social speculation (Chartrand, 1972; Martin and Notman, 1969) thought to be irrelevant by pragmatically inclined scientists. Often, simple pieties substitute for careful analysis. In addition, each of us holds some view about the impact of his work. We amateurs often seem no less accurate than people

writing, or speaking, under the rubric of "social impact." Thus we have a hard time believing that especially prescient studies of social impacts are likely or possible. 6b1

Certainly no one will say that social impacts should be ignored. Like affirmations of motherhood and apple pie, periodic attention to "social impacts" serves a ritual function, showing that we are sensitive, concerned, and responsible scientists, rather than crass opportunists, narrowly pursuing our own professional and personal interests. It is in our interest that we speak about "social impacts"; and that the likely impacts of our technologies be, on the whole, labelled benign. Thus, the analysis of social impacts is a necessary, but neither a serious nor dispassionate venture for the AI community. 6b2

A special session, chaired by Lou Fein, met to discuss the "social implications" of AI in a public forum. I won't attempt to summarize their discussion here, except to note that it emphasized AI as a form of theoretical psychology or a set of remote technological possibilities such as an automated courtroom judge. The likely products of AI research, that were identified in the Delphi study reported earlier in the conference (Firschein, et al. 1973), were neglected, and the societal contexts in which computing is now exploited were ignored. 6b3

I'd like to emphasize AI as a technology, since I believe that the mission-oriented AI sponsors such as ARPA, AFOSR, and NIH are as interested in new technologies as in new understanding of human cognitive processes and theories of organized complexity. We are quite self-serving when we emphasize the latter areas that have little short-run payoff and consistently ignore the technologies we develop as a by product of our less applied research.<*N1> (In the long run, the image of man as a cognitive information processor may be the deepest AI impact of all. C.f. Weizenbaum, 1972.) In the short run (10-20 years) the spin-off technologies supported by mission-oriented sponsors may be most critical. 6b4

To give an example, the Delphi group believed that the development of automatic diagnostic equipment or a personal biological model to aid patient monitoring in intensive care units would be of "high-potential significance." Currently we have special problems with medical care in this country. High quality care is easily available to the middle and upper classes, while many of the urban poor and people living in rural areas simply do not have good care available despite their pressing needs. Nevertheless, as a culture we place a

premium value on health. Any health related research carries an angelic halo and an aura of intrinsic good. Despite major attempts to provide more equitable access to medical care based on needs through such programs as community clnics, Medicare, etc., the social structure of medical access has changed little (Alford, 1972). (Alford's acute analysis portrays the political economy of health care as a complex social system in a stable configuration which is highly resistant to fundamental structural changes.) In terms of his analysis which poses a set of "independent" doctors (and the AMA) vying with a research-administrative-educational plus medical-industrial complex, the development of costly technologies may mostly aid the latter in their contest with the former. An increased quality of medical care may simply diffuse over time as a byproduct of such developments and simply trickle down to those most in need over a long period of time. In such a system, expensive technological aids are probably not the most cost-effective means to provide higher quality care to those most in need. 6b5

Whatever the accuracy of this model, it is based on a careful analysis of social change in the relevant societal sectors. An alternative analysis would have to be similarly rooted in the dynamics of change in the medical system in order to be credible. Unfortunately, such deeper analyses are lacking in all too many of our discourses on the social impacts of AI-based products (or X--for all too many X's). 6b6

One assumption implicit in the preceding observations is that the impacts of AI-based technologies are subject to the very same dynamics of social impact as are other computer-based technologies. As we AI researchers separate ourselves from the larger computing community <*N2>, we easily indulge in the fantasy that our impacts will be of a different order than related technologies. This is a very tenuous assumption. For example, to the extent that AI based artifacts are costly and require sophisticated environments for use, they will be used by organizations and groups with substantial power. To the extent that these technologies are "intrinsically" influence-enhancing (Kling, 1973), they will increase the gap bewtween the weak and the powerful, the rich and the poor. Consider federal uses of computing. Everyone exploits computers for routine uses such as budgetary analysis. Everyone automates his payroll. But many of the most advanced computing applicatons go on in DOD. Likewise, the first municipal departments to automate include finance, police, and to a leser extent, welfare. The military and the police are unique in that they hold the only legitimate authority to exercise physical force in this society. Unfortunately, they

have been noted as among the more repressive institutions in our society as well. I am not aware of military or police computing which renders them more humane organizations. I emphasize these concerns with mundane computing, since they help identify those who may be some of the major beneficiaries of any computing technology, especially expensive technologies such as AI. It is not that such organizations will necessarily exploit computing in singularly anti-social ways. Rather, computing aids may provide (differentially) greater power without rendering them more humane. 6b7

In a market economy, expensive sophisticated computing aids are an elite-enhancing technology. For example, the Mead General Corporation is developing an elegant system to retrieve legal precedents for inquiring lawyers. (In many ways it typifies the kind of large--public?--data bases upon which sophisticated question-answering systems are hoped to operate.) Such a technology could help equalize the quality of legal aid available to all by providing easy access to a large body of legal precedent to private lawyers who do not own or are remote from large law libraries. At present this system, which has been given a de facto monopoly by the state Bar Associatons, is sold on an ability-to-pay basis. Unfortunately, the cost is approximately $50K per year and can be afforded only by the larger law firms. In principle, the Mead system could be made generally available.<*N3> That would require a kind of underwriting similar to that which provided electricity to the rural population earlier this century. Without such underwriting, its high cost will prohibit widespread use. Insofar as it is a useful technology, it will simply provide better legal aids to those already well supplied.<*N4> 6b8

In the decades of the 1960's and the 1970's the major computer users are large bureaucratic organizations. Within particular organizations, computing aids automate routine work and provide information and skills that were previously prohibitively expensive or unavailable. Indirectly, computing effects organizational structure, effectiveness, and efficiency. Impacts on the larger society are mediated by whatever missions, policies, and styles of action computer-using organizations employ. While policies are influenced by the available technologies, technological possibilities do not propagate automatically. For example, the FBI does not update its arrest files in the National Criminal Information System to include the disposition of cases, even though it is technically easy to do so. The short-range impacts of AI-based technologies are intimately bound with the policies of the groups that can afford to use them. Any meaningful assessment of AI-based technologies must be situated in a context which

describes likely users and their policies. Such studies require careful, dedicated empirical work, not just part-time avocational efforts. (Unfortunately, only a trickle of support is available for "technology assessment" in contrast with "technology development"). 6b9

Funding Sources 6c

A special session at IJCAI-73 was devoted to such questions as: Who funds AI research, and to what extent? (See s. (5b1)) What do each of the funders expect in return for their support? 6c1

Many people were concerned that ARPA is the major single supporter of AI research and that ARPA would expect (direct?) (long-term) military payoffs from the research it funds. Spokesmen from ARPA, NSF, and AFOSR tried to place their research support in the context of their agency's mission. However, the expectations of the funding agency may be less central than we assumed in that session. For example, even if NSF were to fund all AI research under the rubric of basic science, military scientists and engineers at centers such as (or under contract to) the Rome Air Development Center, Wright-Patterson Air Force Base, and Fort Manmouth would attempt to exploit whatever technology they could to solve military problems (that range from inventory and scheduling to weapons systems, counter-measures, and intelligence). In fact, they would not be doing their jobs very well if they did not attempt to exploit the available technologies, including AI. 6c2

For example, while the projects that AFOSR funds indicate technologies that are of special interest to the Air Force, the concern that many of us share of not aiding the development of ever more devastating and automatic weapons systems is not assuaged by simply working with NSF support rather than Air Force Support. After all, scientists working on Air Force development projects read the project reports and articles in the open literature just as we do. Some deeper analysis of the connection between technical development, military needs, and the control of technology is needed. A central issue is not simply who funds AI, but who are the likely users of the techniques we develop and principles we uncover. (I don't intend to claim that if AI were supported almost exclusively by any one sponsor, regardless of whom, whether DOD, NSF, or a private philanthropist, that such centralized funding could not shape the course of AI development.) 6c3

A Cautionary Note on the Delphi Study 6d

The Delphi Study selected a panel composed of AI experts and

engineers to predict a set of potential AI-based products, predict their likely time of appearance as commercial systems, assess areas of likely application (e.g., library fact and reference retrieval), and assess the desirability of each application. This is the first comprehensive study of possible AI impacts and deserves recognition as a serious venture. Unfortunately, the methods used have two major flaws which limit the conclusions that may validly be drawn from this work. 6d1

1. Some descriptions of possible applications are removed from the human-social and organizational contexts. The expert is left to situate these applications in some meaningful context. For example, "increased utility of data bases, since data is better used and organized," is torn from the context of any particular data and data user. In addition, it triggers our attitudes that, in general, "better information" is preferable to "poorer information." Likewise, "greater opportunity for censorship" is remote from any sense of who may censor whom. Nevertheless, we don't like censorship in any form. 6d1a

2. Assessing impacts, such as those sketched above, requires some special skills in sociological, political, and economic analysis. Some impacts may be subtle, but powerful. For example, it appears that "increased utility of data bases" lends influence and power to the data user (Downs, 1967; Kling, 1973). To the extent that public bureaucracies are major users of large data-base systems, they will gain power over individual citizens and technically unsophisticated citizen's groups. (Such power shifts are typically not at the forefront of our attention when we think of computer impacts, but they may be substantial and difficult to reverse.) 6d1b

3. The Delphi technique is designed to synthesize a concensus of expert opinion. The experts selected for this study were sophisticated technologists. They may, or may not, be equally expert at assessing social impacts, and their social assessments must be viewed with that in mind. I appreciate that the Lockheed-SRI group, which carried out the study, was working with limited funds. Even though a two-panel study which includes both technical and assessment experts might be more useful, it would also be more costly and time consuming. 6d1c

Epilogue 6e

These notes are suggestive and incomplete. I welcome any

elaboration or commentary either via SIGART or through personal correspondence. 6e1

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2. Westin, Alan, ed., INFORMATION TECHNOLOGY IN A DEMOCRACY, (Harvard University Press, 1971). 6g2

Notes 6h

<N1> Speech-recognition and question-answering systems are the kind of artifacts I have in mind. 6h1

<N2> Some members of the computing community, especially those

who have attempted to develop integrated information systems for cities, hospitals, and complex organizations have begun to appreciate the difference between technical possibility and likely impact. 6h2

<N3> For the present argument, I assume that the Mead system is a useful aid. Certainly this is the hope of its designers and users. In its present state of development it is actually of marginal use, but promises more utility in the "near future." 6h3

<N4> In the 1980's powerful computers may become rather inexpensive--on the order of several hundred dollars for a fancy CPU and 65K of memory. While such devices may become easily accessable, they may not have much effect upon the cost of a (legal) informaton system, where the expense of gathering the data is a major fraction of the cost of service. 6h4

PROGRESS REPORT FROM SUNY AT BUFFALO by Teiji Furugori
Department of Computer Science
State University of New York at Buffalo 7

A ROBOT TO LEARN TO DRIVE A CAR 7a

Following Prof. David G. Hays's suggestions concerning a network form for the representation of knowledge in the human mind, we are constructing a robot that will create and use a human memory based on the linguistic experience of learning to drive a car. The main functional components in the model are a Parser, an Integrator, a Planner, and an Effector. The robot is to be simulated in a general-purpose digital computer. 7b

The robot has different functions during teaching time, driving time, and thinking time (not yet designed). During teaching time, the robot learns how to drive a car; it takes input sentences and builds its memory. The Parser and Integrator perform this function. During driving time, the robot receives commands and tries to drive its car on a highway. The Planner and Effector translate analyzed commands into programs of actions. During thinking time, the robot would change its memory structure to store its knowledge more consistently and efficiently. 7c

PRIMITIVES 7d

A few primitive concepts and transformations associated with them enable the robot to connect linguistic meaning directly to perceptions of the highway and the motor control mechanisms of the car it is driving. They are: 7d1

Events Entities Attributes 7d1a

turn	brake	left	right
push	accelerator	front	behind
release	speedometer	near	far
see	steering wheel	high	low
	lane		
	car		

7d1b

The command 'Turn the steering wheel to the left ' requires linguistic analysis, but then can immediately be translated into the control program TURN (STEERING WHEEL, LEFT). Some other commands that can be translated directly are 'Push the brake ', 'Push the accelerator ' and 'Release the accelerator ' The corresponding control programs are PUSH (BRAKE), PUSH (ACCEL) and REL (ACCEL).

7d2

Other primitives are used in conditional commands: 'If you see that the speedometer is high, then...' becomes ON(SPEED(HIGH))..., and so on.

7d3

For the system to work we need to specify the car the robot uses, other cars on the highway, and the highway itself. These are represented in a physical simulation; information about them is stored in the robot's cognitive network.

7d4

TEACHING TIME

7e

The teaching system assumes the primitives and consists mainly of giving the robot principles of driving, causal and sequential relations, and metalingual definitions. For example, the instructor might say, 'Increase speed means speed up. Speed up means that you push the accelerator.' To push the accelerator is primitive; hence the effect of the instruction is to make the internal representation of 'Push the accelerator' serve as a definition for speed up, and also, directly or indirectly, as a definition for the expression increase speed.

7e1

A more complex example is 'Change lane to the left means that you turn left, then when you come to the left lane you turn right.' The latter part of the instruction is to serve as a definition for change lane. The definition has two main clauses, linked sequentially (by then); the second main clause contains a condition (arriving in the left lane) and an action. This complex is stored symbolically in the cognitive network; the whole of it is a definition in which the smallest parts are primitives.

7e2

DRIVING TIME

7f

We now test the robot's ability to drive a car on a highway. Suppose the command is 'Increase speed ' The robot finds a metalingual definition, namely 'speed up', but this is not primitive. Another metalingual link leads to 'push the accelerator', which, being primitive, can be executed. The Planner having done this work passes the command to the Effector, which is in direct communication with the highway simulation. 7f1

However, circumstances may cause the robot to delay or alter execution of a command. 'Change lane to the left ' is impossible if a car is in the left lane and too close, for example. The Integrator leaves an internal representation of each command in touch with a symbolic description of the present situation. If the robot knows the principle that turning sharply while driving fast can cause trouble, it can match this principle against the composite of the current command and the current situation. When the match shows a conflict, the robot either ceases to pursue the purpose fixed by the command (and issues a report) or changes the situation, so that it can carry out the command. 7f2

The Planner develops out of instructions during teaching time a hierarchy of purposes; when conflicts occur, it follows the principle of altering its operation of the vehicle so as to violate only lower-order constraints and only temporarily, if possible. Recursive planning is necessary; each analysis of a command in a situation can reveal conflicts calling for new, internally generated commands that must be analyzed in turn. 7f3

A PROGRESS REPORT ON PROJECT CONSIM

by Joe K. Clema
Department of Mathematics and Computer Science
Colorado State University
Fort Collins, Colorado 8

PROJECT CONSIM (Conflict Simulation) is a research effort devoted to emulating the processes of human decision making in complex situations requiring value judgements. The goals are (1) the development of a general computer decision aid and (2) a better understanding of how humans learn to improve in their decision making. The computer decision aid is designed to be prescriptive rather than to include the flaws of some particular human or group of humans, although "CONSIM I" did include the capability for incorporating some human imperfections. The model is of a mathematical and statistical nature and includes the following techniques: (1) linear programming, (2) alpha-beta search methods, (3) bayes's theorem, (4) linear evaluation function, (5) pattern recognition techniques, (6) heuristic procedures,

(7) computer modeling and simulation of human decision processes, (8) game theory, (9) utility theory, and (10) decision theory. 8a

PROJECT CONSIM first undertook research efforts in the area of international affairs. It was obvious that to validate the heuristic methodology employed in this project it must be obvious to the researchers whether the computer decisions are "good" or "bad." Thus, the effort during the last year has moved from international affairs to parlor games where good and bad decisions are quite easily related to wins and losses. 8b

The conflict simulation methodology has been applied in a simplified version of chess and has proven itself successful in a limited fashion. The measure of success was to play the program against a random opponent and count the number of moves in each game. If the "learning" program lost, a penalty of sixty moves was assigned, which was also the upper bound before beginning a new game. A learning procedure as described by Slagle, Samuel, and others was used. The number of moves required to win a first game (no learning) was significantly higher than latter games played with learning. The problem is basically to find a methodology enabling a computer program to re-adjust coefficients and in so doing find better coefficients enabling the program to recognize patterns and distinguish "good" situations from "bad" ones. A rather new methodology was employed utilizing a Bayesian approach and linear programming to achieve a successful re-evaluation of the coefficients. 8c

Present work involves streamlining the learning program and development of two subroutines which will both be equiped with a "learning" capability. These subroutines will play against each other and the results should prove quite interesting. The program has also been used to play against human opponents via an interactive terminal. Even though the program looks only one full move (2 plies) ahead, it has had some success against good human opponents, and nearly won a game The improvement in play from game to game has been quite apparent at times. This project has only scratched the surface of the various mathematical, statistical, and programming techniques available. Further work involving parallel processing and non-linear evaluation functions should provide a vehicle for a general automated decision aid. 8d

[Ed. Note: Dr. Clema has informed us that this project has resulted in five refereed publications, a Doctoral Thesis, and several other publications.] 8e

AI FORUM 9

During the past several months I have become an interested

follower of the progress in AI, notwithstanding the articles of Sir James Lighthill at Cambridge. 9a

It appears that research on AI is extremely limited in the U.S. as compared with, say, Japan. It also appears that almost no effort has been directed towards using existing heuristic programming techniques in current business applications. The large financial resources of the business community remain untouched by those now involved in AI research, possibly because business programming has up to this time been handled by rather simple, unrelated algorithms. 9b

I am now employed as a banking systems engineer by the Electronic Data Systems Corporation. Heuristic programming is just about the farthest thing from current banking operations that bankers can imagine--but it is clear that the problems that will arise when the "checkless society" starts functioning can not be handled efficiently by the current patchwork programming efforts. 9c

I would greatly appreciate hearing from those who are considering AI techniques in business environments. I am convinced that several industries have quietly developed to the point where AI now offers a reasonable alternative to much larger programming staffs. 9d

Charles L. Bernier
P.O. Box 1027
Whiteville, N.C. 28472 9d1

CHESS 10

1. RESULTS OF THE FOURTH ANNUAL U.S. COMPUTER CHESS TOURNAMENT
ACM-73 Atlanta, Georgia August 26-28, 1973

by
Ben Mittman
Northwestern University
and
Monty Newborn
Columbia University 10a

Northwestern Remains Undefeated 10a1

CHESS 4.0, a completely rewritten version of Northwestern University's computer chess program, won its fourth consecutive title in the Fourth U.S. Computer Chess Championship sponsored by the ACM at ACM-73 in Atlanta, Georgia last August. CHESS 4.0 was written by David Slate and Larry Atkin, systems programmers at Northwestern's Vogelback Computing Center, with the help of Keith Gorlen, now with the U.S. Public Health

Service. It ended the tournament with three wins and one draw (against the Dartmouth chess program) for a total of 3 1/2 points in the four-round Swiss-style tournament. 10a2

Three programs ended in a tie for second place with 3 points each: OSTRICH from Columbia University, CHAOS from Sperry-Rand Univac, and TECH II from MIT. They are to have a play-off for the second-place trophy. 10a3

Other programs were entered by representatives of Carnegie-Mellon, Bell Labs, University of California at Davis, University of California at Berkeley, University of Southern California, Georgia Tech, and the College of William and Mary. Complete results and copies of the game scores appear below. 10a4

The tournament was organized by Prof. Monty Newborn of Columbia University and Prof. Ben Mittman of Northwestern. The tournament director was Mr. David Levy, an international master from London. Messrs. Newborn, Mittman, and Levy are currently trying to arrange for the first world computer chess championship at IFIPS-74 in Stockholm next August. 10a5

Chess programmers from any nation are urged to contact: 10a6

Prof. Ben Mittman
Vogelback Computing Center
Northwestern University
Evanston, Illinois 60201
U.S.A. 10a6a

[Ed. Note: Because of the larger number of games played in this tournament, we will publish only the games from the fourth and final round in this issue. We will be publishing games from the first three rounds, as well as play-off games, in future issues. 10a7

Aside from the first game of the fourth round (CHAOS vs. CHESS 4.0), the games in this round are in my opinion uniformly inferior and hardly worth playing if good chess is one's major interest. Nevertheless, it might be a worthwhile exercise if you're curious about the "machineomorphic" pattern of inferior play. 10a8

My own observation is that these chess programs do not seem to be susceptible to a common failing of mediocre human play--vis., "tunnel vision." I've never made a psychological study, but it seems to me that a poor human player tends to become so caught up in the local tactics of a highly goal-directed sequence that he frequently fails to capitalize on new targets

of opportunity as they present themselves. The programs, on the other hand, always appear to maintain a global perspective and invariably postpone the natural development of a plan in order to execute an irrelevant check or other forcing move, even when it contributes literally nothing to the plan in progress, which is subsequently resumed just as though the distraction never occurred. Occasionally, this non-anthropomorphic feature of the programs is surprising, since it leads to something good and gives the illusion that the programs are better than they really are. In conclusion, it appears that poor human players and poor machines have something to learn from one another.] 10a9

2. FOLLOW UP ON THE MATCH 10b

After the match CHESS 4.0 and CHAOS both played a simultaneous exhibition against Mr. Charles Kalme, a Senior Master, who was a consultant to the USC team. Mr. Kalme played at queen odds, i.e., he removed his queen from the board. He defeated CHAOS (winning a $100 bet) and was defeated by CHESS 4.0. 10b1

3. RECENT ARTICLES ON COMPUTER CHESS 10c

(A) "Some Necessary Conditions for a Master Chess Program" by Hans J. Berliner, Proc. IJCAI-73, pp. 77-85. 10c1

(B) "Can a Computer Beat Bobby Fischer?" by Benjamin Mittman, DATAMATION, pp. 84-87, June 1973. 10c2

4. PRELIMINARY TESTING OF THE EFFECTIVENESS OF THE CICHELLI DEPTH-2 AND REFUTATION HEURISTICS <*N1> 10d

Although the heuristics were designed to improve alpha-beta pruning in middle game play, a test of the program's integrity and heuristics was made on 10 two-move-mate problems. Two runs were made, one with and one without the heuristics enabled. The CPU time and move counts were tabulated for the runs. 10d1

Visiting a node necessarily entails a call to SELECTMOVE, MAKEMOVE, LISTMOVES, and eventually REVERSEMOVE. If the heuristics were applied, a call to PRERATE provided pointers for the DEPTH-2 data and statically-ordered plies with both refutation and DEPTH-2 data. Without the pointers no dynamic ordering was possible. 10d2

The positions were loaded identically for the two runs so that the search trees would be identical if no reordering occurred. Without the heuristics, the program solved the 10 problems by

generating 74,485 nodes at 35 nodes per second. The overall improvement is 212% 10d3

Of particular note is that in general the larger the search is without the heuristics, the greater the improvement with the heuristics. For example, problem 10 had an improvement of 735% 10d4

Problem 1: Bell <*R1>, Figure 3. 10d5

Whites: (11 pieces)
Bf1, Rg1, Kh1, Pe2, Pg2, Pg3, Bh3, Pg4, Pe6, Pg6. <*N2> 10d5a

