SIGART NEWSLETTER Number 39 April 1973

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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.

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SIGART CHAIRMAN: George Ernst 1b1a

Computing and Information Sciences
Case Western Reserve University
Cleveland, Ohio 44106
Telephone: 216-368-2936

1b1a1

NEWSLETTER EDITOR: Steve Coles 1b1b

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

1b1b1

ASSOCIATE EDITOR: Rich Fikes 1b1c

Artificial Intelligence Center
Stanford Research Institute
Menlo Park, Calif. 94025
Telephone: 415 326-6200 ext. 4620 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 June Issue: May 25th.

CHAIRMAN'S MESSAGE 2

There will be a SIGART meeting at the first National Computer Conference and Exposition this June and Saul Amarel will be the invited speaker. (See Editor's Entry for details.) 2a

Last February, I attended the Computer Science Conference in Columbus, Ohio and found it to be an interesting and successful conference. There were over 300 talks most of which reported on work in progress rather than finished results, and only the abstracts were published. Each was scheduled for a particular, 15 minute time slot, and amazingly enough, the session chairman held the speakers to their scheduled time. Thus, one could look at the abstracts to see which talks he wanted to hear and after attending a talk in one session, he could leave that session for a talk during the next time slot in another session. If there was nothing of interest during the next time slot, that period could be spent in the lobby talking to someone he had not seen for a few years. Hence, this format also improved personal communication, since people were constantly wandering in and out of the lobby. 2b

Refereeing abstracts is not as selective as refereeing complete papers. However, the number of high quality papers in which I was interested seemed to be the same at this conference as at the average conference which referees complete papers. One of the reasons for this was a relatively large number of experienced researchers, including a half dozen from the West Coast that I know personally, who took the time to come to Columbus to tell other people what they are currently doing. 2c

G.W.E. 3/26/73 2d

EDITOR'S ENTRY 3

1. SIGART MEETING AT THE NATIONAL COMPUTER CONFERENCE 3a

There will be a SIGART meeting at the first National Computer Conference and Exposition in New York, tentatively scheduled for Tuesday, June 5th at 8:00 P.M. Prof. Saul Amarel, Chairman of the Department of Computer Science at Rutgers, will talk on "AI at Rutgers." Topics to be discussed include research on representations and modeling in problem solving, question answering, generation and interpretation of event sequences, as well as applications in medical decision-making and automatic programming.

2. IJCAI-73 3b

According to the conference Program Chairman, Dr. Nils Nilsson, "approximately 150 papers have been submitted for the third IJCAI. A preliminary look reveals that many are outstanding." More information will be forthcoming in future issues of the Newsletter.

3. ADDITIONAL SIGART NEWSLETTER REPORTERS 3c

Univ. of California at Berkeley	Michael H. Smith
GM Research Labs.	Arvid L. Martin
Information Sciences Institute at USC	Robert Hoffman

4. CHARGES FOR BACK ISSUES OF SIGART NEWSLETTER 3d

Liz Klein informs me that the charge for back issues of our newsletter is $.50, prepaid. (Since there is a $2.00 billing charge, prepayment is obviously more convenient.) Make checks payable to the ACM. Back issues are still available as listed in the December '72 Newsletter, p.29, and including the most recent issues (Dec. '72 and Feb. '73). Write to:

Ms. Liz Klein
ACM
1133 Avenue of the Americas
New York, New York 10036

5. ARPA NET USED TO TRANSMIT NEWSLETTER MATERIAL 3e

For the first time in history, we did not need to retype an article solicited for the newsletter. The report by Mike Rychener on AI research at CMU, appearing on p. 17 of this issue, was obtained over the Net using the standard FTP protocol and edited on-line. We hope this precedent will be followed by many more in the future.

6. NSF PROJECT TO STUDY ROBOT HARDWARE

3f

The National Science Foundation has awarded SRI a contract to study and recommend moderately priced, general-purpose robot hardware for possible use by any university or organization interested in starting a research program in artificial intelligence. A few institutions such as MIT, Stanford University, and SRI have already invested many man-years in developing special-purpose hardware, and are continuing to do so. However, there are many other universitites engaged in research in computer science that simply cannot afford to commit a substantial engineering effort to the development of such hardware for their own AI research.