Blacks: (11 pieces)
Pe3, Pe4, Pe5, Pf5, Pg5, Pf6, Pe7, Pg7, Bf8, Rg8, Kh8. 10d5b

Solution: Pg4*f5 10d5c

Nodes with the heuristics: 6
Nodes without the heuristics: 6 10d5d

Problem 2: Bell, Figure 1b. 10d6

Whites: (11 pieces)
Kb2, Qf2, Nb3, Pf3, Ph4, Ra5, Pg5, Bc7, Ba8, Nf8. 10d6a

Blacks: (7 pieces)
Pd3, Pd4, Pf4, Nd5, Qe5, Kf5, Pf6. 10d6b

Solution: Qf2*d4 10d6c

Nodes with the heuristics: 1388
Nodes without the heuristics: 3994 10d6d

Problem 3: Bull <*R2>, No. 41. 10d7

Whites: (8 pieces)
Ba1, Kh1, Pe2, Pg2, Ph6, Ba8, Nc8, Qg8. 10d7a

Blacks: (9 pieces)
Pa2, Ph2, Pe3, Kf4, Pe5, Pe6, Pb7, Pe7,Ph7.. 10d7b

Solution: Nc8*e7 10d7c

Nodes with the heuristics: 222
Nodes without the heuristics: 832 10d7d

Problem 4: Bull, No. 44. 10d8

Whites: (5 pieces)
Ne1, Pe2, Pe4, Qe7, Ke8. 10d8a

Blacks: (2 pieces)
Ke5, Pe6. 10d8b

Solution: Pe2-e3 10d8c

Nodes with the heuristics: 997
Nodes without the heuristics: 1258 10d8d

Problem 5: CHESS LIFE <*R3>, No. 1. 10d9

Whites: (9 pieces)
Re1, Bd4, Rc5, Ne5, Ph5, Pg6, Ka7, Pd7, Qf8. 10d9a

Blacks: (7 pieces)
Ba1, Pg4, Qh4, Bb5, Pc6, Ke6, Pb7. 10d9b

Solution: Qf8-c8 10d9c

Nodes with the heuristics: 6461
Nodes without the heuristics: 2839 10d9d

Problem 6: CHESS LIFE, No. 2. 10d10

Whites: (11 pieces)
Qd2, Pe2, Nf2, Bh3, Rc4, Nf5, Pc6, Pd6, Pe7, Kf8, Bh8. 10d10a

Blacks: (9 pieces)
Pc3, Pf4, Nb5, Qd5, Pa6, Ke6, Ph6 Rd7, Bf7. 10d10b

Solution: Nf2-e4 10d10c

Nodes with the heuristics: 8303
Nodes without the heuristics: 14706 10d10d

Problem 7: CHESS LIFE, No. 3. 10d11

Whites: (11 pieces)
Rc1, Ka2, Pg2, Bb3, Rc4, Bh4, Pb6, Pf7, Nd8, Qf8.. 10d11a

Blacks: (10 pieces)
Pc2, Pe3, Pe4, Pe5, Rg5, Rh5, Kd7, Ng7, Be8, Ng8. 10d11b

Solution: Rc4*c2 10d11c

Nodes with the heuristics: 3013
Nodes without the heuristics: 10521 10d11d

Problem 8: CHESS LIFE, No. 4. 10d12

Whites: (7 pieces)
Bb1, Ne1, Rc2, Bd4, Pb5, Qc5, Ka6. 10d12a

Blacks: (12 pieces)
Qh2, Pb3, Pf3, Pg3, Ke4, Ph4, Pd5, Pf5, Bb6, Pa7, Rc8, Ng8. 10d12b

Solution: Qc5-d6 10d12c

Nodes with the heuristics: 5177
Nodes without the heuristics: 2849 10d12d

Problem 9: CHESS LIFE, No. 5. 10d13

Whites: (10 pieces)
Bc1, Kf1, Pg2, Ne3, Bf3, Ra4, Ne5, Re6, Qc7, Pf7.. 10d13a

Blacks: (9 pieces)
Ng1, Rb4, Kf4, Rh4, Ph5, Pc6, Pf6, Pe7, Pg7.. 10d13b

Solution: Bf3-g4 10d13c

Nodes with the heuristics: 5144
Nodes without the heuristics: 11279 10d13d

Problem 10: CHESS LIFE, No. 6. 10d14

Whites: (11 pieces)
Rd1, Pe2, Pf2, Nc4, Pg4, Rf5, Kd6, Ne6, Bh6, Bb7, Qe8.. 10d14a

Blacks: (8 pieces)
Nh1, Qd3, Rh3, Ke4, Pd5, Bg5, Pf6, Ph7.. 10d14b

Solution: Rf5*d5 10d14c

Nodes with the heuristics: 3013
Nodes without the heuristics: 26201 10d14d

References 10d15

<R1> Bell, A. G., "How to Program a Computer to Play Legal Chess", (THE COMPUTER JOURNAL, May 1970). 10d15a

<R2> Bull, T. P., CHESS PROBLEMS, (O. A. Brownson, Rockdale, Illinois, [date unknown]). 10d15b

<R3> CHESS LIFE AND REVIEW, "Two-Move Awards," March 1972. 10d15c

Notes 10d16

<N1> See previous issue, SIGART Newsletter, pp. 32-36, June 1973. 10d16a

<N2> [Ed. Note: Using algebraic chess notation, board columns are labeled with the lower case leters from "a" to "h" while rows are numbered from "1" to "8". Thus, the lower left-hand square of the chess board is labeled "a1" while the upper right-hand square is labeled "8h". The coordinate system orientation remains the same for both white and black. 10d16b

CONFERENCES 11

1. COMPUTER SCIENCE CONFERENCE 11a

February 12-14, 1974, Detroit Hilton, Detroit, Michigan 11a1

This conference is sponsored jointly by the ACM and a number of universities and industrial organizatons, in cooperation with the Computer Society of the IEEE and the Computers in Education Division of ASEE. Partial support has also come from NSF. The conference is primarily devoted to short, current research reports. Invited papers will be presented by Juris Hartmanis of Cornell University discussing complexity theory, Thomas Cheatham of Harvard University on extensible languages and automatic programming, Hurbert Dreyfus of the University of California at Berkeley on "The Ever Incomplete Robot," and Frederick Brooks of the University of North Carolina on computer graphics. The banquet presentation will be given by John Opel, Senior Vice President of IBM. 11a2

Participants in the conference need only submit abstracts. The deadline for abstracts is December 1, 1973. The printed program will be prepared directly from the abstracts submited. This form of presentation was well received during the first Computer Science Conference held last February in Columbus, Ohio. 11a3

In addition to the technical program and invited speakers, a number of other activities are planned. Two professional societies will hold meetings at the end of the Computer Science Conference: the Special Interest Group on Computer Science Education of ACM and the Computers in Education Division of ASEE. 11a4

For additional details on this conference see earlier Newsletters (p.45, June 1973 and pp. 41-42, August 1973). 11a5

Information concerning all aspects of the conference can be obtained from: 11a6

Seymour J. Wolfson, Chairman
Computer Science Conference
Computer Science Section
Wayne State University
Detroit, Michigan 48202 11a6a

2. 1974 NATIONAL COMPUTER CONFERENCE AND EXPOSITION 11b

The 1974 National Computer Conference and Exposition will be held May 6-10 in Chicago, Illinois, according to an announcement by the American Federation of Information Processing Societies, Inc. The 74 NCC will be the year's largest gathering of the world-wide computer community and is expected to attract more than 35,000 attendees to its sessions, seminars, and extensive exhibit program. Overall planning for the conference will be handled by a Chicago-based Steering Committee under the direction of Dr. Stephen S. Yau, Conference General Chairman. Dr. Yau is Chairman of the Computer Sciences Department, Northwestern University, Evanston, Illinois. 11b1

3. PROCEEDINGS OF 1973 NATIONAL COMPUTER CONFERENCE 11c

The Proceedings of the 1973 National Computer Conference and Exposition are now available from the American Federation of Information Processing Societies, Inc. The 920-page hard-cover volume contains more than 160 technical papers and abstracts covering a wide range of topics in computer science, technology, methods, and applications featured at the 73 NCC held in New York, June 4-8. The price for the Conference Proceedings, Volume 42, is $40. A reduced rate of $20 is available for prepaid orders from ACM members stating their affiliation and membership number. The Proceedings may be ordered from: AFIPS Press, 210 Summit Avenue, Montvale, New Jersey 07645. 11c1

4. SECOND TEXAS CONFERENCE ON COMPUTING SYSTEMS 11d

November 12-13, 1973, Austin, Texas 11d1

The Texas Conference on Computing Systems is an annual forum for the presentation of state-of-the-art practice in computing systems and research results. This tentative list of sessions and invited papers indicates the scope and depth of the conference. Sessions will feature surveys of state-of-the-art practice as well as reports on recent specific developments by means of invited and contributed papers. 11d2

A partial list of invited participants follows: 11d3

PROGRAMMING LANGUAGES
Chm Harlan Mills (IBM)
S.R. Kosaraju (John-Hopkins) 11d3a

APPLICATIONS OF COMPUTATION THEORY
Chm K.S. Fu (Purdue)
Philip Lewis (General Electric Research Lab)
C.L. Liu (university of Illinois) 11d3b

OPERATING SYSTEMS
Chm James C. Browne (University of Texas)
George H. Mealy (Harvard) 11d3c

SYSTEM EVALUATION AND OPTIMIZATION
Chm C. V. Ramamoorthy (UC Berkeley)
William Lynch (Case-Western Reserve)
John Tarter (University of Alberta, Canada) 11d3d

DATA MANAGEMENT AND INFORMATION RETRIEVAL
Chm Paul deMaine (Penn State)
Robert Simmons (University of Texas) 11d3e

MANAGEMENT OF COMPUTING FACILITIES
Chm Timothy Ruefli (University of Texas)
K. Knight (University of Texas) 11d3f

COMPUTER COMMUNICATIONS AND NETWORKS I
Chm Mani Chandy (University of Texas)
Julius Aronofsky (SMU)
Donald Aufenkamp (National Science Foundation)
Eric Manning (University of Waterloo, Canada)
Jerry Weeg (University of Iowa)
Paul Green (IBM) 11d3g

COMPUTER COMMUNICATIONS AND NETWORKS II
Chm Robert Kuhn (ARPA)
L. Kleinrock (UCLA)
Eric Manning (University of Waterloo, Canada) 11d3h

RELIABILITY AND DIAGNOSIS
Chm Stephen Szygenda (University of Texas)
Herbert Chang (Bell Laboratories)
Francis Mathur (University of Missouri) 11d3i

COMPUTER ARCHITECTURE
Chm Joseph Watson (Texas Instruments)
Michael Flynn (John-Hopkins) 11d3j

MINICOMPUTER SYSTEM
Chm Frank Spiznogle (Texas Instruments)
John Allan (University of Texas) 11d3k

For more information contact Program Chairman: 11d4

Professor Terry Welch
Department of Electrical Engineering
University of Texas
Austin, Texas 78712. 11d4a

5. FIRST INTERNATIONAL JOINT CONFERENCE ON PATTERN RECOGNITION 11e

October 30 - November 1, 1973, Washington, D.C. 11e1

The First International Joint Conference on Pattern Recognition is intended to bring together scientists and engineers to report their latest research and developments, and to discuss the directions and goals for future work in pattern recognition. It is hoped that the conference will assist in coordinating the many activities in pattern recognition which are presently narrowly compartmented along lines of specialization. 11e2

Sixty-five papers covering such diversified subjects as Mathematical Methods, Character Recognition, Biomedical Applications, Picture Processing, Speech, Syntactic Methods, Adaptive Pattern Recognition, Scenes and Structures, and Remote Sensing will be presented by leading scientists and engineers from ten different countries. In addition, there will be two workshops: one entitled, "Gap between Theory and Practice" and the second, "Problems in Pattern Recognition Research." 11e3

The conference is being sponsored by the following societies: ACM, IEEE, IFIPS, OSA, PRS, and SPIE. 11e4

For further information contact: 11e5

Louis S. Rotolo
Pattern Recognition Society
P.O. Box 629
Silver Spring, Maryland 20901
202-625-2121 11e5a

ABSTRACTS 12

CARNEGIE-MELLON WORKING PAPERS IN SPEECH RECOGNITION - II
Department of Computer Science
Carnegie-Mellon University

Pittsburgh, Pennsylvania
August 1973 12a

This report contains three previously published papers and two unpublished ones: 12a1

D. R. Reddy, L. D. Erman, and R. B. Neely, "A Model and a System for Machine Recognition of Speech," IEEE Trans. Audio and Electroacoustics, AU-21 (3), June, 1973. 12a2

D. R. Reddy, L. D. Erman, R. D. Fennell, and R. B. Neely, "The HEARSAY Speech Understanding System: An Example of the Recognition Process," Proc. of the IJCAI-73, Stanford, Calif., August, 1973. 12a3

L. D. Erman, R. D. Fennell, V. R. Lesser and D. R. Reddy, "System Organizations for Speech Understanding: Implications of Network and Multiprocessor Computer Architectures for AI," IJCAI-73, August 1973. 12a4

Janet M. Baker, "A New Time-Domain Analysis of Human Speech," April, 1973. 12a5

James Baker, "Machine-Aided Labeling of Connected Speech," April, 1973. 12a6

ANALYSIS OF THE ALPHA-BETA PRUNING ALGORITHM by S. H. Fuller, J. G. Gaschnig, and J. J. Gillogly
Department of Computer Science
Carnegie-Mellon University
Pittsburgh, Pennsylvania 12b

An analytical expression for the expected number of bottom positions examined in a game tree using alpha-beta pruning is derived, subject to the assumptions that the branching factor N and the depth N↑D of the tree are arbitrary but fixed, and the bottom positions are a random permutation of N↑D unique values. A simple approximation to the growth rate of the expected number of bottom positions examined is suggested, based on a Monte Carlo simulation for large values of N and D. The behavior of the model is compared with the behavior of the alpha-beta algorithm in a chess-playing program and the effects of correlation and non-unique bottom position values in real game trees are examined. 12b1

THE EQUIVALENCE OF REDUCING TRANSITION LANGUAGES AND DETERMINISTIC LANGUAGES by Mario Schkolnick
Department of Computer Science

Carnegie-Mellon University
Pittsburgh, Pennsylvania 12c

The class of reducing transition languages introduced by Eickel, Paul, Bauer, and Samelson was shown by Morris to be a proper superclass of the Simple Precedence Languages. In this paper we extend this result showing that in fact, the first class is equivalent to the class of Deterministic Context-Free Languages. 12c1

LABELLED PRECEDENCE PARSING by Mario Schkolnick
Department of Computer Science
Carnegie-Mellon University
Pittsburgh, Pennsylvania 12d

Precedence techniques have been widely used in the past in the construction of parsers. However, they imposed restrictions on their grammars that were hard to meet. Thus, alteration of the rules of a grammar was necessary in order to make them acceptable to the parser. We have shown that, by keeping track of the possible set of rules that could be applied at any one time, one can enlarge the class of grammars considered. The possible set of rules to be considered is obtained directly from the information given by a labeled set of precedence relations. Thus, the parsers are easily obtained. Compared to precedence parsers, this new method gives a considerable increase in the class of parsable grammars, as well as an improvement in error detection. An interesting consequence of this approach is a new decomposition technique for LR parsers. 12d1

MODEL VERIFICATION AND IMPROVEMENT USING DISPROVER by L. Siklossy and J. Roach
Department of Computer Sciences
University of Texas at Austin 12e

Confidence in the adequacy of a model is increased if tasks that are impossible in the world are shown to correspond to disprovable tasks in the model. DISPROVER has been used as a tool to test, in worlds of robots, the impossibility of tasks related to various conservation laws (objects, position, model consistency, etc.) and time constraints. The adequacy and sufficiency of operators can be established. Interacting with DISPROVER, the model designer can improve his axiomatization. The frontier between "acceptable" and "ridiculous" axiomatizations is shown, in many examples, to be a most tenuous one. 12e1

ON THE PREPROCESSING OF RADIOGRAPHIC IMAGERY by Y. P. Chien and K. S. Fu

School of Electrical Engineering
Purdue University
West Lafayette, Indiana 12f

The main idea behind the preprocessing of picture patterns is to effectively reduce the large amount of data, so that it will be easy for us to extract significant features. In other words, in the preprocessing phase, we would like to reduce the so-called irrelevant data and preserve the significant information for a later classification stage. These all seem to be necessary for us to develop a preprocessing technique that has the capability of singling out the specific object of interest from the background. This idea can also be termed "field of vision." In order to remove irrelevant data, we should extract the desired object as a discrete entity and "zoom in" on this particular region. Then the set of features extracted in this region would not be meaningless. 12f1

The concept of "field of vision" plays an important role in most pictorial pattern recognition problems. As in the case of automated computer diagnosis of chest x-rays, we would like to first locate the lung region and heart region, and then proceed to extract the set of features in each region. If we have no knowledge of the location of regions of lung or heart, it would be meaningless to talk about whatever features we extract. Thus, the first step in preprocessing the picture patterns is to locate the region of interest. This is equivalent to picture segmentation or boundary detection. The segmentation of binary pictures does not pose any problem. However, for pictures of multi-grey levels, the boundary for defining the region of interest is not easy to detect. 12f2

RECOGNITION OF X-RAY PICTURE PATTERNS <*N1>by Y. P. Chien and K. S. Fu
School of Electrical Engineering
Purdue University
West Lafayette, Indiana 12g

The "field of vision" is a very important concept in pictorial pattern recognition. In this paper, it is shown that this concept should be used as the preliminary step in preprocessing if automatic picture processing is ever to be of practical use. The preprocessing technique suggested in this paper will enable us to segment the picture into subregions so that it is possible for us to "zoom" into the specific objects. Thus the set of features we extract in that region would at least be meaningful. 12g1

In this paper, x-ray pictures with venus hypertension are used

as an application example. In the preprocessing phase, we first locate the coarse boundary of the lung by registering 5 key points on the lung boundary. Then the detailed lung boundary could be easily located by any existing boundary-finding technique. However, even in the present case, it is shown that the set of texture features extracted from the coarse lung region could be used effectively to screen out abnormal pictures. 12g2

<N1> This paper will be presented at the 1973 Annual conference of the Society of Photographic Scientists and Engineers, May 6-11, 1973, Rochester, New York. 12g3

ON SPEAKER IDENTIFICATION USING COARTICULATION OF NASAL CONSONANTS WITH VOWELS by Lo-Soun Su and K. S. Fu
School of Electrical Engineering
Purdue University
West Lafayette, Indiana 12h

A new approach which used the statistical properties of the nasal spectra was used to quantitatively study the coarticulation of nasal consonants with the vowels in isolated /h 'CVd/ utterances. The mean spectra difference of the nasal followed by front vowels and by back vowels was used as the acoustic measure of coarticulation. The coarticulation of [m] was found to be strongly speaker dependent in particular. This coarticulation, which generally reflects each individual speaker's idiosyncratic characteristics and is not likely to be consciously modified in natural speech, was proved to provide good acoustic clues for speaker identification. Speaker identificaton was performed using the correlation decision criterion and the results indicate that coarticulation clues are much better than the nasal spectrum, which has already been proved to be one of the best acoustic clues for speaker identification. 12h1

APPLICATION OF THE TREE SYSTEM APPROACH TO CLASSIFICATION OF BUBBLE CHAMBER PHOTOGRAPHS. by B. K. Bhargava and K. S. Fu
School of Electrical Engineering
Purdue University
West Lafayette, Indiana 12i

This report concerns the application of the tree system approach to classification of bubble chamber photographs. The report contains details of the classification procedure and results obtained from real photographs. The results were very encouraging, and various programs are being improved at present to get greater efficiency of computation and to reduce the ambiguity in classificaton. 12i1

DYNAMIC SCHEDULING OF LARGE DIGITAL COMPUTER SYSTEMS USING ADAPTIVE CONTROL AND CLUSTERING TECHNIQUES <*N1>by Richard A. Northouse
Electrical Engineering and Computer Science Department
University of Wisconsin
Milwaukee, Wisconsin
and
King-Sun Fu
School of Electrical Engineering
Purdue University
Lafayette, Indiana 12j

This research is directed toward the development of a scheduling algorithm for large digital computer systems. To meet this goal, methods of adaptive control and pattern recognition are applied. As jobs are received by the computer, a pattern recognition scheme is applied to the job in an attempt to classify its characteristics, such as a CPU-bound job, an I/O job, a large memory job, etc. Simultaneously, another subsystem, using a linear programming model, evaluates the overall system performance, and from this information an optimized (or desired) job stream is determined. When the processor requests a new job, it is chosen from the various classifications in an attempt to meet the optimal (or desired) job stream. 12j1

After the jobs are completely processed, their characteristics are compared to the projected classification produced by the pattern discriminant function. The results are then returned to the discriminant function to update the decision mechanism, a minimum-distance discriminant function. From a systems point of view, this results in an adaptive or self-organizing control system. The overall effect is a dynamic scheduling algorithm. 12j2

Simulation studies indicated that the scheduler was able to adapt to changing work loads, and it improved the turnaround times significantly. These simulation studies were based on a multiprocessor-uniprogram environment. 12j3

<N1> IEEE Transactions on Systems, Man, and Cybernetics, Vol. SMC-3, No. 3, pp. 225-234, May 1973. 12j4

A UNIFICATION ALGORITHM FOR TYPE THEORY by Gerard P. Huet
AIRIA-Laboria
Domaine de Voluceau
78150-Rocquencourt, FRANCE 12k

A semi-decision algorithm to search for unification of formulas in

-order type theory is presented, and its correctness proved. It is shown that the search space is considerably simpler than one for most general unifiers. This allows our algorithm to have good directionality and convergence properties. 12k1

Available as "Rapport de Recherche," No. 23, Laboria, Juillet 1973. 12k2

GADGET: A PROGRAM THAT GENERATES PROGRAMS FOR TESTING SOME PROPERTIES ABOUT GRAPHS AND SETS by Anne Adam
Third Cycle Thesis - University of Paris VI
Laboratoire de Mathematiques Appliquees
Universite de CAEN, FRANCE 12l

This program accepts mathematical statements concerning properties of graphs and sets. It generates a program corresponding to the data in FORTRAN IV. In addition to being a compiler for a new high-level language, it has the following capabilities: 12l1

(1) simplification rules are applied to the data; 12l1a

(2) theorem-proving is used for recognizing valid statements or contradictions; 12l1b

(3) some properties of the source statements such as reflexivity and symmetry are used for optimizing loops; and 12l1c

(4) dominance relations in the generated program are used for simplifing branches. 12l1d

About fifty programs have been generated by GADGET thus far. 12l2

SCENE ANALYSIS FOR BREADBOARD MARS ROBOT FUNCTIONING IN AN INDOOR ENVIRONMENT by Martin D. Levine
Jet Propulsion Laboratory
Pasadena, California
September 1, 1973 12m

This report deals with the problem of computer perception in an indoor laboratory environment containing rocks of varios sizes. Such sensory data processing is required for the NASA/JPL breadboard mobile robot that is a test system for an adaptive variably-autonomous vehicle that will someday conduct scientific explorations on the surface of Mars. Scene analysis is discussed in terms of object segmentation followed by feature extraction, which results in a representation of the scene in the robot's world model. 12m1

ON THE SEGMENTATION PROCESS IN SCENE ANALYSIS by Martin D. Levine
Department of Electrical Engineering
McGill University, Canada
Report No. 73-25, August 1973 12n

The problem of scene analysis in artificial intelligence is concerned with obtaining a three-dimensional description of the objects in a digitized representation of the scene. A basic paradigm for scene analysis is presented which includes as sub-models the areas of picture processing, picture analysis, and pattern recognition. Central to this problem is the segmentation process which partitions the picture into subsets of points which constitute atoms. It is argued by reference to the literature and a proposed scene taxonomy that all procedures to date except one result in atoms which can be categorized by humans as recognizable objects. These procedures are classified according to whether they are context-independent or context-dependent. The more general scene analysis paradigm is then discussed in detail and associated with the study of human psychologial behavior. 12n1

AUTOMATED PRESCREENING OF CERVICAL CYTOLOGY SPECIMEN by Ronald S. Poulsen
Department of Electrical Engineering
McGill University, Canada
Ph.D. Thesis, March 1973 12o

In this thesis the cervical cytology prescreening problem is examined in detail and a dual-resolution image processing method is proposed for automating the analysis of the routine cervical smear. The feasibility of this method is established through a comparison of the computer results with those of a manual study involving a large number of cervical specimens from patients with cancerous or precancerous conditions of the uterine cervix. 12o1

In this research an interactive image processing system has been used to develop a model of the abnormal cell class specifically in the context of cervical smears. These studies demonstrate that the image processing system developed here is capable of detecting the vast majority of isolated and slightly overlapping abnormal cells occurring in routine cervical smears and hence, is capable of prescreening these specimens into suspect and normal categories. 12o2

COMPUTER DETERMINATION OF TOTAL LUNG CAPACITY FROM X-RAY IMAGES by J. Lawrence Paul
Department of Electrical Engineering

McGill University, Canada
M. Eng. Thesis, March 1973 12p

This thesis describes an attempt to automatically calculate total lung capacity (TLC) from the posteroanterior and lateral chest X-ray images by computer. The lung model is that of Barnhard, which assumes that the cross-sectional shape of each lung is elliptical. Major and minor axes of each ellipse are determined from the lateral and posteroanterior projections respectively, and the integration of the elliptical cylindroids gives total thoracic volume. From this, values representing heart volume, hemi-diaphragm domes, blood volume, and tissue volume are subtracted, leaving the total lung capacity. 12p1

The major portion of this work describes the feature extraction procedures used to locate such features as the heart, lung outline, and diaphragm in both projections. The feature extration techniques employ feature locaton by means of directional signatures, edge detection by weighting the derivatives of the picture points with a Gaussian function, and binary conversion. Machine calculated results are consistently lower than hand calculated results, but the high correlation coefficient (0.971) suggests that true TLC may be linearly related to machine calculated values. 12p2

CANADIAN A.I. SOCIETY FORMED

Canadian Society for Computational Studies of Intelligence
(Societe Canadienne des Etudes d'Intelligence par Ordinateur)
by
Zenon Pylyshyn
Departments of Psychology and Computer Science
The University of Western Ontario
London, Canada 13

The AI group at the University of Western Ontario, London, Canada recently invited a number of people from several Canadian universities to get together at U.W.O. to discuss the present state and future prospects for AI research in Canada. The response was more than we had hoped for. More than 30 people arrived on May 23, 1973 for a three-day meeting. Tutorial and position talks were given on six topics: Mathematical Studies (T. Pietrykowski, Waterloo; R. Reiter, U.B.C.); Psychological Modeling (Z. Pylyshyn, U.W.O.; G. Baylor, J. Gascon, U. Montreal); Pattern Recognition and Machine Perception (E.W. Elcock, U.W.O.; W.A. Davis, U. Alberta; M. Levine, McGill; R. Paulsen, McGill); Languages for AI (J. Mylopoulos, Toronto; E.W. Elcock, U.W.O.); AI Education (R. Rosenberg, U.B.C.); and Applications in Teleconferencing (B. Bridgewater, P. Allard, C. Billowes,

Communications Research Centre, Department of Communications, Ottawa). 13a

Besides giving Canadian AI researchers an opportunity to find out what others in the country were doing, the most important result of the meeting was the formation of a new society dedicated to the advancement of research in human and machine intelligence. The society is to be called The Canadian Society for Computational Studies of Intelligence [Societe Canadienne des Etudes d'Intelligence par Ordinateur]. Besides promoting development and applications of research the society will maintain links with government and industry, will organize meetings, will set up special study groups to investigate issues relevant to the interests of the Society, and will publish a bulletin as a means of communication among members. A steering committee chaired by E. W. Elcock (Department of Computer Science, U.W.O.) with J. Hart (U.W.O.) as secretary/treasurer will oversee the initial development of the Society. Committee members include, G. Baylor, W. Davis, J. Gascon, M. Levine, J. Mylopoulos, T. Pietrykowski, R. Reiter, R. Rosenberg, and Z. Pylyshyn. 13b

One of the committee's first tasks will be to undertake a study of the computer resource needs of the Canadian AI community. Study groups have also been set up to investigate sources of research funding and to look into the possibilities for exchange of educational materials. 13c

Anyone who is interested in this fledgling society is invited to write the Editor of the bulletin requesting that his name be put on the mailing list: 13d

Professor R. Reiter
Computer Science Department
University of British Columbia
Vancouver, B.C., CANADA 13d1

If you wish to become a member send a $3.00 membership fee to the secretary/treasurer (Professor J. Hart, Computer Science Department, University of Western Ontario, London, Canada). 13e

ARTIFICIAL INTELLIGENCE JOURNAL

[Ed. Note: The following letter was handed out to each registrant at IJCAI-73 and is reprinted here for your further consideration.] 14

On behalf of the Editorial Board, listed below, we invite all registrants at IJCAI-73 to submit, and encourage colleagues to submit, research papers. We also invite IJCAI authors to submit their papers for possible publication in the more permanent form

of our Journal in addition to publication in the Conference Preprints. 14a

ARTIFICIAL INTELLIGENCE is the only international journal centrally devoted to AI. In spite of the great amount of activity in this field, and the considerable volume of research results reported at AI conferences and in university theses, laboratory reports and internal memoranda, the Journal is barely able to obtain enough high-quality material to maintain quarterly production at present. This seems to be largely due to very many workers in the field being entirely content, as far as communication is concerned, with exchange of internal reports and occasional attendance at conferences. Useful as these are, they need to be supplemented by recourse to a well-recognized regular journal for at least three good reasons: 14b

Firstly, workers in the field can be saved a great deal of time and trouble by having a high-quality sieve for selecting, generally, the best core of current work and results. Secondly, a properly supported and recognized journal provides a running overview of the state and development of the subject as a whole for specialists in particular departments of it. Last and by no means least, AI is a subject of such significance and implications for others--e.g., computer scientists, psychologists, linguists, and philosophers--who do not have access to the "inner" grapevine, that it would be irresponsible not to use the obvious means of a central journal to keep them abreast of the subject. 14c

Bernard Meltzer, Editor-in-Chief
Bertram Raphael, Associate Editor 14c1

Editorial Board: Professor M. Aiserman, Professor S. Amarel, Professor W. Bledsoe, Dr. R. Burstall, Dr. M. Clowes, Dr. E. Elcock, Professor E. Feigenbaum, Professor R. Gregory, Professor J. McCarthy, Professor D. Michie, Professor A. Newell, Dr. N. Nilsson, Dr. J. Pitrat, Dr. E. Sandewall, Dr. D. Walker, Professor T. Winograd. 14d

AI ON TV 15

The offerings for the new Fall season are pretty slim. As reported earlier, <*N1> "The Six Million Dollar Man" has been slated to appear on ABC on Saturdays once a month from 8:30-10:30 PM. However, "Genesis II" does not appear to have made it for this Fall. 15a

The only other offerings, "The Starlost," is set in the year 2285 and described by its creator, writer Harlan Ellison, as "the story of three young people discovering their world, and their place in

it." A Canadian production, it stars Keir Dullea, Gay Rovan, and Robin Ward. 15b

<N1> SIGART Newsletter, No. 39, p. 36, April 1973. 15c

ASIMOV'S "I, ROBOT" 16

Long out of print and in great demand, Isaac Asimov's famous science fiction classic has now been reprinted in paperback by Fawcett Crest Publications, Inc., Grenwich, Connecticut; 75 cents. Most of the ten short stories contined in "I, Robot" were originally published during the decade of the 1940s in ASTOUNDING SCIENCE FICTION. However, there is very little about them that seems "dated," as is the case with many other now quaint stories from this time period. Of course, "The Rest of the Robots" (Pyramid Books, New York, 1964, paperback, 75 cents), which picks up where "I, Robot" leaves off with eight more stories exploring the theme of Asimov's now famous "three laws of robotics," is still availale. 16a

ADVERTISEMENTS 17

SIGART NEWSLETTER Number 42 October 1973

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The SIGART Newsletter is a bimonthly publication of the Special Interest Group on Artificial Intelligence of the Association for Computing Machinery. The Newsletter reports on projects being conducted by the artificial intelligence research community and generally reviews current progress in the state-of-the-art. Correspondents report news from local SIGART Chapters and other AI Centers.

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SIGART CHAIRMAN: Bob Balzer 1b1a

USC Information Science Institute
4676 Admiralty Way
Marina del Rey, California 90291
Telephone: 213-822-1511 1b1a1

SIGART NEWSLETTER Number 43 December 1973

NEWSLETTER EDITOR: Steve Coles ASSOCIATE EDITOR: Rich Fikes 1b1b

Artificial Intelligence Center
Stanford Research Institute
Menlo Park, California 94025
Telephone: 415-326-6200 exts. 4601, 4620 1b1b1

ASSISTANT EDITOR FOR ONLINE OPERATIONS: Kirk Kelley 1b1c

Augmentation Research Center
Stanford Research Institute
Menlo Park, California 94025
Telephone: 415-326-6200 ext. 3630 1b1c1

The Editors encourage contributions from authors, including Letters to the Editor (AI Forum), Technical Contributions (1 to 6 pages), Abstracts (preferably 100-200 words), Book Reviews, Bibliographies of Special Topics in AI, News Items (Conferences, Meetings, Course Announcements, Personals, etc.), Advertisements (New Products or Classified Advertising), Puzzles, Poems, Cartoons, etc. Material may be reproduced from the Newsletter for non-commercial purposes with credit to the author and SIGART. 1b2

Anyone interested in acting as editor for a special issue of the Newsletter devoted to a particular topic in AI is invited to contact the Editor. Letters to the Editor will be considered as submitted for publication unless they contain a request to the contrary. Technical papers appearing in this issue are unrefereed working papers, and opinions expressed in contributions are to be construed as those of the individual author rather than the official position of SIGART, the ACM, or any organization with which the writer may be affiliated. 1b3

You are invited to join and participate actively. SIGART membership is open to members of the ACM upon payment of dues of $3.00 per year and to non-ACM members upon payment of dues of $5.00 per year. To indicate a change of address or if you wish to become a member of SIGART, please complete the form on the bottom of the last page of this issue. 1b4

Copy deadline for the February Issue: January 25th. 1b5

CHAIRMAN'S MESSAGE 2

This is the traditional time of year to wish everyone a Happy

Holiday Season and a Prosperous New Year. It is also a time for reflection; for stepping back from our day-by-day activities to examine our accomplishments and failures and goals. Throughout the year, the press of immediate needs screens out longer term issues. For this reason, the break in our daily schedule at this Holiday Season is an important opportunity to evaluate ourselves and our efforts this past year. 2a

I know of no greater wish than for you to find, in addition to health and happiness, that you've grown in capability, responsibility, and in service, and that you've addressed important issues without getting lost in the immediate details. The failure to see and heed the larger picture is usually a major limitation on our ability to grow and advance. 2b

Organizations, much like individuals, are largely preoccupied with immediate problems. It is therefore most appropriate that SIGART is currently undergoing such self evaluation (through last issue's questionnaire) of its goals, directions, and accomplishments. The increasing importance of AI techniques in applications and other disciplines gives us many opportunities, both as individuals and as an organization, to grow in new directions. I hope the New Year finds each of us willing and able to accept these challenges. 2c

R.M.B. 11/20/73 2d

EDITOR'S ENTRY 3

1. Foerster Public Lecture at Berkeley: "Computers and the Mind" 3a

The Foerster Memorial Lectureship Series (on the Immortality of the Soul) was innaugurated at the University of California in 1928. Since that time, except for a brief lapse between 1965 and 1968, this series has played host to such distinguished theologians as Rev. Fulton J. Sheen, Bishop James A. Pike, and Dr. Paul J. Tillich (Harvard Divinity School). However, other noted lecturers such as Aldous Huxley (writer), Loren C. Eiseley (anthropologist), and Sir John C. Eccles (well-known neurobiologist from SUNY at Buffalo) have contributed to the series. 3a1

In an attempt to update the series, the 1973 lecture on October 25th was a debate on "Computers and the Mind" held at Zellerbach Playhouse on the Berkeley campus. Participants included Professors Seymour Papert (AI Laboratory at MIT), Hillary Putnam (Philosophy Department, Harvard), and Donald M. MacKay [pronounced MacEye] (Professor of Communication at the University of Keele, Staffordshire, England). 3a2

The format called for three one-hour presentations, one by each participant, followed by a general discussion (unfortunately, the audience was never included). Starting at 3:00 PM and with approximately 2 1/2 hours scheduled for dinner (the speakers were sequestered by one of the deans to a private dinner party), things didn't finish up until after 10:00 PM, and this was quite a long time for such an enthusiastic audience to absorb one-way communication. Nevertheless, the talks (and later interaction) were well worth the audience's effort. 3a3

In the first lecture, subtitled "The Simplicity of Mind" or "Talking about Talking about Artificial Intelligence", Prof. Papert called for a new epistemological approach to AI <*N1> to replace the old inadequate approach of trying to find a single powerful deductive procedure with sufficient generality to account for human intelligence. He gave numerous examples such as bicycle riding, catching a baseball, and elementary scene analysis to illustrate the apparent simplicity of what might be imagined to be extraordinarily complex feats. He then cited Herbert Simon's hypothesis <*N2> that the observed complexity of human behavior may reside largely in the complexity of man's environment rather than in his intelligence per se. 3a4

In talking further about the "artificiality" of human intelligence, he asked us to consider two skilled chess players, both of equal caliber, but one who acquired his talent through a careful and lengthy reading of chess books, while the other had only played a half-dozen games in his whole life. At first blush it may seem that the well-read player has capitalized on his rather pedestrian direct "knowledge" of the game, while the brilliant newcomer relied solely on native "intelligence". Yet how can we characterize the new-comer's "knowledge" of game-playing strategy and tactics in general? Could this not also be regarded as an exercise of knowledge too, but of a different sort? 3a5

Papert then suggested that AI is akin to the field of lexicography of several hundred years ago, before dictionaries were written down. In both cases a great deal of common sense knowledge has yet to be encoded in a form that one can deal with. Until we tried to write computer programs to operate in the real world, we never needed to "understand the ordinary." Papert also presented a metaphor between AI and aeronautics, suggesting that just as studying the structure of feathers is not the way to learn how birds fly, so studying neurons in order to learn how people think is a limited preoccupation. 3a6

In conclusion from among the numerous other models that have been proposed, Papert urged the audience to regard as the best

model of the human mind, a complex network of interacting computer programs. 3a7

In the second presentation, Prof. Putnam generally supported Prof. Papert, giving examples from number theory (Wilson's Theorem), Newton's contribution to Kepler's Laws (concerning the elliptical orbits of planets around the sun), and the explanation of why a square peg won't fit through a round hole (from a modern physics point of view). However, he found it difficult to believe that general-purpose intelligence could result from the accumulation of a large number of sub-programs, each of which had a severely restricted solution space. He argued that prehistoric man, whose brain evolved millions of years ago in an environment with no hint of the sort of complexity that characterizes modern civilization, nevertheless in principle has the capability to be educated (by sending him to a university or whatever) in order to deal successfully with today's world. He suggested that it is this "capacity to know" that is involved in intelligence and not a linking of innumerable, restricted subroutines in a network under a "big switch." He concluded by appealing to automata theory to point out that the distinction between "brain stuff" and "soul stuff" is really irrelevant for psychology. 3a8

Prof. MacKay, a Christian theologian as well as a computer scientist, was quite interested in the structure of personal self-awareness or consciousness in men and machines (what he referred to as the "I story") and stated that it is still an open question as to whether machines could be programmed to have an "I story." He then observed that it should be as easy for God (since he made us) to achieve immortality of the human soul (as he already demonstrated by resurrecting Jesus Christ and reembodying his soul) as it is for a human programmer to run his programs on a different machine. This led to the conclusion that all mechanistically-based science, including AI, is in no way incompatible with theistic beliefs, arguments by uninformed theologians notwithstanding. To the contrary, it is quite congenial, and Prof. MacKay distinctly encouraged research in AI, which was quite refreshing. 3a9

During the joint discussion period which followed, Prof. Papert made a number of incisive observations (the two other participants occasionally had difficulty in getting him to relinquish the microphone) including, "just as the history of programming languages has been an attempt to make programs as remote as possible from the digital character of machine hardware, human children strive through learning to escape from their own biological heritage." 3a10

In the closing minutes a debate emerged between MacKay and Papert on the extent to which (rational) humans might feel that their dignity was lessened by the advent of highly intelligent machines. MacKay argued that even if Papert were an intelligent android (humanoid automaton) instead of a human being, his own self-esteem would in no way be threatened. Papert never really had time to bring his argument to its natural conclusion, but he wondered how society as a whole might respond to such a development. 3a11

NOTES 3a12

<N1> Papert's use of this term in AI is somewhat different, although similar in spirit, to the use John McCarthy has made of it over the years to distinguish the "engineering" or "heuristic" component of AI from the part concerned with causal reasoning or the relation between "knowledge" and "belief." 3a12a

<N2> H. A. Simon, THE SCIENCES OF THE ARTIFICIAL, (MIT Press, 1969), p. 25. 3a12b

<N3> He clearly was interested in including non-digital as well as digital machines in his notion. 3a12c

2. AI at the IEEE SMC Meeting in Boston 3b

Dr. Amand Mundra (Mitre Corporation, McLean, Virginia) and I recently served as co-chairmen of a session on Artificial Intelligence at the IEEE Systems, Man, and Cybernetics Society 1973 International Conference held in Boston, Massachusetts, November 5-7, 1973. The following papers were presented: 3b1

(1) "Problem Generation and Solution" by J. M. Perry and Elliot B. Koffman, University of Connecticut at Storrs. 3b1a

(2) "A Computer Controlled Rotating-Belt Hand for Orienting Objects" by John R. Birk, University of Rhode Island at Kingston. 3b1b

(3) "Theory Formation by Machine: A General Framework of the Golem System" by Alois Glanc, The City University of New York in Flushing. 3b1c

(4) "An Artificial Intelligence Approach to Automatic Speech Recognition" by Steven E. Levinson, University of Rhode Island at Kingston. 3b1d

(5) "The Four Faces of HAL" by Howard A. Peelle and Edward M. Riseman, University of Massachusetts at Amherst. 3b1e

(6) "An Augmented Active Image Transmission System for Visual Man-Machine Interaction" by Harold Alsberg of JPL and California Institute of Technology, Pasadena, California. 3b1f

Other papers in the Proceedings of the Conference relevant to AI but not presented in this session, are as follows: 3b2

(1) "Man and Computer Construction Techniques for the Generation of Crosswood Puzzles" by Lawrence J. Mazlack, University of Guelph, Ontario, Canada. 3b2a

(2) "A Structure of Memory in Concept Formation" by T. M. Khalil, University of Florida at Gainsville and Vladimir Lovitsky, Kharkow Institute of Radioelectronics, U.S.S.R. 3b2b

(3) "A Method of Concept Formation Based on Functional Decomposstion" by Edwin Towster, University of Iowa in Iowa City. 3b2c

Copies of the Proceedings may be obtained by writing to Mr. David Downing, Publicatons Chairman, Boston University, Boston, Massachusetts. 3b3

One of the highlights of the entire conference was the concluding session, a five-hour commemorative symposium celebrating the 25th anniversary of the publication of Norbert Wiener's book "Cybernetics: Control and Communication in the Animal and Machine." Chaired by Prof. B. Chandrasekharan of Ohio State, the session drew on a number of eminent speakers, most of whom knew Norbert Weiner personally and were able to relate first-hand anecdotes concerning Wiener's personal ideosyncrasies as well as take an objective view of what transpired during this quarter century regarding the promises of cybernetics, which ones have been satisfied and which were not. The list of distinguished speakers included: Michael Arbib (University of Massachusetts), Hans Bremermann (University of California at Berkeley), Collin Cherry (Imperial College, London), Michael Watanabe (University of Hawaii), Karl Deusch (Harvard University), Rudolf Kalman (University of Florida), and Marvin Minsky (MIT). 3b4

I'm not sure whether it was a side effect of Prof. Minsky being the concluding speaker or whether those present were truly more interested in discussing AI than pure cybernetics, but when the floor was opened up to the general audience, the vast majority of the questions pertained to AI and were directed to Prof.