SRI is planning to put forth its recommendations in the form of a catalog of modular system components, which will hopefully satisfy the above need for the near future. Of course, as new system components become available, the catalog would have to be expanded and updated.

The SRI study consists of two parts: First, a questionnaire was sent to approximately 250 universities and research institutions throughout the world that might be interested in "robotic" equipment, such as television cameras, manipulator arms, and mobile vehicles. The purpose of the questionnaire was to try and establish functional characteristics and operational parameters deemed important at the present time. The second part of the study is to inquire from all known manufacturers the specifications of relevant hardware devices, such as visual and tactile sensors, manipulators, and other related devices. Tom Binford of the Stanford University Artificial Intelligence Laboratory has provided us with valuable information on sensors, which he has been studying for the past year.

Also in connection with this project, Victor Scheinman of Stanford University and Jerry Gleason of SRI have recently completed a two-week tour of AI-related hardware developments in Japan. (Jerry's report appears on p. 12 of this issue). Judging from the enormous level of activity by both Japanese universities and industry, as well as strong government endorsement through the PIPS Project, it is quite possible that the Japanese will outdistance us in the development of robot hardware in the next few years. Although there seems to be comparatively little attention being given to the more theoretical aspects of AI such as problem solving, theorem proving, etc. in Japan, perhaps the development of fairly sophisticated hardware will precipitate greater concern for this area of AI in the future.

7. THE LIGHTHILL REPORT

3g

It has recently come to my attention that our British colleagues are in the midst of a serious controversy about the future of artificial intelligence in Great Britain and its proper level of government support. To document this debate, see two recent articles appearing in the British Journal, THE NEW SCIENTIST (cf. p. 29 for abstracts).

As best as I can infer from these articles and other personal communications, the British Science Research Council commissioned Prof. Sir James Lighthill, an eminent physicist, to examine the future of AI research and formulate recommendations for future government funding. It appears that his report was so displeasing to workers in the field that the SRC has not yet made its contents public and only a few people have actually seen it in full. (It will allegedly be published late this Spring.) Needless to say, it could not have been a very positive report.

It is reputed that Sir James was invited by Prof. Donald Michie to visit the facilities at the School of Artificial Intelligence at Edinburgh University while he was preparing his report in order to learn what AI was all about first hand, but that he declined. Michie's article in the NEW SCIENTIST seems to be a direct public refutation of the contents of the Lighthill Report. The second article by Rex Malik provides a more detailed account of its contents with additional observations by Drs. Marvin Minsky and Terry Winograd of MIT and Dr. Bertram Raphael of SRI. We certainly hope that our British cousins will resolve this controversy in a satisfactory manner, so they can continue to produce the high quality AI research which they have demonstrated in the past.

8. PRINTER QUALITY

3h

Finally, Rich and I wish to thank those who volunteered the services of their own line printers, in printing a more legible edition of the newsletter for publication. We apologize for the poor type-quality of the last issue and hope that this current issue is more adequate, having been printed with a mylar instead of cloth ribbon.

L.S.C. 3/28/73

IN MEMORIUM 4

1. TO THE FRIENDS OF JAIME CARBONELL
by
Ted Strollo, BBN

4a

As many of you know already, Jaime died suddenly and unexpectedly of a heart attack on February 2, 1973. He leaves his wife, Nelly, and 5 children: Jaime Jr., Dina, Miguel, Ana Maria, and Pablo, their ages ranging from 19 to 6 years old.

Nelly is most concerned about her financial ability to provide for the children's educations, and many of us want to help with that concern. To this end, we have contacted the Carbonell's family lawyer and arranged to set up a trust fund that will minimize any tax burden to the family. We hope you too may want to help. Please send checks made to "The Jaime R. Carbonell Memorial Trust" in care of the undersigned.