Minsky, who as usual did an admirable job of representing the field. 3b5

3. On-Line SIGART Membership Directory 3c

You may recall a promise we made some time ago <*N1> to provide a directory of our 1831 members, giving up-to-date names and addresses, as an additional feature of the On-Line Newsletter. Although it wasn't easy <*N2>, we are pleased to report that our SIGART membership file now exists, and can be accessed over the ARPA Network at SRI-ARC on our directory 'SIGART' under the file 'MEMBERS'. However, we should say that it is indexed in a somewhat unusual way--by geographical location rather than alphabetically by name <*N3>. An interesting consequence of this indexing, however, is that one can browse near by his own name and discover other members of SIGART that are physically near by. We hope that you will find this additional capability useful. 3c1

NOTES 3c2

<N1> Advantage No. (5), Item 2, p. 4, SIGART Newsletter, No. 36, October 1972. 3c2a

<N2> After six months of negotiation and delay, due partially to a change over by the ACM to the IEEE computer system (for billing purposes), I stopped off at ACM Headquarters in New York City on my way back from the East Coast and picked up a computer tape of our membership. We then experienced just about every sort of tape incompatibility imaginable (9 track -> 7 track; 1600 -> 800 bpi density; BDC -> ASCII; etc.) before we succeeded in getting it on our own PDP-10. Clearly, it will be trivial if we ever need to do this again. Incidentally, the folks back at the New York Headquarters are a great bunch of people and don't deserve the vituperation normally heaped on them by those few irate members whose billing account goes astray or whose journals get lost in the mails. 3c2b

<N3> The file is actually listed alphabetically by State, and within each State in order of increasing zip code. 3c2c

4. LISP for IBM 360 3d

The University of Michigan has recently developed a new version of LISP for the 360 now running under the Michigan Terminal System. The major goals were efficiency, compatibility with other LISP systems (MIT, BBN, Carnegie, etc.), and powerful I/O and error recovery procedures. The interpreter is written in

360 assembly language and is now available. The compiler is under development. For a user's manual or other documentation contact: 3d1

Bruce Wilcox
Mental Health Research Institute
Ann Arbor, Michigan 3d1a

5. New SIGART Newsletter Reporters 3e

(1) At MIT, Ms. Andee Rubin replaces Dr. Eugene Charniak.
(2) At Stanford, University Horace Enea replaces Ms. Peggy Karp. 3e1

6. Questionnaires 3f

Please don't forget to send in your October-Issue Questionnaire. As of this date, they are starting to pour in. We hope to have a preliminary summary of the results by the next issue. 3f1

7. Holiday Greetings 3g

Rich Fikes and I would like to join with Bob Balzer in wishing you and yours a safe and happy holiday season. 3g1

L.S.C. 11/29/73 3h

INTERLISP by Warren Teitelman
Xerox Research Center
Palo Alto, California 4

INTERLISP (INTERactive LISP) is a LISP system currently implemented on the DEC PDP-10 under the BBN TENEX time sharing system<*R1>. INTERLISP is designed to provide the user access to the large virtual memory allowed by TENEX, with a relatively small penalty in speed (using special paging techniques described in <*R2>). Additional data types have been added, including strings, arrays, and hash association tables (hash links). The system includes a compatible compiler and interpreter. Machine code can be intermixed with INTERLISP expressions via the assemble directive of the compiler. The compiler also contains a facility for "block compilation" which allows a group of functions to be compiled as a unit, suppressing internal names. Each successive level of computation, from interpreted through compiled, to block-compiled provides greater speed at a cost of debugging ease. 4a

INTERLISP has been designed to be a good on-line interactive system. Some of the features provided include elaborate debugging

facilities with tracing and conditional breakpoints, and a sophisticated LISP-oriented editor within the system. Utilization of uniform error processing through user accessible routines has allowed the implementation of "DWIM," a Do-What-I-Mean facility, which automatically corrects many types of errors without losing the context of computation. The CLISP facility extends the LISP syntax by enabling ALGOL-like infix operators such as +, -, *, /, =, ←, AND, OR, etc., as well as IF-THEN-ELSE statements and FOR-WHILE-DO statements. CLISP expressions are automatically converted to equivalent LISP forms when they are first encountered. CLISP also includes list construction operators, a LISP oriented pattern match compiler, and facilities for record declarations. 4b

A novel and useful facility of the INTERLISP system is the programmer's assistant which functions as the interface between the user and the system, and monitors and records all user inputs. The user can instruct the programmer's assistant to repeat a particular operation or sequence of operations, with possible modifications, or to UNDO the effects of specified operations. The goal of the programmer's assistant, DWIM, CLISP, etc. is to provide a programming environment which will "cooperate" with the user in the development of his programs, and free him to concentrate more fully on the conceptual difficulties and creative aspects of the problem he is trying to solve. 4c

INTERLISP is the successor to BBN LISP<*R3>, a system developed first at Bolt Beranek and Newman for the SDS 940, and subsequently for the DEC PDP-10. System development and maintenance is continuing at Xerox Palo Alto Research Center and Bolt Beranek and Newman; implementations for other machines are in progress at the University of California, San Diego (for the Burroughs 6700), at the University of Uppsala, Sweden, (for the IBM 370 series), and at Xerox PARC, for the Data General Nova. 4d

A users group has been formed for INTERLISP consisting of all people on the official mailing list maintained by the executive committee (see below). The purpose of the users group is to promote communication among the users, help maintain a standard basic system, and make available other documented packages such as FLIP, a complete format directed list processing system <*R4>, TRANSOR, a subsystem which aids in converting programs written in other LISP dialects (e.g., LISP 1.5, Standard LISP) to INTERLISP, and INTERSCOPE, a question-answering system whose data base is the user's programs. 4e

Documentation for INTERLISP is available from Warren Teitelman. A new version of INTERLISP will soon be released that implements the general control-structure scheme described in <*R5>, thereby

enabling and encouraging use of backtracking, coroutines, and other types of multiple environments. 4f

INTERLISP Executive Committee: 4g

Alice K. Hartley Bolt Beranek and Newman
50 Moulton Street
Cambridge, Mass. 02138 4g1

Warren Teitelman Xerox Palo Alto Research Center
3180 Porter Drive
Palo Alto, Calif. 94304 4g2

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<R2> Bobrow, D. G., and Murphy, D. L., "The Structure of a LISP System Using Two Level Storage," Communications of the ACM, Vol.15, No.3, March 1967. 4h2

<R3> Bobrow, D. G., Hartley, A. K., Murphy, D. L., Teitelman, W., BBN-LISP TENEX Reference Manual, Bolt Beranek & Newman, July 1971, revised February 1972. 4h3

<R4>Teitelman, W., FLIP, A Format Directed List Processor in LISP, BBN Report, 1967. 4h4

<R5> Bobrow, D. G. and Raphael, B., "New Programming Languages for AI Research," given by D. G. Bobrow at IJCAI-73, August 1973, Stanford University, Xerox PARC Report No. CSL-73-2, August 1973. 4h5

EUROPEAN AISB SUMMER SCHOOL ON KNOWLEDGE SYSTEMS by Keith Oatley

Laboratory of Experimental Psychology
University of Sussex, England 5

A most successful meeting was held by the Study Group on Artificial Intelligence and Simulation of Behavior at Oxford University this summer. It took the form of a number of Britain's more distinguished workers in AI, Dr. M. B. Clowes, Mr. P. Hayes, Professor H. C. Longuet-Higgins, Mr. A. Mackworth, and Professor D. Michie each giving a series of lectures and leading discussions on the problems of how human and artificial intelligence organize and use knowledge. 5a

The School was limited in numbers to 50 participants, many of them

lecturers and research leaders in departments of psychology and computer science. Perhaps the limitation was unfortunate because the very much larger number of applicants meant that many people had to be turned down. However the response did also indicate a very substantial and growing interest in AI in Britain, which the AISB group is now serving. 5b

A good deal of effort in AI at the moment is devoted to problems which people find very easy, but which computationally are very difficult - in particular perception and language. Some of the principles that have emerged from this work indicate the extremely rich and detailed knowledge of the world and of specific problems that need to be embodied in a machine to perform even the simplest linguistic or perceptual tasks in any plausible fashion. Indeed, artificial intelligence work on vision indicates in a striking way the real intelligence of human vision. This was brought out in the lectures of Alan Mackworth of the University of Sussex in which he traced the development of work on scene analysis, the task of forming descriptions of the objects and 3-dimensional structure of a scene by interpreting a 2-dimensional digitized photograph. 5c

It turns out that to do this task successfully there must be embodied in the program not only some understanding of the three-dimensional geometry of the world, but of the kinds of entities it might expect to encounter. It must have knowledge of what two-dimensional appearances result from translations and rotations of various 3-dimensional entities (be they whole objects as in Robert's program, corners as in Clowes's, or surfaces as in Mackworth's), it must know about viewpoint, perspective, lighting, and physical processes such as occlusion and support. Typically successful scene analysis programs have mobilized a varity of these specialized types of knowledge to make interpretations of the grey-scale patterns they were given. Typically also the knowledge in question has needed to be flexibly available at a number of different levels of the program. 5d

Thus rather than simply being able to categorize patterns in the picture, scene analysis needs to bring to the task a great deal of understanding about the universe it is dealing with. The same kind of conclusion follows from question answering programs, such as the widely-known one by Winograd. Much of the present excitement of Artificial Intelligence (and its importance for related disciplines) is due to the real progress being made with the problems of organizing and using knowledge in perceptual and question answering systems which although artificial, we can now say with a straight face, are also beginning to be intelligent. 5e

Winograd's program was based on Hewitt's computing language

PLANNER. This language was motivated partly by the idea of embedding specific knowledge about tasks in procedures which could be called easily from many parts of the program. Pat Hayes of the University of Essex spoke about the important recent developments in programming languages of this kind. 5f

Some of the directions of artificial intelligence are becoming very clear: on the one hand it constitutes a theoretical vehicle for psychology. On the other it opens new vistas of computation in the engineering sense which are quite different, and altogether more challenging than the number-crunching and stock-control applications which dominate much of current computational practice. 5g

GROUP D'INTELLIGENCE ARTIFICIELLE - UNIVERSITE D'AIX-MARSEILLE 6

There are about ten people in the group, most of whom are teaching in the Mathematics and Computer Science Departments. These are the projects which are currently being worked on: 6a

- the programming language PROLOG and its interpretor, based on a mechanical theorem-provng approach. 6a1

- a question-answering system in French with automatic inference (all written in PROLOG). 6a2

- a heuristic theorem prover (also written in PROLOG). 6a3

- the development of basic software for a small TI600 computer made by the French Company, Telemecanique. 6a4

CHESS 7

RESPONSE TO SIMON AND CHASE <*R1> 7a

Prof. Gordon W. Gribble (Department of Chemistry: Dartmouth College; Hanover, New Hampshire) has written a letter entitled "Chess Prodigies" published in the November-December 1973 issue of AMERICAN SCIENTIST (pp. 644-646) in which the author seeks to discredit the Simon-Chase premise that "no one has reached grandmaster level with less than about a decade's intense preoccupation with the game," by citing the examples of Sam Reshevsky and Jose Capablanca. 7a1

He also takes issue with the "chunking" of familiar patterns in short term memory by citing the counter example of the astonishing performance of blindfold masters like Najdorf and Koltanowski. Simon and Chase successfully refute these objections, however, in an accompanying letter (pp. 446-447). 7a2

<R1> SIGART Newsletter, No. 41, August 1973, p.37. 7a3

FOURTH U.S. COMPUTER CHESS CHAMPIONSHIP 7b

The 2nd-Place Playoff for the 4th U.S. Computer Chess Championship at ACM '73 has now been completed. The standings are as follows: 7b1

1. TECH II Points 7b1a

PDP-10, Alan Baisley, MIT 2 7b1a1

2. CHAOS 7b1b

Univac 1108, I. Ruben et al, Sperry-Rand 1 7b1b1

3. OSTRICH 7b1c

Data General Supernova, 0
George Arnold and Monty Newborn,
Columbia University 7b1c1

Following the three games from the playoff are the six games from the first round of the tournament. We will publish games from rounds 2 and 3 in subsequent issues. 7b2

READER COMMENTARY ON THE CICHELLI HEURISTICS by Richard Cichelli
901 Whittier Drive
Allentown, Pennsylvania 18103 7c

Alex Bell (July 20,1973) on implementing some of my suggested changes to his two move mate solver: "I've got the 'refutation man' working in PL/1 on the IBM 360/195 and that alone seems to give improvements equal to the ones you describe. E.g., 'Bell Figure 1' has dropped from 7 seconds to about 2 seconds and three move mates are averaging about 1 minute." 7c1

James Gillogly (July 3, 1973): "The Killer heuristic is the same as your refutations, but applied locally rather than globally. One would expect this to give even better results than a global application because of the closer similarity of starting positions; but in TECH the improvement is not statistically significant in most cases..." 7c2

I quote from my letter of August 20 to Alex, and my reply to Jim was similar in content. 7c3

"Refutation and killer heuristics are, in my view, static ordering devices designed to find cheaply, likely moves which

will generate alpha-beta cutoffs. Both you and Jim Gillogly have contributed to my thinking, which I here clarify. 7c4

There appear to be two conflicting goals in these heuristics which I call specificity and applicability. Given that we wish to associate some move, set of moves, or value with some pattern, then specificity measures how accurately the pattern is recognized and applicability measures the number of times the heuristic returns a recommended action. Obviously, the more specific the heuristic the more accurate its recommendation and the lower its applicability. We can thus see the following progression in decreasing specificity of chess patterns. 7c5

Actual position -> move -> square-to -> man-moved -> unspecified 7c6

Gillogly's use of Al Zobrist's exclusing ORing on move bit patterns lets him recognize identical positions (by hashing-error less than .01%) in the game tree and assign the previous back-up value with no further search. (Note: the ORing method solves your equivalent positions by differing paths problem.) Jim's few accurate hits don't pay for his overhead. 7c7

Move, square-to, and man-moved are the three levels of specificity my "refutation heuristic" uses. I make associations with moves, not simply movers, hoping that lack of specificity would be compensated for with limiting applicability. The intuitive notion here is that if some man is moved, then it ceases to perform some of its functions (e.g., defending or attacking) and the opponent's reply which proves this fact has a high enough incidence in the game tree to be a likely candidate to generate a prune. Similarly, if a capture occurs on some square-to, then for any mover to this square, the capture is likely to exist. For the sake of completeness, I include "unspecified" to suggest that moves may simply be ranked, global to the tree, without any reference to local board or move conditions. 7c8

Of course, in addition to my refutation static ordering which is global to the search tree, 'DEPTH - 2' data from two plies above is also used in static ordering and 'DEPTH + 2' data is passed back for dynamic ordering." 7c9

Note for those implementing chess programs based on Bell's Algorithm: The published program fails to reverse searched plies which are captures with promotion, therefore failing on my problem #7. 7c9a

Antony Marsland (at the ACM 73 tournament): "What determined the arbitrary order of search in the control run of the problem set? What about random ordering?" 7c10

I replied: If square a1 is numbered 1 and square h8 is 64, then the plies of the piece occupying the highest numbered square are searched first. (This results from loading Bell piece lists with an algorithm which reads Cooper-Kozdrowicki board input notation. E.g., problem #4 of the problem set in COKO is 7c11

4N34P384P3884Q34K3.88884K34P388). 7c11a

Further notes on the program: 7c12

A brute force tournament program should be able to search nearly 250,000 nodes in three minutes. The Pascal implementation of my program is 1/40th this fast; to achieve tournament rate would require a rewrite in COMPASS (CDC assembler). However, Pascal has proven to be an ideal development tool for writing easily modifiable, readable, structured programs. 7c12a

Acknowledgments: 7c13

I wish to thank Lehigh University for their continued computer time funding of this project. 7c13a

[Ed. Note: A typographical error was made in the summary of Richard Cichelli's preliminary results in October SIGART Newsletter, s. (10d). The second sentence of the third paragraph should read: 7c14

"Without the heuristics, the program solved the 10 problems by generating 74,485 nodes at a rate of 41.5 nodes per second. With the heuristics, the program solved the problems by generating 33,724 nodes at 35 nodes per second. The overall improvement is 212%." We regret the error.] 7c15

LESSONS FROM PERCEPTION FOR CHESS-PLAYING PROGRAMS (AND VICE VERSA) by Herbert A. Simon
1972-73 Computer Science Research Review, pp.35-40
Department of Computer Science
Carnegie-Mellon University
Pittsburgh, Pennsylvania 7d

For nearly twenty years, artificial intelligence and cognitive psychology have maintained a close symbiotic relationship to each other. It has often been remarked that their cooperation

stems from no logical necessity. That a human being and a computer are both able to perform a certain task implies nothing for the identity, or even similarity, of their respective performance processes. Each may have capabilities not shared by the other, and may build its performances on those peculiar capabilities rather than upon those they hold in common. 7d1

In spite of this logical possibility of total irrelevance of the one field for the other, during the last two decades there has been massive borrowing in both directions. Artificial intelligence programs capable of humanoid performance in particular task domains have provided valuable hypotheses about the processes that humans might use to perform these same tasks, and some of these hypotheses have subsequently been supported by evidence. Bobrow's STUDENT program, for example, which translated story problems into algebraic equations, provided a model, later tested by Paige & Simon for some of the human syntactic processes in performing that task. 7d2

Conversely, hypotheses and data about human performance have been important inputs to artificial intelligence efforts. The General Problem Solver, for example, received its early shape from analyses of human thinking-aloud protocols in a problem solving task. 7d3

The distance between AI and cognitive psychology has not been the same in all task domains. Until quite recently, for instance, AI research on theorem proving developed in directions quite different from those suggested by the study of human behavior in theorem proving tasks. There is little that is humanoid about resolution theorem proving. 7d4

In the domain of chess playing, the distance between AI and cognitive psychology has been neither so close as in the GPS example, nor so distant as in theorem proving. The early chess playing programs, in their reliance on brute force and machine speed, borrowed little from what was known of human chess playing processes. The clear demonstration by their relatively weak levels of performance that speed was not enough, produced a gradual movement toward incorporating into the programs some of the selective task-dependent heuristics that humans rely heavily upon in their chess playing. However, the strongest chess programs in existence today still rely heavily upon extensive rapid search, usually over thousands or tens of thousands of branches of the game tree. 7d5

I should like to describe [in this paper] some efforts on the other side of the line--attempts to explore chess playing

mechanisms that can explain human chess performance. These mechanisms may turn out to have important implications for the future of chess playing programs motivated by AI goals. Their own motivation, however, was largely psychological. 7d6

THOUGHTS ON COMPUTER PROGRAMS THAT PLAY CHESS by Francis D. Tuggle
Departments of Computer Science and Business Administration
The University of Kansas at Lawrence 7e

I have never written a computer program to play chess, so read these remarks with a degree of tolerance and annoyance, both of which are warranted. (But to justify my second comment below, I may be forced to author one sometime.) As I read descriptions of chess programs, tournaments, heuristics, results, etc. in the SIGART NEWLETTER, the journal ARTIFICIAL INTELLIGENCE, and elsewhere, I succumb to uneasy feelings. Two of these I have been able to identify, isolate, and discuss. 7e1

First, emphasis in the field seems to be shifting toward computer-computer chess matches. There are undoubtedly many good reasons for this state of affairs, but despite them, it strikes me as a diversion from the main task of constructing computer programs able to defeat skilled humans at the game of chess. Perhaps this represents stagnation. Faster hardware, larger memory, subtler code, and clever heuristics may only result in small gains on the same plateau. Whatever the reasons, the programs need to be benchmarked against people. (If there was a reliable human TECH <*R1> benchmark, and if there were reliable TECH "other programs" benchmarks, then the thrust of this comment would be blunted). 7e2

Second, I am struck by an essential "sameness" to most of the chess programs. Let me use some Newell and Simon <*R2> terminology. Most (all?) chess programs operate in the problem space of Move Selection: game trees get generated (heuristically) and positions get evaluated (heuristically) so a move can be selected and made. Yet chess, human chess anyway, is more than a sequence of moves; the moves are selected to help fulfill a strategy. Let me next employ the thoughts of Botvinnik <p.7--*R3>: "...the [chess] program must be modelled on human thought processes." It seems to me that what is needed is a second problem space for (intelligent) chess programs, call it a Strategy Selection space. In the second space, a strategy is selected (say, King-side attack), then it is passed to the first problem space (Move Selection), perhaps in the form of specifying certain parameters (e.g., a depth bound, an evaluation function, a plausible move generator). That is, the specifics of choice of move should depend upon what strategy one is trying to follow. 7e3

One could argue that strategy selection is implicit in the choice of evaluation function, etc., but in reading the play of human-computer chess games, I get the impression of disjointed play on the part of the computer. It does not seem to smoothly flow. One could also argue that there is but one strategy, namely to obtain checkmate. Yet this is as non-operational as a corporation which announces it will act so as to maximize its long term profit. At least the firm has the good sense to produce 5 year and 10 year plans and to produce annual targets based upon those plans. Should not chess programs also produce and utilize realizable strategic plans? One might also contend that researchers are attempting to build in "strategic" and "long-range planning" into chess programs. Botvinnik <p. 81--*R3> (or perhaps Krinitski, or the translator Brown) feels that long-range planning could be enhanced if the goal were adopted of "...strengthen[ing] oneself rather than gain[ing] immediate material advantage." This may improve long-range planning, but it certainly is not the real-time selection of a strategy. 7e4

Let me heroically suppose that I have convinced you of the need for a second problem space for Strategy Selection. What would ensue therein? In that problem space, a determination would be made of several items; stage of the game (opening--e.g., no major pieces moved, midgame--e.g., Queen moved, endgame--e.g., both Queens off the board), state of the game (e.g., White is ahead by 2 pawns), history list of previously employed strategy (to provide some possible continuity), and an estimate of the opponent's strategy. These estimates would then be linked, via a decision process, to a strategy (e.g., an attack, the development of pieces, the coordination of pieces, obtaining or maintaining control of the center, responding to an attack, guarding a position, etc.). Since there are various tactics or plans by which any strategy could be accomplished, a second decision process might be employed to select a currently feasible plan. 7e5

It appears then that the major obstacles to be overcome in using this approach would be these: (i) the development of the list of alternative strategies to be considered; similarly, plans or tactics for each alternative might be developed, (ii) the features of the game and opponent to be "noticed", (iii) how the choice of a strategy influences search in the Move Selection problem space, and (iv) what decision process is used to relate the features of the game to the choice of a strategy. (My own research has been concerned with decision processes of this sort; see <*R4>. For one of the better articles discussing choice of corporate strategy, see <*R5>). 7e6

As an illustration of the use of decision process models in the study of strategy selection, refer to the paradigm of games against an uncertain nature, first stated by Von Neumann and Morgenstern <*R6>. For such games, there exist a number of different decision rules by which to select an action, e.g., maximax, maximin, minimax regret, etc. One can interpret these choice procedures as representing different strategies of play, e.g., the first is an optimistic one, the second is pessimistic, the third is ex post facto pessimistic, etc. Finally, given these several different strategies, Tuggle et al <*R4> offer an information processing simulation model of a subject selecting from a given set of alternative strategies. So it is possible to produce mechanisms which intelligently select from a set of strategies. 7e7

Now that you have seen the substance of this second, rather lengthy comment, let me briefly address some related issues. The above idea (of a second problem space) has some loose connections to the CP-1 program of Newell, Shaw, and Simon <*R7>, though it is clearly distinct from the ideas behind CP-1. That program was more of a "simulation of human thought" type than the others of its day; likewise, use of the second problem space method would (presumably) continue the tradition. 7e8

Zobrist and Carlson's <*R8> intriguing advice-taking chess program might be further improved if it could be given strategic as well as tactical advice (their program apparently is only receptive to tactical advice such as "keep your knights off the edge of the board".) It might also be cleaner conceptually to separate the program into two problem spaces. 7e9

Another way to interpret my two problem space suggestion is to view it as yet another heuristic; i.e., it should not be adopted until its benefits (strength of game played) are shown to outweigh its costs (increased processing time). My beliefs on this matter should be obvious (and I try to shore up their plausibility in the next paragraph), but, again, Botvinnik <p. xiii--*R3> goes to the crux: "the word is quickly spoken, but the deed takes longer." Ergo, I may be forced to write my own chess playing program. (Never having written a chess playing program, I am unexperienced in the practical difficulties that occur and the pragmatic compromises that must be effected, but at the same time, I have been able to maintain a sense of perspective over such programs, remaining a detached, objective observer.) 7e10

Lastly, anyone reading this who is even remotely linked to the "simulation of human thought" field will see another level to my comments. I am really suggesting that human thought, as

regards problem-solving and allied cognitive activities, occurs in two problem spaces--one in which the problem is actually solved (or attempted), and one in which progress on the problem is monitored, solution strategies are selected for use, etc. Based on the evidence Newell and Simon <*R2> present, the residence times in the second problem space for most of their subjects is pretty minimal. (However, see the protocol of S8 on pp. 367-374 and their discussion of it on preceding pages. One can find several behaviors on his (S8's) part consistent with this idea of monitoring problem-solving progress, e.g., B13-B15, B110-B121, B131-B133, etc.) But investigations of human play of chess, human behavior on "impossible" problems, and human behavior on problems that admit many strategies (e.g., decision problems) may disclose the empirical validity (or falsity) of my contentions. 7e11

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<R6> Von Neumann, J. and Morgenstern, O., THEORY OF GAMES AND ECONOMIC BEHAVIOR (Princeton, 1944). 7e12f

<R7> Newell, A., Shaw, J. C., and Simon, H. A., "Chess Playing Programs and the Problem of Complexity," in Feigenbaum and Feldman (eds.), COMPUTERS AND THOUGHT, (McGraw-Hill, 1963), pp. 39-70. 7e12g

<R8> Zobrist, A. L. and Carlson, F. R., Jr., "An Advice-Taking Chess Computer," SCIENTIFIC AMERICAN, Vol. 228, No. 6, June 1973, pp. 92-105. 7e12h

CONFERENCES 8

1. 2nd MILWAUKEE SYMPOSIUM ON AUTOMATIC CONTROL
March 29-30, 1974
The University of Wisconsin at Milwaukee
Milwaukee, Wisconsin 8a

Papers are being accepted on artificial intelligence, robotic systems, and speech processing. 8a1

Contact: Dr. Richard A. Northouse, Program Chairman
MSAC-74
Electrical Engineering Department
University of Wisconsin at Milwaukee
Milwaukee, Wisconsin 53201 8a2

2. 2nd EUROPEAN MEETING ON CYBERNETICS AND SYSTEMS RESEARCH
April 16-19, 1974
Vienna, Austria 8b

Contact: Dr. Robert Trappl, President
Austrian Society for Cybernetic Studies
Schottengasse 3
A-1010 Wien 1, Austria 8b1