Dr. Theodore R. Strollo
Bolt Beranek and Newman Inc.
50 Moulton Street
Cambridge, Massachusetts 02138

2. W. ROSS ASHBY, FAMOUS CYBERNETICIST DIES
by
Gordon Pask
(from the ASC Forum, Vol. V, No. 1, March 1973)

4b

Prof. Dr. Ross Ashby, gentleman, genius, and scholar, died at the age of 69 on November 15, 1972. He was, of course, a world authority on cybernetics and systems theory. He came down from Sidney, Sussex, Cambridge, and practiced medicine; served for many years as Research Director of Barnwood House and at the Burden Neurological Institute. Later he came to the United States, where he was Professor in the Department of Biophysics, at the University of Illinois from 1961 to 1971. On retirement he returned home to Great Britain and spent the last few years of his life as Professorial Fellow at the University of Wales.

AI FORUM 5

COMPUTATIONAL LOGIC - A DISSENTING VIEW

by
John Laski
Computing Center
University of Essex
Colchester, Essex.

5a

Now that Pat Hayes has joined us at Essex, I have stopped being lazy and looked more closely, though not technically very deeply, at computational logic, or as it's devotees call it, Automatic Theorem Proving. What I found has confirmed my earlier naive view.

I can best express this by paraphrasing my memory of Bar-Hillel's beginning to a lecture on language translation at IFIP in 1962. "After n million dollars of support, after m man-years of effort, after x Ph.D. theses, we must honestly admit that our goals (of fully automatic, high quality translation and of new and interesting proofs automatically generated for new and interesting theorems), though properly attractive as an area of scientific research that had a good chance of payoff when it began, must now be recognized as a chimera."

Bar-Hillel exaggerated then and I exaggerate now. I admire the intellectual contribution originated by Robinson in reformulating Predicate Logic in a manner amenable to computation and the mathematical ingenuity of many of his followers.

But I consider that the work of this school has reached a plateau or local maximum whose level is way below the then reasonable expectations of the earlier pioneers and is an order of magnitude below what we need for proofs of program correctness. And I don't see extra-hyper-para-super-modulation, or improvements in software or hardware technology making a blind bit of difference to the situation.

Those were the symptoms; now a dignosis of what I think is wrong. When we produce a program that we confidently allege solves the problem we set out to solve or embark on a plan of action that we believe will attain some desired goal, our confidence is based on natural informal reasoning. Moreover, we can convince our friends of the validity of our solutions; they accept the "reasonableness" of our reasoning.

What is more amazing is that our programs often do what we intended them to, and that our plans, too, yield us, usually, the gratifications we sought. Conversely, when we formalize this reasoning into applied predicate logic, proving the corresponding theorems is too difficult for current automatic theorem provers. This contrast is all the more striking at first sight because these programs are much faster and more reliable at producing proofs than I am; I am actually rather inaccurate at writing things down and consequently don't trust what I've written without constant

rechecking. But, I can, and think I should, turn this last thought upside down to reach my diagnosis.

The formal deductive systems we are using are bad ones for constructing proofs that justify our informal reasoning. This is not surprising; we have taken them uncritically from the mathematical logicians who use them as objects of analysis, whereas we want to use them as objects of use. An object of study should be as parsimoniously specified as possible so that elaborate case analysis in proving its properties can be minimized; conversely, the richer the tools of arguments available, the easier it is to justify some (valid) proposition.

To use a programming analogy, the way we construct proofs is like writing programs in absolute hexadecimal. After diagnosis comes treatment. Robin Milner's LCF system is interesting, and not due to the fact that the logic with which he is working is due to Scott, rather than being classical, applied predicate logic. Scott is just as traditionally parsimonious in describing his system as the predicate logic systems in the literature. What is interesting about what Milner has done is that he has embedded Scott's Logic within an interactive, proof-construction mechanism. The user constructs his proof either bottom-up by requesting that a rule of deduction be applied to already proved formulae or top-down by hypothesizing that a goal will finally be reached by some rule of deduction. The system automatically produces the consequent wffs that are, in the one case, now proved and, in the other, form new subgoals. In both cases -- and this is what I see as important -- the wffs that are produced are syntactically correct and do not require tedious textual checking. To continue the programming analogy, Milner allows us to construct our proofs in a macro-assembly language.