3. 12th ANNUAL SIGCPR (COMPUTER PERSONNEL RESEARCH) CONFERENCE
July 18-19, 1974
Colorado University 8c

Contact: Robert W. Reinstedt, Chairman
SIGCPR Conference
RAND Corporation
1700 Main Street
Santa Monica, California 90406 8c1

4. FIRST ANNOUNCEMENT OF THE 2nd INTERNATIONAL JOINT CONFERENCE ON PATTERN RECOGNITION
August 13-15, 1974
Copenhagen, Denmark 8d

The Second International Joint Conference on Pattern Recognition will take place in Copenhagen in August 1974 under the chairmanship of Professor C. J. D. M. Verhagen, Delft University of Technology, The Netherlands. The Conference will cover all aspects of theoretical and applied pattern recognition. Papers on industrial applications, feature extraction, image processing, and scene analysis are particularly welcomed. It is intended that there will be a special session on pattern recognition applied to urban

environmental problems. In addition to invited papers, there will be submitted papers of 10 and 25 minutes duration; also, sessions are planned for student papers and presentation of last minute results. The deadline for submission of first drafts of papers is March 15, 1974. Authors will be notified by May 1 as to acceptance of their papers. Camera-ready copies must be submitted before June 15. Excursions will be arranged and a Ladies Program is being planned. 8d1

Additional information may be obtained from: 8d2

Mr. E. Backer
E. E. Department
Delft University of Technology
Delft, The Netherlands 8d2a

5. 5TH INTERDISCIPLINARY MEETING ON STRUCTURAL LEARNING
April 20-21 1974
University of Pennsylvania at Philadelphia 8e

(Post-sessions are scheduled for April 22-23, 1974.) The meeting will emphasize multidisciplinary contributions of a theoretical and empirical nature with implications for behavioral science and for education. Individuals proposing contributions or wishing to attend the meetings should contact: 8e1

Joseph M. Scadura
University of Pennsylvania
3700 Walnut Street
Philadelphia, Pensylvania 8e1a

6. CALL FOR PAPERS: 8TH PRINCETON CONFERENCE ON INFORMATION SCIENCES AND SYSTEMS
March 28-29, 1974
Princeton University, Princeton, New Jersey 8f

Authors are invited to submit abstracts and summaries for consideration by January 11, 1974 to 8f1

Prof. M. E. Van Valkenberg
Princeton Conference Program Director
Department of Electrical Engineering
Princeton University
Princeton, New Jersey 08540 8f1a

Special sessions are planned this year for the following topics: Applications of error correcting codes, source encoding, games and decision making, picture processing, computer system theory, theory of intractable problems,

transporatation systems, energy systems, state estimation, computer control, and resource planning and management. Papers need not nesessarily be in these areas to receive consideration. 8f2

7. CONFERENCE ON COMPUTER GRAPHICS AND INTERACTIVE TECHNIQUES
July 15-17, 1974
The University of Colorado at Boulder 8g

Contact: Robert L. Schiffman
Computing Center
University of Colorado
Boulder, Colorado 80302 8g1

8. EUROPEAN AISB SCIENTIFIC MEETING 8h

A one-day meeting will be held at the University of Edinburgh on Saturday, 5 January, 1974. The meeting, which is open to both members and non-members of the AISB will last from 9:30 A.M. to 6:00 P.M. 8h1

There will be four talks, followed by discussion, viz: 8h2

'World Models for Blind Robots', by Dr. M. H. E. Larcombe, of the School of Computer science, University of Warwick. 8h2a

'Problem Solving, And-Or Graphs, and Dynamic Programming', by Dr. U. Montanari, of the Instituto di Elaborazione della Informazione, Pisa. 8h2b

'Problem-Solving Paradigms', by Dr. R. Kowalski, of the Department of Computational Logic, University of Edinburgh. 8h2c

The fourth talk will probably be on structured programming by Professor Dijkstra, of the Department of Mathematics, Technische Hogeschol, Eindhoven. 8h2d

The registration fee of 4.00 will include lunch. Unfortunately, the University is unable to provide accommodation, but details of hotels and guest-houses in the Edinburgh area will be sent to prospective participants. 8h3

Further details are available from Lesley Daniel. 8h4

Those wishing to attend should send their fee to: - 8h5

Mrs. Lesley Daniel
Department of Computational Logic
School of Artificial Intelligence

University of Edinburgh
9 Hope Park Square, Meadow Lane
Edinburgh, EH8 9 NW
Scotland 8h5a

9. EUROPEAN ARTIFICIAL INTELLIGENCE AND SIMULATION OF BEHAVIOR (AISB) STUDY GROUP
7-10 July 1974
University of Sussex, Brighton, England 8i

CALL FOR PAPERS 8i1

Papers are requested from any of the following major research areas associated with Artificial Intelligence: 8i2

Natural-Language Understanding (Text and Speech)
Heuristic Problem Solving and Game Playing
Automatic Program Writing
Computer Perception (especially vision)
Artificial Intelligence and Psychology
Robots
Theoretical Foundations of Artificial Intelligence
Special Hardware and Software for AI
Applications of Artificial Intelligence
Social Consequences of AI 8i2a

(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.) 8i3

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 characterizing the content should be included. 8i4

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. 8i5

Besides submitted papers, the conference will feature tutorial talks on current topics in AI, special informal discussion sessions, and films. 8i6

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. 8i7

General enquiries about the Conference should be directed to: 8i8

Dr. K. Oatley
General Chairman, AISB Summer Conference, 74
Laboratory of Experimental Psychology
University of Sussex
Brighton, Sussex BN1 9QG,
England, U.K. 8i8a

Manuscripts and enquiries about the program should be directed to: 8i9

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 8i9a

Reservations to attend the Conference should be made by writing to: 8i10

Dr. Margaret Boden
School of Social Sciences
University of Sussex
Brighton, Sussex BN1 9QG
England, U.K. 8i10a

enclosing a conference fee of 4.00 for non-members of AISB, or 3.00 for members of AISB. This fee will entitle registered participants to attend the sessions, and to receive the booklet of pre-circulated papers. Those wishing to stay at the University will be expected to arrive during the evening of 7 July (though no meal will be provided on that evening) and leave after lunch on 10 July. The total charge for accommodation and meals will be of the order of 14.00 (including VAT), payable on arrival. Application and payment of conference fees should be made as soon as possible, and preferably not later than 30 March 1974. Reservations for accommodations can be accepted between this time and 15 June

1974 with a surcharge of 1.00. We unfortunately cannot guarantee accommodation to people applying after 15 June. 8i11

BOOK REVIEW 9

PURPOSIVE EXPLANATION IN PSYCHOLOGY by Margaret A. Boden
Harvard University Press
Cambridge Massachusetts, 1972 9a

Reviewed by Kenneth Mark Colby of the Stanford University AI Project 9b

Artificial Intelligence is a type of theoretical psychology studying mental symbol-processing functions in living and nonliving, real and abstract systems. Psychology's methods have been limited to experimental, survey, mathematical, interview, and participant-observation approaches. AI adds a new formal method in which theories are cast in the formalism of a programming language. Many workers in AI lack knowledge about psychological theories relevant to their interest. This is the perfect book for them. 9b1

Boden, a Lecturer in psychology and philosophy at the University of Sussex, England, provides a thorough and authoritative analysis of the concept of purpose which is fundamental in explaining both human behavior and the behavior of computer models emulating or simulating it. A great puzzle of the past, how final causes or purposes or goals can determine behavior, now becomes clear if one takes computer models as the key analogy. For it is not the goal-state, which has not yet come into being, which determines behavior but a system's CONCEPT or MODEL of the goal-state which directs its behavior. A convincing argument is then made to show that teleological and mechanistic explanations are complementary, and the latter cannot replace the former without losing explanatory power. 9b2

This scholarly work is packed with information not only about psychological issues central to AI, but also about surrounding and beclouded philosophical problems. Our philosophy and even metaphysics should be clear to us because they influence the system of concepts we choose in trying to understand the world. 9b3

Some of Dreyfus' inanities and confusions are dealt with firmly and without malice; for example, his confounding of a symbolic code with the information coded. Boden suggests McDougall's theory of the mind as an example of a rich theory to be simulated. I would have some reservations about this task, but only because the theory seems too holistic. Model building

involves a strategy of simplification and partial approximation by investigating part-processes. But it may be that in case of the mind, we will need all the parts or most of them to have an adequate simulation. 9b4

I not only highly recommend this book--I would insist that any AI theoretician worthy of the name must be familiar with it, and the issues it addresses. My one criticism is directed at the publisher who stodgily sticks to the convention of putting the notes at the end of the book, requiring a serious reader to keep fingers in three positions as he awkwardly flips back and forth between text, notes, and bibliography. 9b5

AI IN OTHER MEDIA 10

1. "The Robot Who Looked Like Me" short story by Robert Sheckley, COSMOPOLITAN MAGAZINE, pp. 192-195, August 1973. (An updated tale of infatuated androids.) 10a

2. "Do Androids Dream of Electric Sheep?" paperback novel by Philip K. Dick (Panther Books Ltd., 1972). 10b

3. "Murder in the Computer" ABC-TV late night movie, Tuesday, December 4, 1973. Garry Merrill plays a science writer who is one of six suspects in the murder of a computer genius. The computer plays chess and wins Look for the Summer rerun in 1974. 10c

ABSTRACTS 11

ON LOCATING OBJECTS BY THEIR DISTINGUISHING FEATURES IN MULTISENSORY IMAGES by Jay M. Tenenbaum
SRI Artificial Intelligence Center
Technical Note 84, September 1973 11a

This paper reports preliminary work on a knowledge-based perceptual system for a robot that must function in an actual office environment. This system is distinguished by the following pragmatic considerations: 11a1

1. It is designed to find specific objects needed by the robot in the performance of a task rather than attempting the usually unnecessary and very much harder job of completely describing an environment of potentially overwhelming complexity. 11a1a

2. It is based on the premise that in real scenes there is a sufficient redundancy of perceptual clues, as well as contextual constraints among objects, so that an intelligent system can devise a relatively simple strategy for

distinguishing the specific objects of interest from others likely to be present. 11a1b

3. It relies heavily on multisensory (i.e., color and range) data to increase the likelihood of finding distinguishing surface attributes for a particular object. Similarly, detailed descriptive representations for complex attributes (e.g., shape and color) are avoided in favor of the simplest representations sufficient to distinguish the object of interest. 11a1c

(Presented at the Japanese/American Seminar on Picture Processing and Scenee Analysis, Kyoto, Japan.) 11a1c1

COMPUTATION AND DEDUCTION by P. J. Hays
Essex University, England
(Appeared in Proceedings of The 2nd MFCS Symposium,
Czechoslovakian Academy of Sciences, 1971) 11b

I argue that the usual sharp distinction that is made between the processes of computation and deduction, is misleading. An intepreter for a programming language and a theorem-proving program for a logical language are structurally indistinguishable. Important benefits, both practical and theoretical, are obtained by combining the best of both methodologies. On the one hand, looking upon the activity of a programming language interpreter as being the generation of proofs of statements often clarifies the semantic structure of the language and allows the design of more efficient interpreters. On the other hand, regarding a theorem-prover as a device which is to be PROGRAMMED (i.e., whose behavior is to be CONTROLLED by its input language), enables the considerable body of work on computational logic technique to be put to practical use in Computer Science, and especially in Artificial Intelligence (AI) applications. In particular, one obtains a new perspective upon problem-solving languages such as PLANNER (Hewitt 1971) and CONNIVER (Sussman & McDermott 1972). 11b1

More specifically: I argue that computation is best regarded as a process of CONTROLLED deduction. It will be furter argued that the two aspects (specifying the base logic and specifying the control mechanism) of programming are best seperated explicitly, as the kinds of language involved have quite distinct semantics. Of course, a theorem-proving program also engages in a process of controlled deduction of consequences of its inputs. The outstanding difference between a conventional theorem-proving program and a conventional interpreter is that in the latter case the control is part of the input statement supplied by the user, while in the former case it is fixed in

the program. The techniques of computational logic in no way depend upon this limited notion of control, however. It is the METHODOLOGY of conventional theorem-proving which is responsible for this restriction, and which is here rejected. 11b2

The ideas expounded here are the foundation of a research project begun at Edinburgh and now underway at Essex University. The practcal aim of this work is the design and implementation of a new programming-logical system, called GOLUX <*R1>, suitable for AI work and complex non-numerical computing generally. In part, therefore, this paper is a progress report on GOLUX. 11b3

<R1> "I am the Golux," said the Golux proudly, "the only Golux in the world, and not a mere device." from THE 13 CLOCKS by James Thurber. 11b4

THE LOGICIANS' FOLLY by D. Bruce Anderson
Department of Machine Intelligence
and
Patrick J. Hayes
Department of Computational Logic
University of Edinburgh 11c

Among claims made for the usefulness of theorem-proving to A.I. are that it will enable computers to do formal mathematics (via logic) and that its methods are useful for robot reasoning. We believe that the techniques developed in this field, and indeed any techniques which could be developed by its current methodology (so aptly described as 'Computational Logic') are not useful in either of these ways, though in this paper we argue mainly the latter point. Robot reasoning is central to our philosophy of artificial intelligence - and there seems to be no doubt that knowledge of how to construct a machine which can reason about and act in the real world as well as converse about itself in natural language is a necessary (but not sufficient) condition for achieving a real artificial intelligence. 11c1

AN EFFICIENT UNIFICATION ALGORITHM by Lewis Denver Baxter
Technical Report CS-73-23
Department of Applied Analysis and Computer Science
University of Waterloo
Waterloo, Ontario, Canada 11d

In "Machine Intelligence" vol. 6, Robinson gives an implementation of the unification algorithm which is the basic pattern matching procedure used in computational logic. He purports that his method is "very close to maximal efficiency."

However, in this paper, it is shown that his method requires exponential amounts of resources. 11d1

Also, an efficient algorithm to unify sets of expressions of first order logic is presented. The algorithm consists of a simplifying transformational phase followed by a (topological) sorting phase. The space required to implement this efficient algorithm is linear in relation to L, the length of the input. It is conjectured that the time requirement is O(L log L), however, a precise estimate is difficult to make due to a connection with the equivalence algorithm. 11d2

INFERENCE AND THE COMPUTER UNDERSTANDING OF NATURAL LANGUAGE by
Roger C. Schank
Report No. CS358
Computer Science Department
Stanford University
Stanford, California 11e

The problem of inference and how it affects language understanding is discussed. Ten classes of inference are isolated. A program that accomplishes a limited class of inference tasks from a natural language input is described. 11e1

THE FOURTEEN PRIMITIVE ACTIONS AND THEIR INFERENCES by Roger C. Schank
Report No. CS344
Computer Science Department
Stanford University
Stanford, California 11f

In order to represent the conceptual information underlying a natural language sentence, a conceptual structure has been established that uses the basic actor-action-object framework. It was the intent that these structures have only one representation for one meaning, regardless of the semantic form of the sentence being represented. Actions were reduced to their basic parts so as to affect this. It was found that only fourteen basic actions were needed as building blocks by which all verbs can be represented. Each of these actions has a set of actions or states which can be inferred when they are present. 11f1

THE DEVELOPMENT OF CONCEPTUAL STRUCTURES IN CHILDREN by Roger C. Schank
Report No. CS369
Computer Science Department
Stanford University
Stanford, California 11g

Previous papers by the author have hypothesized that it is possible to represent the meaning of natural language sentences using a framework which has only fourteen primitive acts. This paper addresses the problem of when and how these acts might be learned by children. The speech of a child of age 2 is examined for possible knowledge of the primitive acts as well as the conceptual relations underlying language. It is shown that there is evidence that the conceptual structures underlying language are probably complete by age 2. Next a child is studied from birth to age 1. The emergence of the primitive acts and the conceptual relations is traced. The hypothesis is made that the structures that underlie and are necessary for language are present by age 1. 11g1

THE GOALS OF LINGUISTIC THEORY REVISITED by Roger C. Schank and Yorick Wilks
Report No. CS368
Computer Science Department
Stanford University
Stanford, California 11h

We examine the original goals of generative linguistic theory. We suggest that these goals were well defined but misguided with respect to their avoidance of the problem of modelling performance. With developments such as Generative Semantics, it is no longer clear that the goals are clearly defined. We argue that it is vital for linguistics to concern itself with the procedures that humans use in language. We then introduce a number of basic human competencies, in the field of language understanding, understanding in context and the use of inferential information, and argue that the modelling of these aspects of language understanding requires procedures of a sort that cannot be easily accommodated within the dominant paradigm. In particular, we argue that the procedures that will be required in these cases ought to be linguistic, and that the simple-minded importation of techniques from logic may create a linguistics in which there can not be procedures of the required sort. 11h1

PREFERENCE SEMANTICS by Yorick Wilks
Report No. CS377
Computer Science Department
Stanford University
Stanford, California 11i

Preference semantics [PS] is a set of formal procedures for representing the meaning structure of natural language, with a view to embodying that structure within a system that can be said to understand, rather than within what I would call the

derivational paradigm, of the transformational grammer [TG] and generative semantics [GS], which seeks to determine the well-formedness, or otherwise, of sentences. I outline a system of preference semantics that does this: for each phrase or clause of a complex sentence, the system builds up a network of lexical trees with the aid of structured items called templates and, at the next level, it structures those networks with higher level items called paraplates and common-sense inference rules. At each stage the system directs itself towards the correct network by always opting for the most "semantically dense" one it can construct. I suggest that this opting for the "greatest semantic density" can be seen as an interpretation of Joos' "Semantic Axiom Number 1." I argue that the analysis of quite simple examples requires the use of inductive rules of inference which cannot, theoretically cannot, be accommodated within the derivational paradigm. I contrast this derivational paradigm of language processing with the artificial intelligence paradigm. 11i1

THE CONCEPT OF A LINGUISTIC VARIABLE AND ITS APPLICATION TO APPROXIMATE REASONING by L. A. Zadeh
Memorandum No. ERL-M411 (170 pp.), October 15, 1973
Department of Electrical Engineering and Computer Sciences
University of California at Berkeley 11j

By a linguistic variable we mean a variable whose values are words or sentences in a natural or artificial language. For example, "age" is a linguistic variable if its values are linguistic rather than numerical, i.e., young, not young, very young, quite young, old, not very old and not very young, etc., rather than 20, 21, 22, 23,... . 11j1

In more specific terms, a linguistic variable is characterized by a quintuple (, T( ), U,G,M) in which is the name of the variable; T( ) is the term-set of , that is, the collection of its linguistic values; U is a universe of discourse; G is a syntactic rule which generates the terms in T( ); and M is a semantic rule which associates with each linguistic value X its meaning, M(X), where M(X) denotes a fuzzy subset of U. 11j2

The meaning of a linguistic value X is characterized by a compatibility function, c : U -> [0,1], which associates with each u in U its compatibility with X. Thus, the compatibility of age 27 with young might be 0.7 while that of 35 might be 0.2. The function of the semantic rule is to relate the compatibilities of the so-called primary terms in a composite linguistic value - e.g., young and old in not very young and not very old - to the compatibility of the composite value. To

this end, the hedges such as very, quite, extremely, etc., as well as the connectives And and Or are treated as nonlinear operators which modify the meaning of their operands in a specified fashion. 11j3

The concept of a linguistic variable provides a means of approximate characterization of phenomena which are too complex or too ill-defined to be amenable to description in conventional quantitative terms. In particular, treating Truth as a linguistic variable with values such as true, very true, completely true, not very true, untrue, etc., leads to what is called fuzzy logic. By providing a basis for approximate reasoning, that is, a mode of reasoning which is not exact nor very inexact, such logic may offer a more realistic framework for human reasoning than the traditional two-valued logic. 11j4

It is shown that probabilities, too, can be treated as linguistic variables with values such as likely, very likely, unlikely, etc. Computation with linguistic probabilities requires the solution of nonlinear programs and leads to results which are imprecise to the same degree as the underlying probabilities. 11j5

The main applications of the linguistic approach lie in the realm of humanistic systems - especially in the fields of artificial intelligence, linguistics, human decision processes, pattern recognition, psychology, law, medical diagnosis, information retrieval, economics, and related areas. 11j6

SEMANTIC MEMORY OF A PROBLEM SOLVER GENERATOR by Franco Sorovich
Computer Science Department
Carnegie-Mellon University
Pittsburgh, Pennsylvania 11k

This paper is concerned with computer semantic memory, i.e., with the problem of representing general knowledge about a given world. The semantic memory issue is raised in the context of the problem of machine learning of heuristics, and the connection with the problem of machine representation of knowledge is emphasized. A brief overview is made of what is known about the mechanisms responsible for the observed human memory behavior. The guidelines for the implementation of a sematic memory are presented. The problem of knowledge representation is tackled in its general form, so that the proposed semantic memory may be of interest also in other fields, like natural language understanding, question answering, or theorem proving. 11k1

A MODEL FOR ADAPTIVE PROBLEM SOLVING APPLIED TO NATURAL LANGUAGE

ACQUISITION by Larry R. Harris
Ph.D. Thesis, TR-133
Computer Science Department
Cornell University
Ithaca, New York 11l

Adaptive problem solving is the application of artificial intelligence learning techniques to practical problems. The approach taken in studying Adaptive Problem Solving is three-fold. First, to develop a model for Adaptive Problem Solving in order to specify the processes involved in computer learning, as well as the interaction between these processes. Second, theoretically well-founded, practical algorithms are developed for each of these learning processes. Third, as an application of these theories, the Natural Language Acquisition Problem is formulated in terms of the adaptive model. 11l1

The specification of algorithms to perform learning processes leads to the development of a Bandwidth Heuristic Search, an extension of heuristic search, that includes many practical considerations without forfeiting any theoretical capabilities. A modification of this algorithm, the Bandwidth Heuristic Search for Min/Max trees, is shown to be superior to the minimax process. 11l2

INFANTS IN CHILDREN'S STORIES - TOWARDS A MODEL OF NATURAL LANGUAGE COMPREHENSION by Garry S. Meyer
M.I.T. AI Memo No. 265, August 1972
Massachusetts Institute of Technology
Cambridge, Massachusetts 11m

How can we construct a program that will understand stories that children would normally understand? By understand we mean the ability to answer questions about that story. Here we are interested in the understanding of natural language in a very broad area. In particular, how does one understand stories about infants? We propose a system which answers such questions by relating the story to background real-world knowledge. We make use of the general model proposed by Eugene Charniak in his Ph.D. thesis. The model sets up expectations which can be used to help answer questions about the story. There is a set of routines called BASE routines that correspond to our "real world knowledge" and routines that are "put in," called DEMONs, that correspond to contextual information. Context can help to assign a particular meaning to an ambiguous word or pronoun. 11m1

The problem of formalizing our real-world knowledge to fit into the model is the primary problem here. I discuss a first-level

attack on formalizing information about infants and then baby bottles. The contrast between the two leads me to suggest that the same methods can not be used for both inanimate and animate objects. Finally, I outline how a finite-state model of infant behavior can be used to understand infants in children's stories better. 11m2

A COMPUTER MODEL OF SIMPLE FORMS OF LEARNING IN INFANTS by Thomas L. Jones
Graduate School of Business
Howard University
Washington, D.C.
(In Proceedings of the AFIPS 1972 Spring Joint Computer Conference, p. 885.) 11n

A major obstacle in artificial intelligence research has been the cost and difficulty of writing large computer programs. We would like the computer to program itself based on its experience. There has been extensive research on machine learning; this report describes a new form of machine learning, i.e., program learning, in which a subroutine called an experience-driven compiler is used. 11n1

The system solves causality-chain problems of the type solved by human infants; thus, it constitutes a synthesis of artificial intelligence and developmental psychology. The system exhibits several forms of learning considered fundamental by psychologists, including operant conditioning, discrimination learning, and behavior chaining. A detailed proposal for a second version of the system, with higher capability, is available from the author. 11n2

AN INFORMATION PROCESSING THEORY OF ASPECTS OF THE DEVELOPMENT OF WEIGHT SERIATION IN CHILDREN (REV.) by George W. Baylor and Jean Gascon
Psychology Department
University of Montreal
M.C.P. #14 July 1973
(To appear in COGNITIVE PSYCHOLOGY, Vol. 6, 1974.) 11o

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. 11o1

LITERARY TEXT PROCESSING by Sally Yeates Sedelow
University of Kansas
Lawrence, Kansas 11p

To date, computer-based literary text processing bears much greater similarity to techniques used for information retrieval and, to some degree, for question-answering, than it does to techniques used in, for example, machine translation of 'classical' artificial intelligence. A literary text is treated not as 'output' in a process to be emulated nor as a string to be transformed into an equivalent verbal representation, but, rather, as an artifact to be analyzed and described. 11p1

The absence of process as an integrating concept in computer-based literary text processing leads to very different definitions of linguistic domains (such as semantics and syntactics) than is the case with, for example, artificial intelligence. This presentation explores some of these distinctions, as well as some of the implications of more process-oriented techniques for literary text processing. 11p2

TYPES OF PROCESSES ON COGNITIVE NETWORKS by David G. Hays
State University of New York at Buffalo 11q

The main storage area in a computer simulation of human thought is often organized as a network. Numerous investigators have recently put forth diverse views of the basic issues in network design, of which the first is What types of nodes and arcs are admitted? Recognition of this issue can only lead, however, to the awareness of a more basic problem, namely, What kind of evidence would influence the design of cognitive networks? For some investigators, practical effectiveness is the sole consideration; their field is artificial intelligence, and their purpose is to write computer programs that can be used with profit. For others, the evidence must ultimately come from observation of human beings, on the level of gross behavior or, ultimately, on the level of microscopic activity in the nervous system. 11q1

(Prepared for the 1973 International Conference on Computational Linguistics, Pisa, August 27 - September 1, 1973.) 11q2

LINGUISTICS AND THE FUTURE OF COMPUTATION by David G. Hays
State University of New York at Buffalo 11r

My subject is the art of computation: computer architecture, computer programming, and computer application. Linguistics provides the ideas, but the use I make of them is not the linguist's use, which would be an attempt at understanding the nature of man and of human communication, but the computer scientist's use. In ancient India, the study of language held the place in science that mathematics has always held in the West. Knowledge was organized according to the best known linguistic principles. If we had taken that path, we would have arrived today at a different science. Our scholarship draws its principles from sources close to linguistics, to be sure, but our science has rather limited itself to a basis in Newtonian calculus. And so a chasm separates two cultures. 11r1

PROGRESS IN COMPUTING TECHNOLOGY AND RESEARCH IN ARTIFICIAL INTELLIGENCE by Nicholas V. Findler
Department of Computer Science
State University of New York at Buffalo
Amhurst, New York 11s

An attempt is made in this paper to show how and why work in Artificial Intelligence contributes to progress in computing technology in general. The objectives of two on-going research projects are outlined as illustrative examples. Finally, it is argued that the categories set up in the recent Lighthill report are arbitrary, counterproductive and, for a large number of projects, unusable. 11s1

HEURISTIC PROGRAMMERS AND THEIR GAMBLING MACHINES by Nicholas V. Findler, Heinz Klein, R. Channing Johnson, Alexander Kowal, Zachary Levine, and John Menig
Department of Computer Science
State University of New York at Buffalo
Amherst, New York 11t

Following our paper given at the IFIP Congress 71, another progress report is presented of our ongoing research efforts aimed at human decision making under uncertainty and risk. We have studied many aspects of human and machine learning processes, inductive and deductive inference-making methods, how heuristic rules are formed and optimized by human players, and how similar results can be arrived at by machines. Although the investigations have been within the general framework of the game of Poker, our findings are considered to have a rather wide range of applicability. Also, the complex information processing system at hand incorporates both normative and descriptive theories of certain human behavior. Finally, the results of some empirical explorations are followed by an account of present and planned activities. 11t1

THE INTERPRETATION OF MASS SPECTROMETRY DATA USING CLUSTER ANALYSIS by Stephen R. Heller, Chin L. Chang, Heuristics Laboratory
Kenneth L. Chu, Computer Science Laboratory
Division of Computer Research and Technology
National Institutes of Health
Bethesda, Maryland 11u

The application of a graph-theoretical method of cluster analysis has been used to investigate the classificaton of mass spectral data. The method, the shortest spanning path (SSP), has been used to classify and characterize the mass spectra of straight-chain monofunctional alkyl-thiol esters. 11u1

PATTERN RECOGNITION BY NEAREST NEIGHBOR CLASSIFIERS by Chin-Liang Chang
Division of Computer Research and Technology
National Institutes of Health
Bethesda, Maryland 11v

A nearest neighbor classifier is one which assigns a pattern to the class of the nearest prototype. In this paper, an algorithm is given to find prototypes for a nearest neighbor classifier. The idea is to start with every sample in a training set as a prototype, and then successively merge any two nearest prototypes of the same class so long as the recognition rate is not downgraded. The algorithm is very efficient. For example, when it was applied to a training set of 514 cases of liver disease, only 34 prototypes were found necessary to achieve the same recognition rate as the one using the 514 samples of the training set as prototypes. Furthermore, the number of prototypes need not be specified beforehand in the algorithm. 11v1

SKELETON PLANNING SPACES FOR NON-NUMERIC HEURISTIC OPTIMIZATION by L. Siklossy and M. A. Maecker
The University of Texas at Austin
November 1973 TR-29 11w

The AFTERMATH system implements a heuristic technique for improving long solutions (up to about 250 steps) for robot planning problems. AFTERMATH transforms the given solution into a skeleton solution that focuses attention on repetitious and opposite moves. AFTERMATH attempts to obtain an alternate, improved skeleton. From the alternate skeleton, an alternate solution is built (if possible) to the original problem. If the alternate solution is an improvement, AFTERMATH accepts it as input, and cycles. 11w1

Although not guaranteeing optimality, AFTERMATH improves many solutions, sometimes gradually in several cycles. Examples can be built for which AFTERMATH obtains an arbitrarily large improvement in one cycle. 11w2

COLLABORATIVE PROBLEM-SOLVING BETWEEN OPTIMISTIC AND PESSIMISTIC PROBLEM-SOLVERS by L. Siklossy and J. Roach
The University of Texas at Austin
November 1973 TR-30 11x

An optimistic problem-solver assumes that a problem has a solution and attempts to find such a solution. A pessimistic problem-solver assumes that a problem has no solution, and tries to prove this lack of a solution. When one of the problem-solvers fails to achieve its goal, it is an indication that the other problem-solver may succeed. Moreover, information may be extracted from the failure to help the other problem-solver in its success. In such a case, the two complementary systems are said to collaborate. 11x1

We give examples of collaboration between an optimist, LAWALY, and a pessimist, DISPROVER, which operate on worlds of simulated robots. When collaborating, each system can solve more problems than if it worked alone. 11x2

ENGLISH AS A COMMAND LANGUAGE FOR MACHINES AND THE SEMANTICS OF "LEFT" AND "RIGHT" by Norman Sondheimer
Computer Sciences Department
University of Wisconsin-Madison
Madison, Wisconsin 11y

A speech-understanding system for man-machine communication in unrestricted English is a distant goal. A more feasible task is the development of systems for the control of machines. The English in these command languages should be confinable to small sets of words, simple sentences, and phrases. This should avoid many problems but those of spatial reference would still remain. These include the noncorrespondence of frames of reference and the nonconformity of heuristics that identify the sides of objects. This paper looks at the problems of understanding "left" and "right" as examples of the general phenomena. Conclusions are drawn from these problems that effect the structure of any command language and the general hope for English-based command languages. 11y1

ENGLISH AS A VERY HIGH LEVEL LANGUAGE FOR SIMULATION PROGRAMMING
by George E. Heidorn
IBM Thomas J. Watson Research Center
Yorktown Heights, New York

RC 4536 (#20187)
September 21, 1973 11z

An automatic programming system which produces simulation programs from information obtained through natural language dialogue has been implemented under CP/CMS on the IBM 360/67. In the current version the information obtained from an English conversation about a simple queuing problem is used to build a language-independent entity-attribute-value data structure. From this structure both an English description of the problem and a GPSS simulation program for it can be produced. This processing is done by a FORTRAN program which interprets sets of decoding and encoding rules written in a specially developed grammar-rule language. The paper includes a complete sample problem with a discussion of its processing and examples of decoding and encoding rules. 11z1

CLASSIFIED ADVERTISING 12

Situations Wanted: 12a

Edward G. Yalow (Apt. 1-D; 45 Linden Blvd.; Brooklyn, New York 11226) is seeking AI-related employment in the New York City area. He has a BS in Math and is finishing a Masters in Computer Science from Stevens Institute of Technology. 12a1

Employment Opportunities: 12b

University of Edinburgh 12b1

Research Fellow required to work in the Department of Computational Logic, School of Artificial Intelligence. The research of the department is on automatic theorem-proving and related topics in artificial intelligence. 12b1a

The applicant's background and experience should be in one or more of the following subjects: artificial intelligence, computer science, logic, and mathematics. 12b1b

The appointment, funded by a Science Research Council grant, will be for a period from as soon as possible until 30th September 1975. Renewal thereafter will be dependent upon continued Science Research Council support. The salary will be on the University Lecturer scale in the range 1,929 to 2,553 per annum, with normal increments and F.S.S.U. benefits. 12b1c

Applications, giving curriculum vitae, an account of

professional experience and publications, and names of two referees, should be sent as soon as possible to: 12b1d

Professor Bernard Meltzer
Department of Computational Logic
8 Hope Park Square
Edinburgh EH8 9NW, SCOTLAND. 12b1d1

[Ed. Note: Classified advertising is accepted for positions wanted or offered in the field of AI. We reserve the right to edit unsolicited ad copy.] 12c

AI IN THE MOVIES by Steve Coles 13

WESTWORLD, one of the two films suggested to arrive in 1974 <*R1>, already appeared in late October 1973. The film, written and directed by Michael Crichton (Andromeda Strain, The Terminal Man <*R2>, Pursuit), stars Yul Brynner, Richard Benjamin, and James Brolin. Brynner plays the role of a "robot gunslinger" in a giant amusement park of the future styled after Disneyland. Guests pay $1000 a day to relive the excitement of the Old West, including the opportunity to engage the gunslinger in a showdown fight in which they are guaranteed to outdraw and kill it. The guarantee is somewhat dubious, however, since the alleged advertisement for Westworld says, "Boy, have we got a vacation for you...where nothing can possibly go worng." 13a

Perhaps the greatest disappointment in Westworld, however, is the total abandonment of intellectual standards by Michael Crichton in bringing the story premise to a logically coherent as well as visually exciting conclusion. From the time Westworld begins to disintegrate, the plot also begins to degenerate into a rising crescendo of internal inconsistencies with ruthless violence seemingly the only message. It seems strange that inconseqential perturbations in the script (that could not possibly have influenced the films success or failure in the market place, but which could have salvaged its internal consistency) were not made by a man who I know should know better (He has an M.D. degree from Harvard). I counted at last a dozen instances of this sort, ranging from the implausibility of mechanical systems subject to a biological-style epedemic infection to the unlikely prospect that a gunslinger robot could easily drink a shot of wiskey at the bar (at the beginning of the film) while a female android, based on the same technology, could not (at the end of the film) take even a sip of water without going up like a Christmas tree of electrical sparks. Maybe next time Crichton treats the subject of robots in a film or novel he will call for advice from an AI expert. Do I hear any volunteers? 13b

REFERENCES 13c

<R1> SIGART Newsletter, No. 41, p. 56, June 1973 13c1

<R2> SIGART Newsletter, No. 36, pp. 43-44, October 1972. 13c2

DISCOUNT ON THE MACHINE INTELLIGENCE SERIES By George Ernst
Case Western Reserve University
Cleveland, Ohio 14

Last Spring, David Gelperin, a SIGART member, informed me that Halsted Press, the publisher of the Machine Intelligence Series, has a group discount plan. ACM Headquarters has given SIGART permission to make use of this discount plan provided that SIGART does all of the paper work, which I have agreed to do. 14a

The last four volumes of MACHINE INTELLIGENCE are available under this plan. The following table summarizes the saving that a SIGART member will realize: 14b

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14b1

Note that the SIGART price is list price-discount + handling + postage. 14c

It is very important to realize that Halsted Press will not bill individuals. In fact, we only get the discount if we order 10 or more books at one time. For this reason, a SIGART member who wishes to participate in this discount plan must precisely carry out the following steps: 14d

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Prof. George W. Ernst
Computing and Information Sciences Department
Case Western Reserve University
Cleveland, Ohio 44106

BEFORE FEBRUARY 15, 1974. 14d1a

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SIGART NEWSLETTER Number 43 December 1973

(J21209) 26-DEC-73 15:55; Title: Author(s): L. Stephen Coles, Richard E. Fikes/LSC REF; Sub-Collections: NIC ; Clerk: KIRK;
Origin: <SIGART>DEC73.NLS;46, 26-DEC-73 09:39 KIRK ;

DHC 26-DEC-73 17:27 21210

A first message

Welcome to the journal and the Nic, Holger.

You should get an online and a mailed copy of this message. Have fun.

1

DHC 26-DEC-73 17:27 21210

A first message

(J21210) 26-DEC-73 17:27; Title: Author(s): David H. Crocker/DHC;
Distribution: /HO; Sub-Collections: NIC; Clerk: DHC;

Monthly Contract Status Report for RADC Contact, #2697

Stanford Research Institute
Augmentation Research Center
333 Ravenswood Avenue
Menlo Park, California 94025

Mr. Burns, RADC/PMA
Department of the Air Force
Headquarters Rome Air Development Center (AFSC)
Griffiss Air Force Base, New York 13440

Dear Mr. Burns:

This letter responds to block 10 of DD Form 1664 with respect to contract F30602-73-C-0285 (SRI #2697). 1

The table below shows the person-hours expended on the subject contract since the last reporting period (four weeks). 2

	Cumulative to 12/1/73	Person Hours Expended During Report Period
Supervisor	184	24
Senior Professional	0	0
Professional	1867	328
Technical	0	0
Other	0	0
	2051	

2a

Our most important work during November was in sharpening the specificatons of certain features in the the Forms System which has been mentioned in previous reorts. The features in question are those that call on the NLS Query system and posibly other data base management systems. We have co-ordinated with the replanning going on at RADC in their general use of online data bases. The medium of our co-ordinaton has been the access by all parties invovled to the NLS journal and other NLS files. 3

We estimate that the percentage of technical completion at the end of October was 70 per cent. 4

Sincerely,

Dirk van Nouhuys
Research Analyst
Augmentation Research Center

dvn

DVN 26-DEC-73 19:40 21211

Monthly Contract Status Report for RADC Contact, #2697

(J21211) 26-DEC-73 19:40; Title: Author(s): Dirk H. Van Nouhuys/DVN;
Sub-Collections: SRI-ARC RADC; Clerk: DVN;
Origin: <VANNOUHUYS>MENSTRATION.NLS;1, 26-DEC-73 19:35 DVN ;
Author(s): Dirk H. Van Nouhuys/DVN; Distribution: /DLS(Your wish is
our command.) JCN(fyi); Sub-Collections: SRI-ARC RADC; Clerk: DVN;

(J21212) 29-DEC-73 18:40; Title: Author(s): Jean Iseli/JI; Keywords:
ARPANET News; Sub-Collections: NIC SRI-ARC; Clerk: MEJ;
Origin: <HELP>ARPANEWS.NLS;11, 29-DEC-73 18:23 MEJ ;
The Monthly Online Newspaper for the ARPANET Online Community
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ARPANET News

January 1974

Issue 11

NIC 21212

Published for the purpose of encouraging and fostering
intersite communication and interaction
in the ARPA Computer Network

(contents) ARPANET NEWS January 1974 Issue 11 NIC 21212

: The ARPANET vehicle for world understanding, for forming :
: a meeting ground of the world networking community to :
: express their ideas and share their evolving will :
: toward a universal sharing and cooperative work :
: environment for world good :

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(information) Information About the Publication

2

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Stanford Research Institute
Menlo Park, California 94025

2a

Editorial Staff:
Headed by Jean Iseli (MITRE) with volunteers who lend their welcome and appreciated assistance, as occasion arises:
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Jeanne B. North (NIC)
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2b

The online version is available to all Network members who receive online delivery from NIC. It can also be accessed by anyone who logs into SRI-ARC and uses the query language named nic.

2c

The online version contains the month's basic issue. Each week a branch is added, containing items received during the week. This update material is added to the new feature articles to produce the next month's issue.

2d

One hardcopy of the monthly issue will be sent to each Liaison, Principal Investigator, and Station Agent at Network Sites, and to Network Associates. Local reproduction of multiple copies is encouraged.

2e

Contributions to the NEWS may be forwarded to JI at NIC through the Journal, to ISELI@USC-ISI, or to Jean Iseli, The MITRE Corporation, National Systems Design Dept., Westgate Research Park, McLean, Va. 22101. News may also be forwarded to MEJ through the NIC Journal, or mailed to Mil Jernigan at SRI.

2f

(norsar-tip) Norwegian Site - An Introduction

3

Editorial Note (partly from material furnished by Yngvar Lundh and Dag Rieber-Mohn): In the November 1973 ARPANET Newsletter, a description of the site and work of the ALOHA Net, University of Hawaii, pointed up the geographical coverage, and the breadth and scope of the scientific research areas of the rapidly growing ARPANET. The following three articles again highlight the near global nature of the ARPANET: NORSAR-TIP, an active user of the Network located at Kjeller, near Oslo, Norway, is introduced. The philosophy of cooperative resource sharing for joint beneficial effort in scientific investigation by many people at many sites, having many different backgrounds, technical/scientific skills and facilities, is again shown to be the measure of the strength and viability of the ARPANET.

3a

The TIP at Kjeller (some 20 KM "out in the hills" northeast of Oslo) connects with the ARPANET over a satellite link which gives effectively 7.2 Kb/sec data transmission, and through another link connects to the TIP at London University, England. NORSAR-TIP is presently used by three institutions:

NORSAR, or the Norwegian Seismic Array, who holds the joint contract for operation of the TIP and is working in the field of seismic monitoring and analysis.

RBK (Blindern-Kjeller Computer Facility), operating to a large extent in an academic atmosphere.

NDRE (Norwegian Defence Research Establishment), pioneers in introducing the field of computers to their area and deeply involved in a wide range of research such as oceanography, ionospheric research, and computer configurations.

3b

Both RBK and NDRE are presently planning to connect hosts to the NORSAR-TIP and actively enter the ARPANET community.

3c

(norsar) The Norwegian Seismic Array

3d

..... Dag Rieber-Mohn (NTNF/NORSAR)

3d1

The Norwegian Seismic Array (NTNF/NORSAR) is located at Kjeller, 16 miles northeast of Oslo, Norway. It is a joint undertaking by the governments of Norway and the United States and is sponsored by the U.S. Air Force and monitored by the European Office of Aerospace Research and the Air Force Office of Scientific Research, Air Force Systems Command, under contract (F44620 74 C 0001) with the Royal Norwegian Council for Scientific and Industrial Research (NTNF).

3d2

1. Present Configuration.

3d3

NORSAR, a large aperture seismic array, consists of 22 subarrays, each equipped with one three-component long period and six short-period instruments. The array diameter is around 110 KM, while that of a subarray is approximately 8 KM.

3d4

In the data center, located at Kjeller, are installed 2 IBM 360/40 computers with peripheral equipment, a special purpose computer (SPS), and an experimental operations console. Routine tasks performed at the data center comprise array monitoring and calibration, data acquisition, inline event detection and out of line event analysis. The two latter tasks are also called detection processing (inline) and event processing (out of line).

3d5

The two IBM 360/40s are set up in a dual configuration, thereby allowing the out of line (EP) computer to act as a backup for the inline (DP) computer. The detection processor performs all functions associated with data acquisition and array monitoring. Also, the DP processes the incoming data in realtime and decides whether or not a detection of a seismic event should be declared.

3d6

The event processor satisfies two objectives: first, the preparation of a daily seismic bulletin; and second, support of seismic research through the formation of a seismic data base. The EP receives the detections and preliminary epicenter determinations from the DP, and it contains algorithms required to assign seismic phase identifications to the detections reported by DP, and to group together the detections which belong to the same event. One task, of many, performed by the SPS, is to exchange data over a 2.4 Kbaud Transatlantic full duplex connection, with the Seismic Data Analysis Center in Alexandria, Virginia, U.S.A. This connection is presently multiplexed with the TIP-to-TIP connection, effectively reducing the bandwidth of this connection to 7.2 Kbaud.

3d7

NORSAR is a completely open research institution, and our data are available to anyone interested. The data retention time interval is 9 months. For additional information about NORSAR, see the article by Bungum, et al, "The NORSAR Array and Preliminary Results of Data Analysis", Geophysical Journal and Review of the Astronomical Society, Vol. 25, p.115-126, 1971.

3d8

2. Future Plans.

3d9

A Terminal Interface Message Processor was installed at the NORSAR Data Processing Center June 1973. To decrease the transmission error rate for the seismic data exchange, we plan to connect the DP computer to the TIP as a host dedicated to one task only: exchange of seismic data with SDAC through the ARPANET (instead of outside it). This requires that similar changes are performed at the other end of the connection, at SDAC.

3d10

Eventually, to make full use of the TIP, we plan to connect our second computer on a part time basis, to the TIP as a user host. In this way we may use the file transfer capability and (optionally) the remote job entry facility to perform remote computing with our seismic data on a suitable host. This will also facilitate our use of the planned seismic data bank on a mass store. Finally, in addition to the TTY terminal already connected to the TIP, we plan to connect an additional terminal with a CRT.

3d11

(rbk) The Blindern-Kjeller Computer Facility 3e

.....Svein A. Oevergaard (RBK)

3e1

Regneanlegget Blindern-Kjeller (the Blindern-Kjeller Computer Facility) is the joint computer center of the University of Oslo, the Norwegian Meterological Institute, the Norwegian Defence Research Establishment, the Norwegian Institute for Atomic Energy, and the Norwegian Air Materiel Command.

3e2

An important part of the Norwegian computer activities for research and educational purposes thus centers around RBK. Each of the participants has local computers of various makes and sizes. Some of these and a number of terminals are connected to the RBK by communication channels allowing from 200 bits/sec to 48K bits/sec. Outside users, some as far away as the University of Tromsoe (600 miles north of Kjeller) are also served by RBK.

3e3

The main computer of RBK is a CDC CYBER 74-18, running under Scope 3.4 Operating System and processing up to 15 jobs simultaneously. The CYBER has 128K of 60 bits words. Peripherals are CDC 844 and 841 disk stations, drums, 7 and 9 track tapes, etc. Most programming is done in FORTRAN and COBOL. ALGOL and PASCAL are also used. A new SIMULA 67 compiler development is nearly completed, based on the experiences obtained by the successful compiler developed for a CD 3600 computer.

3e4

SIMULA 67 will have an important role not only for simulation purposes. Exploitation of the full powers and the important "class" concept of SIMULA has hitherto been impeded by the lack of satisfactory compilers for the CDC 6000 and CYBER Series of computers.

3e5

Several interesting application programs, e.g., for computer aided design and in the statistical area, are available at RBK.