But treatment is not cure, and I have no cure. I believe, however, that the analogy I have drawn between program-contruction languages and proof-construction languages reaches further and provides a clue to the next step. Above macro-languages exist procedural languages which, over the last two decades we have tuned to express naturally the way we construct algorithms. We need to discover formal deductive systems in which we can naturally construct proofs. What semantic constructs this requires I don't yet know. Milner has a Simplify command which allows a dynamically changing set of simplifications to be, when appropriate invoked as a class; he claims this to be very valuable and I also believe it to be a valuable beginning. Some of my collegues, following Winograd, want to see a proof not as static, but as a planned or contrived procedural construct; of this I am very sceptical.

I hope that this note will stimulate some response, either directly to me, or through the AI Forum.

MEMBERSHIP SERVICES

by

Wiley R. McKinzie
ACM Membership #1185214 (I think)
State University College of Arts and Science
Genesco, New York

5b

A copy of this letter is addressed to "Membership Services" of the ACM. A more appropriate title would have been "Membership Disservices." My dealings with you over the past year surely has aged me by five. I will not bother to outline the blunders you have made in the mailing of publications (I missed 6 last year), the handling of membership numbers (I've had three in one year), and the handling of membership dues (I paid for SIGART membership and got SIGACT). I concede I know when I am dealing with a GIIGO (i.e., Good Information In, Garbage Out).

Therefore, with regard to the current problem of multiple billings for SIGART membership, I reluctantly enclose a $3.00 check for the second payment of my SIGART dues in the hope that you don't lose it, enroll me in SIGCAPH (although I feel I belong there at this point) or spend it on more Renewal Notice Forms (I have enough now to paper the walls and ceiling). I am also enclosing a copy of my previous correspondence on this matter in the event someone there happens to read, and is interested. It is against my principles to submit when I'm being raped. However, SIGART does put out an interesting newsletter and for this reason alone I stand compromised.

Finally, I sound this alarm, although these sage words are surely written on the wind.

> "Layman, beware Your cybernetic priests have feet of clay. They boast of their machines that will deliver up your wildest dreams, but their arts are feeble. They cannot even put their own house in order. Better place your fate in the hands of a shaman than such as these."

[Ed. Note: I have personally consulted with ACM Headquarters on the case of Mr. McKinzie and have been assured that the problems referred to above have been satisfactorily resolved.]

KEEP UP THE GOOD WORK

by
Garry Carlson
Brigham Young University
Provo, Utah

5c

In the December issue of the SIGART Newsletter, which I received on February 12, you have some discussion on a possible dues increase. I think the answer to this problem is very simple: whatever it costs to keep SIGART going, including the Newsletter, is what should determine the dues. I think most of us receiving the Newsletter feel it one of the more significant publications that we get and are happy to pay whatever the costs are that are necessary to create and publish it. We realize that there is a large amount of donated labor by you and your secretaries and others, and that all is being done possible to keep the cost to a minimum. You have at least one member's vote for a raising of the dues to whatever is necessary to cover the costs.

Thanks for your good work.

ROBOT RESEARCH IN JAPAN

by
Jerry Gleason, SRI

6

1. INTRODUCTION

6a

As part of an international study sponsored by NSF to recommend hardware for artificial intelligence research, Victor Scheinman and I spent two weeks in Japan visiting universities, industrial research laboratories, and factories. We were impressed to find that a substantial effort is being devoted to image processing techniques and to the development of robots for industrial automation. The largest effort is an eight-year, 100 million dollar program sponsored by the Japanese Ministry of International Trade and Industry (MITI). This is a National research and development program under the over-all direction of Dr. Hiroji Nishino of the Electrotechnical Laboratory (ETL). The PIPS project (Pattern Information Processing System) has five major goals to be accomplished by 1978: (i) Recognition of 2000 printed characters (including Chinese Kanji characters), (ii) Recognition of pictures, (iii) Recognition of 3-D objects, (iv) Recognition of voice, and (v) Recognition of sentences.

2. ETL

6b

At the Electrotechnical Laboratory in Tokyo, under the direction of Dr. Kohei Sato, we saw five manipulators (one of which is shown in Figure 1), a demonstration of an image dissector/laser ranging system, and a small mobile robot which had a TV camera with a flexible fiber-optic light guide, a manipulator with 68 tactile sensors in its hand, and a mini-skirt around its perimeter equipped with an additional 16 tactile sensors. (The latter was developed by Dr. Hirochika Inove and Dr. Hideo Tsukuno.) The computer used by this laboratory was a 20K PDP-12.

3. HITACHI

6c

The HIVIP Mark I hand/eye system at the Hitachi Central Research Laboratory can assemble simple structures given appropriately shaped blocks and a three-view assembly drawing of the desired structure (see Figure 2). It is currently being modified to permit the introduction of tactile sensors on the fingers of the hand.

Dr. Masakuzu Ejiri and Dr. Tadamasa Hirai then demonstrated the HIVIP Mark III hand/eye system, a successor to the Mark I, which used a TV camera to determine the location and orientation of different blocks moving down a conveyor belt, acquire and track a moving block, and finally pick it up and place it in a standard position. They also showed us a soon-to-be-announced printed circuit board inspection system which displays cracks and other defects in red on a color TV monitor, while the boards are moving on a conveyor belt.

ETL-HAND

The ETL-HAND is a hydraulically-driven, multi-joint manipulator with six degrees of freedom (three modes of motion for both rotation and flexion respectively and finger tips with tactile sensors which detect contact with an object. The ETL-HAND has been designed with special attention paid to its driving mechanism and the entire shape of the system for a minimum number of motions. The finger tips are replaceable as necessary.

Receiving signals from the sensors on the finger tips, the computer sends out action signals to define what steps the HAND should take to perform the task.

4. MITSUBISHI 6d

At Mitsubishi Central Research Laboratory, Dr. Takayasu Ito demonstrated a minicomputer-controlled manipulator that used two TV Cameras: one provides an overview of a rotary conveyer table, and the other is mounted in the hand to provide visual feedback for arm positioning. The system "reads" the Kana Character on each of several blocks placed on a fixed table and stacks them on the moving table in the desired order. This system uses a PDP-8/I with 8K of core. The program, however, occupies only 5K of core, including the storage areas for the video image and reference tables for 20 different shapes and characters. A paper describing this system will be presented at the Third International Symposium on Industrial Robots on May 29-31 in Zurich, Switzerland.

Dr. Ito's group, which was formed two years ago, is interested in studying the mathematical theory of computation, theoretical aspects of AI, theorm proving, and improvements of Planner for program writing. Dr. Ito has a 32K PDP-15/40, a 16K PDP-11/20, an 8K Super-Nova, a 16K Melcom 350-5F, and an 8K Melcom 70 (which is similar to a Super-Nova). All of these computers are inter-connected using the PDP-11's Uni-bus. An XDS Sigma 5 is going to be added to this system sometime this year Mitsubishi also had on display an 80x80 electroluminescent (EL) panel TV, a 200x240 EL Computer display with 3 bits of grey levels, and a multi-color liquid crystal display.

5. WASEDA 6e

At Waseda University, Dr. Ichiro Kato had several arms and articulated hands with tactile sensors that were developed primarily for prosthetic applications. Dr. Kato has developed several "walking machines," the latest of which has two arms with hands and a dual TV system for eyes (see Figure 3). Drs. Atsuya Seko and Hiroshi Kobayashi have developed an experimental, parallel-image preprocessor which utilizes the dead-time characteristics of a channel plate multiplier. This device can be used to extract the boundary of high contrast objects, detect moving objects, and perform logic operations on images such as a+b, axb, etc.

6. OTHER LABORATORIES 6f

In addition to the above, we visited Toshiba Research Laboratory, which has a self-navigating, mobile robot for delivering and picking up packages and Kyoto University, where Dr. Toshiyuki Saki is doing research in automatic speech processing, pattern recognition, picture processing (including computer analysis and classification of photographs of human faces), and processing of natural language. We also visited Tokyo University, where Dr. Jin-ichi Nagumo is doing research on associative memory systems and Dr. Yasuhiro Doi is studying new techniques for real time processing of holographic images. At RiKen Information Science Laboratory, Dr. Takashi Soma is developing an ultra-high resolution CRT (16,000x16,000) for use both as a flying spot scanner and as a

large-scale memory. Dr. Eiichi Goto (who is also on the faculty of

Figure 3

the University of Tokyo) is developing a graphic system with halftone and area color capabilities based on a Data Disk 6500 display system.