3e6

RBK plans to connect the CYBER system in early 1974 to the ARPANET TIP at the NORSAR Data Processing Center, located in an extension to the RBK Building. A suitable minicomputer will form the interface between the TIP and the CYBER communication unit, which allows for transmission rates up to 50K bits/sec. The mini will have some control functions in addition to the necessary format, conversion, and buffering.

3e7

The chosen mode will allow high speed remote job entry, but not full interactive usage of the CYBER system from the Network.

3e8

ARPANET users at RBK and in the owner organization mentioned above may access the Network through the existing terminal system around CYBER. In addition, low speed terminals will be connected directly to the TIP. The first of these have been installed at RBK, and at the Defence Research Establishment. Another one will be at the University of Oslo.

3e9

A wide range of research projects concerning computer science and special applications, in the RBK group of organizations will benefit from cooperations with research workers at other host or terminal sites. We trust that they also can contribute valuably in a resource and idea sharing permitted by the ARPANET.

3e10

(ndre) Norwegian Defence Research Establishment

3f

..... Yngvar Lundh (NDRE)

3f1

NDRE is owned and operated by the Norwegian Government, and most activities are financed through the budget of the Defence Department for analysis and research tasks for the three forces.

3f2

Our activities cover several areas. One field is ionospheric research: instrumentation for experimental work includes ground stations, and packages in rockets and in satellites (the latter area has included considerable international cooperation). Another discipline is oceanography where continued studies are made, especially in the North Atlantic and Arctic Oceans.

3f3

We have developed several pieces of military equipment, notably microwave and other communication equipment, two major naval weapon systems (Terne and Penguin Missile Systems) and others. Fields which have had especially high interest in recent years include inertial navigation, electro-optics, and computer technology.

3f4

Computers became part of our daily lives from 1957. Two of our pioneers in the software area may be known to some of you: Jan Garwick is now in California, and Ole Johan Dahl now teaches at the University of Oslo.

3f5

We have developed computers of various sizes, shapes and descriptions since 1960. The two first, LYDIA and RASMUS were special purpose machines. One was a processor for underwater sound. One was a steering machine for a large radio telescope for early communications satellite experiments (using the RELAY and TELESTAR satellites). The SAM computer was put into operation in 1963. This year it was given, still alive, to the science museum in Oslo.

3f6

Many of the people who helped in building these early machines left us to start industrial acitivity, and by local standards, there is a rapidly growing competitive computer industry here. At present, some of the main interests lie in:

3f7

Microprocessors -

3f8

Several quite small (one circuit card), but very powerful computers are under development. Their main strength will be for realtime control functions and signal processing.

3f9

Multicomputer Systems -

3f10

There is a growing interest in systems where these microprocessors and other machines will be paralleled to implement tasks which require very high processing capacity such that conventional computers would not be feasible for economic or other reasons.

3f11

Communications -

3f12

A significant activity concerns making use of computer technology for communications, both speech and various forms of data communications. Especially, efforts are made to optimize circuit techniques, system organization and programming methods for specialized circuit switching options.

3f13

We have a special computer installation at NDRE we call the Data Laboratory. At present, its main units are two SM-3 computers (A/S Kongsberg Vaapenfabrikk), tapes, disk, and medium speed I/O devices. It has a special input facility for analog signals, e.g., most standard formats for analog and digital telemetry. This has special interest for processing of signals from geophysical experiments and from aerospace development experiments. Further, it has a special, programmable display, with a high performance color display system. It operates over direct memory access channels to the memories of the two SM-3 computers. The Data Laboratory is used for experimental tasks in two categories:

3f14

(1) Processing of experimental data of high volume, and

3f15

(2) Simulations and various online experiments during development of specialized realtime computer based systems.

3f16

At the present time, we are studying the possibilities for connecting the Data Laboratory to the ARPANET. There is also a growing interest in developing possibilities for interaction with other people having common interests with us, making use of, and taking part in, development of the resource sharing possibilities of the ARPANET.

3f17

(London-TIP) ARPANET -- A British way of life?

4

.....Steve Wilbur

4a

Introduction

4b

Apart from being at the receiving end of puns about 'very remote hosts', what does it feel like to be on the British spur of the ARPANET? Well, as for most other TIP users it varies between the bleak 'NET TROUBLE' to the warm 'LINK FROM ..' responses on a terminal. Obviously though, we have other rewards than friendly chit-chat, including access to computer systems which would otherwise be unavailable, and off-peak use of these machines.

4c

Why did I therefore single out the 'NET TROUBLE' and 'LINK FROM ..' messages? Largely because I feel that these are very significant as far as we, at present, in Britain are concerned. The reason is that we are on a spur from Washington, via Norway, and net trouble usually means the spur is down, thus isolating us from all American machines.

4d

Linking and mail facilities are very vital, since these in fact represent to us the only effective means of communication If we had the same computer systems in the UK as we have access to over the net we could obviously rely on telephone or postal services for queries etc.. However, over the net we have to rely on the mailing services within the network, and in fact we probably have very good response to our mail, since they get into your systems at the beginning of the day, resulting in our getting replies the same or next day.

4e

We have been actively on the Network, both via terminals and front-ending the RHEL 360/195, for about three weeks now. My own feelings on logging in to a strange host are ones of wondering where it is, what its surroundings are and such like, so in part of the remainder of this article I shall try to give an informal look at our installation. I shall also try to present some of my experience so far, but as a user rather than a computer network specialist. Perhaps one of our system implementers will write a more technical item in the future.

4f

The UK Scene

4g

The research group working on ARPA related topics, and engaged in looking after the TIP are part of the Dept. of Statistics and Computer Science, at University College, London. We are sited in a set of Georgian houses overlooking Gordon Square, in the heart of Bloomsbury. The houses have their facade preserved and still appear much as they must have done to their former inhabitants, the so-called 'Bloomsbury Set' of the early part of this century. Those inhabitants included Virginia Woolf and Lytton Strachey.

4h

On the ground floor of 47 Gordon Square can be found our installation. In one room we have a TIP, two PDP-9s, two telephone switchboards, four terminals and a very noisy air conditioning plant From the ARPA point of view all U.S. linking comes via the TIP into either, one of the switchboards and thence to the dialled up users, or to PDP-9A and via the other switchboard to the RHEL 360/195 about sixty miles away in Berkshire. PDP-9A is becoming used more and more to front end the 360, and PDP-9B is at present being used largely in the development of further software. In the future, it is hoped that this machine, too, may be connected to the TIP and front end the Computer Aided Design Centre machines in Cambridge, again about sixty miles away.

4i

Geographically, we are somewhat unique. Apart from being the first TIP outside the USA, the majority of our TIP users use the Network via dialled up connections. Although by American standards the distance between them and the TIP is not large, distances of between 60 and 200 miles can pose problems, especially with regard to capturing of printers and related topics.

4j

On a recent count, there are some 15 groups in this country who expect to become active participants on the Net within the next month. They range from groups collaborating on AI work, through some intending to do graphics work to others involved in information retrieval excercises. A document will be issued shortly giving the names and means of contacting these active users.

4k

My Activities

4l

My personal activities on the Net over the past few weeks have been aimed at three broad areas:

4m

Getting familiar with the NIC 4n

Setting up procedures for dealing with local documentation 4o

Providing some personalised mail facilities within the normal SNDMSG facilities

4p

Obviously, the first two activities have involved a reasonable amount of work at the NIC. What we intend to do as far as British copies of Network documentation is concerned, is to keep reference manuals at the British Library in Yorkshire. Documents sent there will then be put on to microfiche and a copy sent to all participants. The original documents are then available for loan, or prints. The microfiche will be free to users, but they will have to pay for prints. Since the documentation concerning the 360/195 will also be kept this way, we hope to be able to extend this service to American users in the future.

4q

The catalogue of this collection will shortly be kept on-line at the NIC, in (uk-ics,uk-docs,bl). If any US users find any of our 360/195 documentation in there of interest, please contact me via ident SRW at the NIC, or by SNDMSG to KIRSTEIN at ISI. In the latter case, include the characters SRW: in the message or title, (see next paragraph).

4r

The other of my recent activities concerned a mail problem which we have, and I suspect, many other sites have. Many of our users are interested first in getting a feel for the Network, and then later in persuing some more specific activity. Until they are engaged in such activities we are unwilling to have separate accounts set up for each user, so we feel that it should be possible to fit them all under the umbrella of one account. This has now been done, and any of the active groups can be contacted via the UK account at ISI. In order to filter the mail, the sender has to include a short mnemonic followed by colon, in the message. When UK users call POST, (our mail subsystem,) they give their identifier and see only mail destined for them. Obviously, means are provided for getting at unaddressed mail.

4s

Experiences

4t

Time Difference:

4u

The one factor which affects us more than any other users is the time difference between the UK and USA. We are normally eight hours ahead of the west coast, and five hours ahead of the east coast. This means that our best response on Californian machines is between 8 am and 12 noon, by which time the east coast users start getting active. This access period immediately gives us a number of advantages, but at the same time a number of sociological disadvantages.

4v

The obvious advantage is that of working on underloaded machines, and having fantastically good response on machines which US users tell me they rarely use because they can never get in. The fairly obvious disadvantage is that all computer installations, out of sheer economics, do their maintenance in off-peak times, and via ARPANET that means we are the ones deprived of the machine In fact, this is a mixed blessing as we shall see.

4w

The reason I entitled this article "A British Way of Life", is because of the sociological changes British network use implies. Student lectures have to be given and telephone calls have to be taken in the morning, (certainly if one wants results by next day,) so that I find the period from about 10 am onward very difficult to use for network activities. Thus my way of life has been tempered to the extent of starting around 6.30 to 7 am and working till 9.30 uninterrupted. It should be now obvious why routine maintenance, one day a week is somewhat of a blessing

4x

Personal Communication:

4y

Whilst we, at UCL, have got access to a reasonable number of general purpose manuals I find, as one always does, that they never quite explain just what you want to know. Over the past few weeks, therefore, I have found the various mail systems invaluable. In general replies have been very prompt. However, on the few occasions when some information was needed desperately and no response was forthcoming, the feeling of frustration is immeasurable due to the lack of telephone access.

4z

Occasionally, we use the Net in the afternoons, when we specifically wish to talk to someone, but the most interesting linking I have done has been at weekends. I suppose the attraction of linking is that it lies somewhere between the pioneering radio ham era and some sort of spiritualism Whenever problems have arisen and I have linked to someone I thought might help, I have found that the assistance given has been fantastic, and obviously beats the mail facilities hands down. One particularly interesting link was after I had requested a file from archive some days ago at SRI. When the file was reloaded the operator came through to inform me. We got to chatting, and he in talking about England said his Uncle was a professor in the university. It eventually turned out that I had been working with the same uncle for some four years

4a@

Technicalities:

4aa

Finally, a few words on the technicalities of life on a spur. Since we only have one route into the general network from London to Washington, any failure on this spur isolates us completely. Furthermore, as I have said, our access is best in the morning. Thus, if either the host we are interested in, or the line is down we have a day in which we can do no work. Ah you say, what about off-line facilities? This is just what we said in the circumstances. All we wanted to do was to prepare some documents off-line, and then next time the net was up send them to our friendly host. To a certain extent we have been successful, but the main problem lies in the fact that the TIP is not designed to support free running devices like a teletype reader, and one ultimately, with any sort of realistic loading on the Net gets into trouble with buffers overflowing. I am told this is being looked into, but I feel a strong need for good facilities in this area.

4ab

Just as we feel we need good facilities in the TIP to allow us to prepare off-line paper tapes, so we also need support systems in the hosts we are using. Many of these facilities exist at the NIC, but as yet through lack of information I have not tried other systems' utilities such as RUNOFF which I believe does page formatting, on other TENEXs.

4ac

(rex) A Resource Location and Acquisition Service

5

.....John W. Benoit and Erika Graf-Webster [MITRE]

5a

An initial version of REX, a resource location and acquisition service for the ARPANET written in PDP-10 FASBOL, is announced. The program exists at CASE-10 and may be executed with the command:

@<jedir>rex.sav<ESC><CR>

at the CASE-10 site. The initial version of REX provides on-line access to information about resources on the ARPANET.

5b

A data base extracted from MTR-6540, "ARPA Computer Network Users Handbook", a MITRE Corporation document prepared under Contract No. F19628-73-C-0001, about network resources and their attributes was developed. Entities considered to be resources include the system and application software, certain unique types of hardware, and certain data bases. A user may query the REX system about the location of a resource or combination of resources, may request a description of the attributes of some particular resources, and may request a listing of the categories of resources that exist on specific host systems.

5c

REX has two major commands: FIND and DESCRIBE. Examples of their usage include:

@Describe help for snobol at not BBN<CR>
@Find snobol and fortran<CR>

5d

Some on-line assistance is also provided to REX users. The HELP command produces a short description of the REX system and its usage. Typing a "?" will produce a list of all valid commands. Lists of valid keywords may be obtained with the KEYWORD command.

5e

Expressions of interest or comments may be forwarded to JEDIR@CASE-10 or to JWB or EG through the NIC Journal.

5f

The following is a brief typescript demonstrating the use of the REX system at CASE-10; it will be noticed that commands may be unambiguously abbreviated to the REX system:

5g

```
TELNET typescript file started at TUE 4 DEC 73 1146:20

#case-10 is complete.#

 Welcome to Case-10, Cleveland, Ohio. For help run Delphi

 CASE-TENEX 1.31.31, Logos-system Exec 1.51.01
@LOG POH
@<jedir>rex

ENTER COMMAND OR ?
*find snobol and  not fortran

THE FOLLOWING HOSTS HAVE THE REQUESTED RESOURCES

CCA IS HOST NO. 31
SU-AI IS HOST NO. 11

ENTER COMMAND OR ?
*f tenex

THE FOLLOWING HOSTS HAVE THE REQUESTED RESOURCES

BBN-TENEX IS HOST NO. 69
CASE-10 IS HOST NO. 13
CCA IS HOST NO. 31
ILLIAC IS HOST NO. 15
SRI-AI IS HOST NO. 66
USC-ISI IS HOST NO. 86
UTAH-10 IS HOST NO. 4
SRI-ARC IS HOST NO. 2

ENTER COMMAND OR ?
*f pdp-10 and not tenex

THE FOLLOWING HOSTS HAVE THE REQUESTED RESOURCES

CMU-10A IS HOST NO. 78
CMU-10B IS HOST NO. 14
HARV-10 IS HOST NO. 9
MIT-AI IS HOST NO. 134
MIT-DMCG IS HOST NO. 70
MIT-ML IS HOST NO. 198
SU-AI IS HOST NO. 11

ENTER COMMAND OR ?
*f fort an   d pdp-10 and  not tenex

THE FOLLOWING HOSTS HAVE THE REQUESTED RESOURCES
```

CMU-10A IS HOST NO. 78
CMU-10B IS HOST NO. 14
HARV-10 IS HOST NO. 9

*↑C
@logo 5h

(hostnames) Official Standard Hostname List 6

by Jake Feinler, Network Information Center

6a

Listed below is the official standard hostname list that was mentioned in Vint Cerf's "Standard Host Name Policy Announcement" in the December issue of the ARPANET News. For convenience it has been organized both by hostname and by host address. This list will be maintained online at the Network Information Center (NIC) by Jake Feinler and will be updated or corrected as new information is received at the NIC. To avoid confusion new hosts will be added to the list only upon official notification to the NIC by RML or ARPA.

6b

The file may be copied via FTP to other hosts.

6c

To copy the file via FTP:
Enter FTP at your own site
Connect to SRI-ARC and login with username GUEST, password ARC, account 1
Specify pathname, <NETINFO>HOSTNAMES.NLS;XNLS

6d

To correct or update hostname information, contact Jake Feinler:
Phone: (415) 329-0740, Sndmsg: FEINLER@NIC, SRI Journal Ident=JAKE
By U.S. mail: Jake Feinler, Rm J2021
Network Information Center
Stanford Research Institute
333 Ravenswood Avenue
Menlo Park, California 94025

6e

For those who may have missed the simple naming rules outlined in the December ARPANET News, host names consist of up to 48 characters drawn from the alphabet (A-Z), the digits (0-9) and the minus sign (-). There is no distinction made between upper and lower case letters. The first character of the name must be a letter and the last character must not be a minus sign, otherwise no restrictions are imposed on the syntax of host names.

6f

In order to accommodate multiple networks, we also specify that a complete host name includes a prefix of up to 24 characters, enclosed in parentheses, designating the network in which the host resides. The characters used in the network name are drawn from the same set as for host names, and follow the same syntax rules. No attempt has been made to impose any further structure on these names. The network name prefix need not be supplied for intranetwork usage. The prefix is merely a means of indicating that a foreign host (that is, one not in the network from which access is being made) is being referenced.

6g

As an example of valid names, we have:
(ARPANET)MIT-DMS (CYCLADES)IRIA (TYMNET)Host-186
Erewhon-FAKESITE
fUnNyNaMe-sameas-funnyname
(NPLNET)beebleberry-and-associates

6h

Note that no embedded blanks are permitted in the network name prefix.

6i

.....

6j

Although the hostname list is being issued by the NIC, its compilation was truly a network collaborative effort. Thanks to Ed Schelonka (RML), Vint Cerf (SU-DSL), Jean Iseli (MITRE), Peter Deutsch (PARC), the ARPA office, the Network Liaison, and particularly Nancy Neigus (BBN) for their contributions.

6k

(name) Listing by Hostname

6l

HOSTNAME	IMP#/ HOST#	HOST ADDR (Dec)	HOST ADDR (Oct)	STATUS

6l1

AFWL-TIP	48/2	176	260	TIP, Up 3-74
ALOHA-TIP	36/2	164	244	TIP
AMES-11	16/3	208	320	USER, up 12-73
AMES-67	16/0	16	20	SERVER
AMES-TIP	16/2	144	220	TIP
ANL	?	?		SERVER, up 2-74
ARPA-DMS	28/0	28	34	USER, agency use only
ARPA-TIP	28/2	156	234	TIP
BBN-11X	5/0	5	5	Peripheral processor for #69.
BBN-1D	40/3	232	350	USER
BBN-NCC	40/0	40	50	USER
BBN-TENEX	5/1	69	105	SERVER
BBN-TENEXB	5/2	133	205	SERVER (Limited)
BBN-TESTIP	30/2	158	236	TIP
BELVOIR	27/0	27	33	USER, up 6-74
BRL	29/0	29	35	USER
CASE-10	13/0	13	15	SERVER
CCA-TENEX	31/0	31	37	SERVER
CCA-TIP	31/2	159	237	TIP
CMU-10A	14/1	78	116	SERVER
CMU-10B	14/0	14	16	SERVER
CMU-11	14/2	142	216	USER, up Spring 74
CMU-CC	14/3	206	316	USER, up Spring 74
DOCB-TIP	25/2	153	231	TIP
EGLIN	61/?	?		Up 3-74
ETAC	20/0	20	24	USER, up Spring 74
ETAC-TIP	20/2	148	224	TIP
FNWC	33/0	33	41	USER, up 2-74
FNWC-TIP	33/2	161	241	TIP
GWC-TIP	24/2	152	230	TIP
HARV-1	9/1	73	111	USER
HARV-10	9/0	9	11	SERVER
HARV-11	9/2	137	211	USER
HASKINS	5/3	197	305	USER (VDH), up Spring 74
HAWAII-500	36/1	100	144	SERVER, up 1-74
HAWAII-ALOHA	36/0	36	44	USER, Up 12-73
I4-TENEX	15/0	15	17	SERVER

I4-TENEXA	15/1	79	117	Peripheral processor for #15	
ILL-CAC	12/0	12	14	USER	
ILL-NTS	12/1	76	114	USER	
ISI-DEVTENEX	22/2	150	226	USER, up 1-74	
ISI-SPEECH11	22/0	22	26	USER, up 1-74	
LBL	34/0	34	42	USER, up Spring 74	
LL-67	10/0	10	12	SERVER (Limited)	
LL-LANTS	31/1	95	137	USER, up 2-74	
LL-TSP	10/2	138	212	USER	
LL-TX-2	10/1	74	112	SERVER	
LLL-RISOS	21/0	21	25	USER	
LONDON	42/0	42	52	SERVER, Limited	614
LONDON-TIP	42/2	170	252	TIP	
LONDON-VDH	42/3	234	352	USER (VDH), up Spring 74	
MIT-AI	6/2	134	206	SERVER	
MIT-DMS	6/1	70	106	SERVER	
MIT-ML	6/3	198	306	SERVER	
MIT-MULTICS	6/0	6	6	SERVER, until 12-17-73	
MIT-MULTICS	44/0	44	54	SERVER, after 12-17-73	
MITRE-TIP	17/2	145	221	TIP	
NBS-ICST	19/0	19	23	USER	
NBS-TIP	19/2	147	223	TIP	
NCC-TIP	40/2	168	250	TIP	
NORSAR-TIP	41/2	169	251	TIP	
OFFICE-1	43/0	43	53	SERVER	
PARC-11	32/2	160	240	USER, up 1-74	
PARC-MAXC	32/0	32	40	SERVER (Limited)	
PARC-VTS	32/1	96	140	USER	
PURDUE	?	?		USER, up 3-74	
RADC-TIP	18/2	146	222	TIP	
RAND-RCC	7/0	7	7	SERVER	
RML-TIP	37/2	165	245	TIP	
RUTGERS-TIP	46/2	174	256	TIP, Up 1-74	
SCI	45/0	45	55	USER, up 6-74	
SCRL	3/1	67	103	USER (VDH)	
SDAC-44	26/0	26	32	USER	
SDAC-TIP	26/2	154	232	TIP	615

SDC-CC	8/1	72	110	SERVER, up 3-74
SDC-LAB	8/0	8	10	SERVER (Limited)
SRI-AI	2/1	66	102	SERVER
SRI-ARC	2/0	2	2	SERVER
SU-AI	11/0	11	13	SERVER
SU-DSL	2/2	130	202	USER (VDH)
TYMSHARE-TIP	43/2	171	253	TIP
UCB	34/1	98	142	USER (VDH), up 1-74
UCLA-CCBS	1/2	129	201	SERVER
UCLA-CCN	1/1	65	101	SERVER
UCLA-NMC	1/0	1	1	USER (after 1-74)
UCSB-MOD75	3/0	3	3	SERVER
UCSD-CC	35/0	35	43	SERVER
UNIVAC	12/2	140	214	USER (VDH), up 2-74
USC-44	23/0	23	27	SERVER
USC-ISI	22/1	86	126	SERVER
USC-TIP	23/2	151	227	TIP
UTAH-10	4/0	4	4	SERVER (Limited)
UTAH-TIP	4/2	132	204	TIP
WPAFB-TIP	47/2	175	257	TIP