RiKen has the largest computational facilities that we encountered with a FACOM 270-60, (a Dual cpu with a 256 Kw x 32 bits and 200x10↑6 bytes of disk storage) and a FACOM 270-30 (65 Kw x 16 bits with a large graphics system). By the end of the year the 270-60 will be replaced with a FACOM 270-75, which is five times faster (and reputed to be the largest computer in Japan).

7. INDUSTRIAL FACILITIES 6g

We visited four manufacturing facilities:

(i) Aida Engineering, which manufactures one- and two-handed industrial robots for working with punch-presses,

(ii) Nikon, where we watched the assembly of the F-2 camera (which contains over 100 parts),

(iii) Honda Engineering Co., where the assembly of Honda cars is accomplished, and

(iv) Furukawa Electric Co., which is the 4th or 5th largest communications cable manufacturer in the world. Dr. Kazuhiko Masuda at Furukawa (and former International Fellow at SRI) has designed many systems to automate the assembly of a wide variety of cables.

8. CONCLUSION 6h

It seemed to us that the Japanese are working very diligently to acquire the technology to carry out advanced image processing and also to apply AI technology to industrial automation within the next few years. On the other hand we saw conparatively little interest in the major software and theoretical aspects of AI research.

AI RESEARCH AT CMU - A BRIEF SUMMARY

by
Mike Rychener
Computer Science Dept.
Carnegie-Mellon University

7

The most populous project at CMU is the speech recognition project headed by Professor Raj Reddy and Lee Erman. The current achievement is a voice-chess system incorporating several knowledge sources working in a hypothesize-and-test mode and interacting smoothly as a set of cooperating independent processes. This Hearsay system is reasonably successful in recognizing connected speech in the limited chess context, even though the chess-move grammar includes about five million possible utterances. It relies on a chess semantic specialist, the Tech program, on a grammar specialist, and on basic acoustic routines. Presently, re-analysis and reorganization of that effort is being undertaken, by Lee Erman, Victor Lesser, and Richard Fennell, with views towards implementation on the CMU C.mmp (multi-mini-processor) system. Bruce Lowerre and Richard Smith are analysing the performance of Hearsay for multiple speakers on several other tasks : a Doctor task, voice news retrieval, and a desk calculator.

7a

More basic linguistic research, consisting of gathering and analyzing large amounts of connected speech, is also under way, in the form of single-person projects: Linda Shockey is studying the rules of relaxed speech; Janet Baker, time domain methods and their relationship to neurophysiological theories; Jim Baker, probabilistic representation of knowledge used in a speech understanding system; and Henry Goldberg, comparative evaluation of various parametric representations of speech.

7b

Two graduate students, Keith Price and Ron Ohlander, are working with Professor Reddy in computer vision : face recognition and detection and representation of motion in natural scenes. The work on SYNAPS (Symbolic Neuronal Analysis Programming System) was reported in the previous SIGART newsletter.

7c

Research in understanding and problem-solving forms the main focus of Professor Allen Newell's interest at the moment. This manifests itself in the form of understanding human problem-solving behavior (protocol analysis), in building an understanding system (MERLIN) to represent and reproduce this behavior, and in analyzing the behavior of such systems, expressed as production systems. PAS-II is a fairly large sophisticated Lisp system for automatic protocol analysis, written by Don Waterman. It features multiple passes over a protocol transcription in English, carrying it successively through grammatical parse-trees, semantic elements, behavior graphs(the context of the protocol), and finally a production system simulation of the protocol. The program is highly interactive, allowing the human to take over where the program makes major or minor slips.