616

(address) Listing by Host Address

6m

HOST ADDR (Dec)	HOST ADDR (Oct)	IMP#/ HOST#	HOSTNAME	STATUS

6m1

1	1	1/0	UCLA-NMC	USER (after 1-74)
2	2	2/0	SRI-ARC	SERVER
3	3	3/0	UCSB-MOD75	SERVER
4	4	4/0	UTAH-10	SERVER (Limited)
5	5	5/0	BBN-11X	Peripheral processor for #69.
6	6	6/0	MIT-MULTICS	SERVER (Until 12-17-73)
7	7	7/0	RAND-RCC	SERVER
8	10	8/0	SDC-LAB	SERVER (Limited)
9	11	9/0	HARV-10	SERVER
10	12	10/0	LL-67	SERVER (Limited)
11	13	11/0	SU-AI	SERVER
12	14	12/0	ILL-CAC	USER
13	15	13/0	CASE-10	SERVER
14	16	14/0	CMU-10B	SERVER
15	17	15/0	I4-TENEX	SERVER
16	20	16/0	AMES-67	SERVER
19	23	19/0	NBS-ICST	USER
20	24	20/0	ETAC	USER, up Spring 74
21	25	21/0	LLL-RISCS	USER
22	26	22/0	ISI-SPEECH11	USER, up 1-74
23	27	23/0	USC-44	SERVER
26	32	26/0	SDAC-44	USER
27	33	27/0	BELVOIR	USER, up 6-74
28	34	28/0	ARPA-DMS	USER, agency use only 6m2
29	35	29/0	BRL	USER
31	37	31/0	CCA-TENEX	SERVER
32	40	32/0	PARC-MAXC	SERVER (Limited)
33	41	33/0	FNWC	USER, up 2-74
34	42	34/0	LBL	USER, up Spring 74
35	43	35/0	UCSD-CC	SERVER
36	44	36/0	HAWAII-ALOHA	USER, Up 12-73
40	50	40/0	BBN-NCC	USER
42	52	42/0	LONDON	SERVER, Limited
43	53	43/0	OFFICE-1	SERVER
44	54	44/0	MIT-MULTICS	SERVER, after 12-17-73
45	55	45/0	SCI	USER, up 6-74 6m3

65	101	1/1	UCLA-CCN	SERVER	
66	102	2/1	SRI-AI	SERVER	
67	103	3/1	SCRL	USER (VDH)	
69	105	5/1	BBN-TENEX	SERVER	
70	106	6/1	MIT-DMS	SERVER	
72	110	8/1	SDC-CC	SERVER, up 3-74	
73	111	9/1	HARV-1	USER	
74	112	10/1	LL-TX-2	SERVER	
76	114	12/1	ILL-NTS	USER	
78	116	14/1	CMU-10A	SERVER	
79	117	15/1	I4-TENEXA	Peripheral processor for #15	
86	126	22/1	USC-ISI	SERVER	
95	137	31/1	LL-LANTS	USER, up 2-74	
96	140	32/1	PARC-VTS	USER	
98	142	34/1	UCB	USER (VDH), up 1-74	
100	144	36/1	HAWAII-500	SERVER, up 1-74	
129	201	1/2	UCLA-CCES	SERVER	
130	202	2/2	SU-DSL	USER (VDH)	
132	204	4/2	UTAH-TIP	TIP	
133	205	5/2	BBN-TENEXB	SERVER (Limited)	6m4
134	206	6/2	MIT-AI	SERVER	
137	211	9/2	HARV-11	USER	
138	212	10/2	LL-TSP	USER	
140	214	12/2	UNIVAC	USER (VDH), up 2-74	
142	216	14/2	CMU-11	USER, up Spring 74	
144	220	16/2	AMES-TIP	TIP	
145	221	17/2	MITRE-TIP	TIP	
146	222	18/2	RADC-TIP	TIP	
147	223	19/2	NBS-TIP	TIP	
148	224	20/2	ETAC-TIP	TIP	
150	226	22/2	ISI-DEVTENEX	USER, up 1-74	
151	227	23/2	USC-TIP	TIP	
152	230	24/2	GWC-TIP	TIP	
153	231	25/2	DOCB-TIP	TIP	
154	232	26/2	SDAC-TIP	TIP	
156	234	28/2	ARPA-TIP	TIP	
158	236	30/2	BBN-TESTIP	TIP	
159	237	31/2	CCA-TIP	TIP	
160	240	32/2	PARC-11	USER, up 1-74	
161	241	33/2	FNWC-TIP	TIP	6m5

164 244	36/2	ALOHA-TIP	TIP
165 245	37/2	RML-TIP	TIP
168 250	40/2	NCC-TIP	TIP
169 251	41/2	NORSAR-TIP	TIP
170 252	42/2	LONDCN-TIP	TIP
171 253	43/2	TYMSHARE-TIP	TIP
174 256	46/2	RUTGERS-TIP	TIP, Up 1-74
175 257	47/2	WPAFB-TIP	TIP
176 260	48/2	AFWL-TIP	TIP, Up 3-74
197 305	5/3	HASKINS	USER (VDH), up Spring 74
198 306	6/3	MIT-ML	SERVER
206 316	14/3	CMU-CC	USER, up Spring 74
208 320	16/3	AMES-11	USER, up 12-73
232 350	40/3	BBN-1D	USER
234 352	42/3	LONDON-VDH	USER (VDH), up Spring 74
?	61/?	EGLIN	Up 3-74
?	?	ANL	SERVER, up 2-74
?	?	PURDUE	USER, up 3-74

6m6

(ccn) UCLA-CCN Newsletter Extracts

7

The November issue of the CCN Newsletter is devoted to a description of new statistical routines and packages available at CCN. Presented here is a brief listing of the new statistical routines. For more information, readers are referred to Mark Cirlin [CCN User Services, (213) 825-7548.]

7a

New Statistical Routines that are available include:

TALLY	Word Frequency Counting Program
INDIFF	Generalized Program for Analysis of Transaction Flows.
GAC	Generalized Analysis of Linear Covariance
GEOG88	Multivariate Analysis Programs
MARKOVI	Computes Equilibrium Distributions and First Passage Statistics for regular Markov Chains with 66 states or less.
MARKOVII	Analysis of Simple Absorbing Markov Chains
DUB	Computes a Double Fourier Series for irregularly spaced data
SINGLE	Computes Single Fourier Series
OPTREG	Develops Optimum combination of independent variables for Regression Analysis
ECON	Multiple Regression Program designed expressly for large sample problems
MEANS	This program is available to form moment matrices if the sample [for multiple regression analysis] is particularly large

7b

The two new Statistical packages are: (1) SOUPAC: A versatile package of statistical data processing programs developed by the Computer Science Department of the University of Illinois at Urbana. The package contains an unusually powerful capability for matrix manipulation and data transformation; and (2) POLYCON: A computer program which performs multidimensional scaling with applications to the behavorial sciences. The program was developed at the L. L. THURSTONE Psychometric Laboratory of the University of North Carolina.

7c

The October 31, 1973 issue of the CCN Newsletter contains extensive information on Documentation at CCN; both hardcopy and available online. Readers may request a copy by addressing: Editor - CCN Newsletter, Campus Computing Network C0012, Math Sciences Addition, 405 Hilgard Avenue, Los Angeles, California 90024. The following are brief extracts of some of the online documentation available:

7d

BBOARD

BBOARD is a listing of current system and policy notices containing those items that require immediate dissemination. It is printed as the last page of output of every batch job run except those routed to URSA, and may be viewed through the ARPA Network BBOARD command.

7e

TSO News

News of interest to TSO users; may be viewed by entering the TSO Command NEWS.

7f

APL News

Contains items of interest to APL users and may be viewed by typing)LOAD 1 NEWS.

7g

TSO HELP Command

The TSO HELP Command is the primary documentation for TSO users. It can be used to request terminal display of information about the use, function, and syntax of a command, subcommand, or public command procedure. TSO will return READY when it is ready to accept a command such as the HELP CCMMAND.

7h

The 26 November [yellow sheet] CCN Newsletter announces the availability of a new statistical package named EISPACK. The following is extracted therefrom: EISPACK, a powerful eigensystem subroutine package developed at Argonne National Laboratory, is available at CCN. It consists of a series of FORTRAN IV and OS/360 ASSEMBLER language subroutines which may be called directly from a Fortran program. It can be used to compute some or all of the eigenvalues, with or without eigenvectors, of complex general, complex hermitian, real general, real symmetric, real symmetric tridiagonal, and certain real non-symmetric tridiagonal matrices.

7i

(ucsb) Special Interest Groups

8

(Abstracted from UCSB Computer Center News & Notes, Dec. '73)

8a

UCSB Computer Center announces the formation of "SIG's", Special Interest Groups, to pursue the goals of:

To exchange information.
To promote better service in that area.
To provide advice to the Computer Center, Computer Advisory Committee and other offices as appropriate.
Other purposes as defined by the group.

8b

With a belief that SIG's will assist in the development of computing at UCSB, the Center is organizing users. All interested students, faculty, staff or members of other organizations that have an account with the Center are invited to join. Participation is purely voluntary. Interested persons may contact the UCSB Computer Center Administrative Office, NH 1041, to obtain a questionnaire for submission of a profile of their interests.

8c

(su-ai) A New Accounting Capability at SAIL

9

A new accounting capability has been introduced at SAIL, SU-AI [Host 11], by L. Earnest. The program is invoked by typing: R BUREAU<CR>, and instructions may be found by typing: TYPE BUREAU.LES[up,doc].

9a

For readers who have not tried the Stanford University Artificial Intelligence machine, it is host 11 and can be entered, during off-hours, with the login: L NET/GUE<CR>.

9b

Trial usage of the program was suggestive of a fine capability; enabling users to retrieve, with a great deal of flexibility, attributes of their computer usage.

9c

(case) Update on Delphi

10

This brief scenario is provided to demonstrate the use of the DELPHI system at Case-10. A typescript was taken; DELPHI is entered, a "?" is typed, then the bulletin.board is queried for new software information. The intent of this mini-scenario is to provide exposure for an informative user-system interface. Comments are welcome and should be directed to Jim Calvin at Case-10, or to the Editor.

10a

```
TELNET typescript file started at SUN 23 DEC 73 0202:29

#case-10 is complete.#

 Welcome to Case-10, Cleveland, Ohio. For help run Delphi

 CASE-TENEX 1.31.31, Logos-system Exec 1.51.01
@LOG JC
 Job 18 on TTY26 23-DEC-73 05:02.
@delphi
  Delphi  v.2.5  11-Oct-73

%?
One of the following:
<CR>
available documentation on
bulletin board
describe
exec
gripe
hack
help
quit
type
users guide
what is

%bulletin board
%%?
One of the following:
<CR>
describe
general information
software information
system schedule
%%software information

Date: 2-DEC-73 01:11:40
From: LCF
Re:   SYSTEM LIBRARY

 New system library T3.
 The following subsystems have been changed or added:
    NETED.SAV
    DELPHI.SAV
    QLIST.SAV
    FASBOL.SAV
    PIC.SAV
```

See DELPHI for details.
%quit

10b

(x3s37) Ad Hoc Group on Packet Switching Networks

11

Report of Meeting on 18 December 1973
.....Prepared by David C. Wood [MITRE]

11a

Ira W. Cotton, National Bureau of Standards, was asked by the chairman of the ANSI [American National Standards Institute] (X3S37), Public Data Networks committee, to form an ad hoc group on Packet Switching Networks. The ad hoc group had their first meeting on 18 December 1973 at the Computer Business Equipment Manufacturers Association offices in Washington, D.C. Chairman for the ad hoc group is Ira Cotton, and the following persons attended the formation meeting:

11b

Ira W. Cotton, NBS, Washington (Chairman)
Ralph Alter, Packet Communications Inc., Waltham, Mass.
Vinton G. Cerf, Stanford University, California
Ronald S. Dodgson, MCI, Washington, D.C.
Hal Folts, National Communications System, Washington, D.C.
Lynn Hopewell, Network Analysis Corporation, Vienna, Va.
William H. Jules, MITRE, McLean, Va.
John J. Kucera, UNIVAC, Salt Lake City, Utah
Claude Lemieux, Bell Canada, Ottawa, Canada
Paul E. Madgeburger, CPI Microwave Inc., Dallas, Texas
Louis S. Nidus, MITRE, Bedford, Mass.
Joseph Podvojsky, Burroughs, Paoli, Pa.
D.G. Rhoades, FAA, Wash., D.C.
Anthony M. Tammaro, Tri-Tac, Ft. Monmouth, N.J.
Barry D. Wessler, Telenet, Wash., D.C.
J. L. Wheeler, Xerox, Rochester, N.Y.
David C. Wood, MITRE, McLean, Va.

11c

Membership in the ad hoc group is open to any interested party; inquiries may be forwarded to:

11d

Ira W. Cotton
National Bureau of Standards
B-216 Technology
Wash., D.C. 20234
(301) 921-2601

11e

The group assembled to explore assorted issues in the area of packet switching. Areas for consideration by the ad hoc group were identified by Hal Folts, Chairman, Public Data Networks committee (X3S37), and included: interface between users equipment and a packet switching network and the relationship with circuit switching. Hal suggested the ad hoc group should produce a work plan identifying the specific areas it proposed to consider, and a schedule..."He would like to see these by March 1974 so they could be discussed at the April 1974 meeting of (X3S37)." Ultimately, the ad hoc group's papers should be presented to International Standards Organization (ISO) and CCITT.

11f

After lengthy discussions of issues to be addressed, the group identified two primary areas: (1) the interface between a user and a packet switching network, and (2) the interface between two packet switching networks. Although (X3S37) appeared to have the former area in mind when establishing the ad hoc group, the attendees seemed more concerned with the latter area.

11g

After a discussion of standard terminology, Cerf and Dodgson agreed to define a vocabulary of relevant terms. Vinton Cerf described an approach for interconnecting packet-switching networks. He suggested that another network must look to a packet switch like a host, and that an International Standard or gateway be defined for this purpose. He identified four places where interface standards might be defined: (1) between a host in one network and a host in another network, (2) as a gateway, looking like a host between packet switches in two networks, (3) between a packet switch and a host, and (4) between a packet switch and a terminal. INWG note #39 by Cerf and Kahn is for a host to host protocol which could be used for (1) above. Alter considered (3) above, the host-packet switch interface to be most important. This necessitates a definition of the host-packet switch boundary, and a choice as to whether the packet switch delivers packets in order. It was agreed that multiple gateways between networks would be necessary.

11h

A schedule of issues to address was developed and includes:

11i

(1) Vocabulary
(2) Scope [to be defined by March]
(3) Identification of key problems [by June]
(4) Consideration of alternative approaches, and
(5) Development of positions.

11j

The next meeting for the ad hoc group is scheduled for Wednesday, 6 March 1974 at the same location.

11k

(extra) ARPANET News Supplement [New Feature]

12

The "EXTRA" feature is designed to provide a forum for articles which may be inappropriate for the ARPANET News either because of length or because they are directed at a subset of the readership. This feature is a supplement to the News which will not be distributed to the hardcopy mailing, but which will be available for viewing online or for printing online. To view the supplement online, when in NIC Query, type: b[ring]extra<CR>, or for viewing and/or printing in NLS, L[oad] F[ile] <help>extra CA.

Additionally, the supplement will serve the purpose of being an online repository of past ARPANET News articles of longer term informational value. These articles will be contained in a separate section.

The current contents of the online supplement are:

12a

12b

(abs) Abstracts of Recent Documents of Interest 13

These documents are announced for the interest of the ARPANET Community; however, the NIC is not able to supply copies.

13a

S. Butterfield, B. Rettberg, and D. Walden (Bolt Beranek and Newman Inc., Cambridge, Massachusetts). The Satellite IMP for the ARPA Network. Paper to be presented at the Seventh Hawaii International Conference on Systems Sciences, January 1974. 4p. NIC 19228.

> A version of the Satellite IMP is implemented which follows a random ALOHA protocol with a pair of nodes. By January '74 there will be another version completed which follows a slotted ALOHA protocol among more than two nodes. An experimental version may be implemented with a conventional round-robin TDMA protocol, in addition to other experimental designs. As yet no Satellite IMP has been installed in the ARPANET, mainly because of difficulty in choosing appropriate sites and obtaining approvals. It is hoped that several such installations may be available soon for experimentation in packet broadcast communication.

13b

Robert Balzer (University of Southern California, Information Sciences Institute), T. E. Cheatham (Harvard University), Stephen Crocker (Advanced Research Projects Agency, Information Processing Techniques), Stephen Warshall (Massachusetts Computer Associates). Design of a National Software Works. November 1973. 25p. NIC 19208.

> This paper presents the initial design of a Network based National Software Works (NSW) whose purpose is to significantly improve programmer productivity. Based on ACTORS, it is specifically for software development, and is inherently growth oriented. The NSW is divided into a program execution component (consisting of a compiler or interpreter and a runtime monitor) and a centralized "environment" component (containing all the other tools such as editors, librarians, documentation aids, test case generators), and is largely language independent.

13c

Leonard Kleinrock, Simon S. Lam (University of California at Los Angeles, Computer Science Department). On Stability of Packet Switching in a Random Multi-Access Broadcast Channel. 8 November 1973. To be presented at Seventh Hawaii International Conference on System Sciences, Subconference on Computer Networks, Honolulu, Hawaii, 9 January 1974. 4p. NIC 18918.

> The dynamic behavior and stability of packet switching in a random multiaccess broadcast data communication channel is considered. Quantitative estimates for the relative stability of these channels are given and tradeoffs among channel stability, delay, and throughput are discussed.

13d

R. P. Blanc, I. W. Cotton, T. N. Pyke, Jr., S. W. Watkins (National Bureau of Standards, Information Processing Technology Division). Annotated Bibliography of the Literature on Resource Sharing Computer Networks. September 1973. NBS Special Publication 384. 95p. NIC 18930.

> Contains references with critical annotations to the literature on computer networks. A classification scheme categorizes entries: introductory; theory; architecture; management; and applications are overall subjects with further coding under each major heading. Five indexes: author; corporate author; network; key word out of context, and report number.

13e

A. J. Neumann (National Bureau of Standards, Systems Development Division). User Procedures Standardization for Network Access. October 1973. NBS Technical Note 799. 41p. NIC 18929.

> A survey of user access protocols of six representative systems. The writer logged into six different sites, printed the paper tape results, and discussed the feedback.

13f

A. J. Neumann (National Bureau of Standards, Systems Development Division). Review of Network Management Problems and Issues. October 1973. NBS Technical Note 795. 76p. NIC 18928.

Computer networking is broadly considered including hardware, software, procedures, and people. In order to survey the problems facing development of network management, user requirements and system requirements are outlined in a qualitative manner. Examples of political, economic and legal constraints are summarized. Critical issues for networking management, and other areas of significant management concern are outlined.

13g

Networks and Disciplines - Proceedings of the EDUCOM Fall Conference, October 11-13, 1972, Ann Arbor, Michigan, 1973. EDUCOM, The Interuniversity Communications Council, Inc., Princeton, New Jersey. 209p. NIC 19231.

The development of interinstitutional cooperation through computer networking has long been a goal of EDUCOM. The Fall '72 Council Meeting and Conference, fifth in a series focusing on computer networking for higher education, evidenced a striking consensus of opinion that the computer networking technology for achieving these goals is at hand. Papers cover areas: Networking activities in the disciplines; discipline-oriented workshops in areas such as museums, chemistry, the humanities, languages, economics, libraries, social sciences; network developments and data base handling; impact of networking, with reports from the various educational networks; resource sharing and development of instructional materials.

13h

(calendar) Events of Network Interest

1/3-4 74	* (using) USING Group Meeting at NIC
1/8-10 74	HAWAII-CON
1/10 74	* ARPANET INWG Mtg. after Hawaii Conf.
2/5-7 74	(data)Wkshp-Performance Spec., Data Transm'n Sys.
2/12-14 74	2nd Ann Computer Science Conference
2/26-28 74	(compcon) COMPCON, 8th Int'l IEEE, San Francisco
4/22-23 74	Workshop on Machine-Independent Graphics
5/6-10 74	NCC 1974 National Computer Conference
5/23 74	(trends) IEEE Comp. Soc. Trends and Applications
6/17-19 74	IEEE Intl Conf on Communications ICC74
7/15-17 74	(graph) Conf on Comp Graphics
7/29-8/1 74	(jerusalem)2nd Jerusalem Conf.,Info Tech.
8/5-10 74	(ifip) IFIP Congress '74, Stockholm

A meeting listed here is sponsored by the Group named. Many meetings are open to other interested people. NIC document references are given where available.

Meetings sponsored by Groups in the Network are indicated by *.

14

(using) USING Group, ARPANET, meeting, 3-4 January 1974 at NIC, Menlo Park, California.

14a

Please contact Dave Crocker@UCLA or Nancy Neigus@BBN regarding any questions concerning the meeting. Mil Jernigan@NIC (phone (415)326-6200, ext. 4775) will be happy to make local hotel/motel reservations for you. All USING members please try to attend.

14a1

(data) Workshop on Performance Specification of Data Transmission Systems, Gaithersberg, Md. 5-7 February 1974.

14b

Sponsored by IEEE, Communications Society Data Communications Committee, Data Transmission Systems Subcommittee, and by the National Bureau of Standards. Objective: Improve level of common understanding between various groups and organizations having an interest in the specification, design, and use of digital data transmission systems. Contact: Terry Simms, Bell Northern Research, P.O. Box 3511, Station C, Ottawa, Ontario K1Y 4H7, phone (613)828-2761.

14b1

(compcon) COMPCON 74, 8th International IEEE Computer Society Conference, 26-28 February 1974, Jack Tar Hotel, San Francisco, Ca.

14c

Theme: "Computer Peripherals - Benefactor or Bottleneck?" Conference aims to present a total picture of peripheral industry, featuring such topics as: devices, architecture, applications, technology and innovations, and issues of past, present and future. There will also be short notes and evening sessions. Contact: Mr. A.F. Hartung, System Development Corporation, 2500 Colorado Ave., Santa Monica, Ca. 90406, phone (213)393-9411, x328/329.

14c1

(trends) IEEE Computer Society, Trends and Applications Symposium, Gaithersburg, Md., 23 May 1974.

14d

A symposium in Trends and Applications in Computer Networks, sponsored by IEEE Computer Society Eastern Area Committee and the Washington, D.C. Chapter. Papers invited describing trends in computer network design and economics, tradeoffs in network design and applications of existing and proposed networks. Abstracts of approximately 1000 words due by 15 December 1973 to Kevin Casey, Catholic University, Computer Center, Washington, D.C. 20017.

14d1

(graph) Conference on Computer Graphics and Interactive Techniques, July 15-17, 1974, University of Colorado.

14e

This will be a formal conference with papers later published in the Journal of Computers and Graphics or in the proceedings. Ira Cotton will chair a session on Graphics and Networks, Jim George of Colorado State University will chair a session on Standards, and Andy van Dam of Brown University is planning one on Division of Labor between Central and Satellite Computers. Robert Schiffman of the University of Colorado, Boulder, Colorado 80302, is the Conference General Chairman, and Jon Meads of Tektronix, Delivery Station 81-872, Box 500, Beaverton, Oregon 97005, is the Program Chairman. Contact any of these if you have suggestions or wish to submit a paper.

14e1

(jerusalem) The Second Jerusalem Conference on Information Technology, 29 July-1 August 1974, Jerusalem, Israel.

14f

Papers are sought on: operational environment of computers, including, not limited to: personnel systems, management information systems, health care delivery systems, financial, process control, manufacturing, and a number of other subjects. Original research, successful computer applications, or state of the art reports are requested. Mms. deadline 31 Dec. '73. Contact Dr. Herbert Maisel, Director, Academic Computation Center, Georgetown University, Washington, D.C. 20007.

14f1

(ifip) IFIP Congress '74, Stockholm, Sweden, 5-10 August 1974.

14g

To cover the whole range of information processing, including computer hardware and architecture, software, mathematical aspects of information processing, technological and scientific applications, applications in the social sciences and the humanities, systems for management and administration and social implications of computers. Dr. Herbert Freeman, Chairman, Programme Committee IFIP Congress '74, c/o AFIPS, 210 Summit Ave., Montvale, N.J. 07645.

14g1

Jean Iseli
MITRE Corporation
National Systems Design Dept., W185
1820 Dolly Madison Blvd.
Westgate Research Park
McLean, Virginia 22101

To:
Access Copy

21212

McLean, Virginia 22101

21212

Author Copy