7d

Use of the system has been made outside the protocol analysis task area, since its components are sufficiently general to apply to

general text-processing "inductive" tasks. Jim Moore is the mainstay of the MERLIN work, incorporating knowledge of processes and methods of AI into a semantic-net framework. Professor Newell's PS(G) has been used as a principle tool for expressing production systems, although almost every task has resulted in a different sort of implementation. 7e

Tom Moran has studied the simulation of a visualization task using a production system which relies solely on symbolic information (ie, no visual memory as such), with a great deal of success. Stu Card is building a complex data structure (he calls it a knowledge bush) including a production system to represent an understanding of the area of cognitive learning experiments. Another project involves expressing AI programs as production systems in order to carry out an analysis of intelligence and knowledge in the program, a particular example of which is the current focus, the STUDENT program of D. Bobrow. 7f

By now I've mentioned five different production system applications in the environment, and there still seems to be a lot that we don't know about these as programming vehicles, in particular we're nowhere near the stage assumed by programs like PLANNER and QA4, which have taken the liberty of building into the system a set of assumptions which guide the user in solving his problems. In other words we're trying to isolate important design issues which will encapsulate the kinds of knowledge one has after writing many production systems, observing how the lack of control structure can make the task very difficult. 7g

In the area of chess, there are three efforts. Jim Gillogly is working on his Tech program as an example of performance analysis for AI programs, in particular heuristic search types. Hans Berliner, our resident chess Master, has worked up a chess tactics program which has attained a level of 65% success in "Win at Chess", a book of tactical problems. His program is successful in limiting tree search to about 400 nodes in a depth 10 search, utilizing the semantics of the chess position to guide the mode in which the program carries out its analysis. Chess also provides a bridge over the gap between perception and problem-solving, in the work led by Professor Herbert Simon. Through the efforts of Bill Chase and others, about 3000 chess patterns have been encoded into an EPAM-like net with the result that boards can be recognized perceptually at the level of Expert with respect to chess memory tasks. 7h

On other fronts, S. Ramani is working in a CAI area, generating fairly complex drill-type problems usable in beginning programming courses. Bill Mann has developed a semantic-net-based system for structuring external data in terms of known templates, in particular on tasks such as encodings for short-term-memory, and dis-assembly of machine-language insructions. Charles Hedrick is working on the design of a system which uses a semantic net to solve a class of problems including concept formation and sequence extrapolation, in other words general rule inducton. Our efforts in mechanical theorem-proving are being directed by Professor Donald Loveland, consisting of a fairly powerful theorem-prover by Mark Stickel which uses the linear format for resolution. This basicly is oriented towards studying applications

and experimenting with newly-discovered proof strategies. Professor Peter Andrews is extending work into mechanizing higher-order logic. 7i

THE HEURISTIC PROGRAMMING/HEURISTIC DENDRAL PROJECT

by
N. S. Shridharan
Computer Science Dept.
Stanford University

8

The Heuristic Programming Project at Stanford University is an interdisciplinary research effort. The problems of interest to this project include, besides the major effort in the Heuristic DENDRAL set of programs, determination of protein structures from X-ray crystallographic data, work in automatic programming and automatic debugging of programs, and studies on the representation problem. Some aspects of the Heuristic DENDRAL work are detailed below: 8a

The co-principal investigators for the project include Dr. Joshua Lederberg (Genetics), Dr. Edward Feigenbaum (Computer Science), and Dr. Carl Djerassi (Chemistry). Dr. Bruce Buchanan has been with the project from its conception. The interdisciplinary staff include several research associates, research assistants, programmers, and graduate students. The problem chosen to work on -- the application of artificial intelligence techniques to mass spectrometry -- is a rich and varied domain of interest to medicine, organic chemistry, and computer science. 8b

Interpretation of mass spectra requires the judicious application of a very large body of knowledge, whether it is done by a chemist or a computer. Our efforts have paid rich dividends in not only providing a handsome tool of utility to mass spectrometrists and in the systematization of knowledge and technique of mass spectral analysis, but also in helping to further the state of the art in artificial intelligence. The project remains committed to the idea that AI can benefit greatly by applications that do not merely demonstrate feasibility, but actually are of significant practical value. 8c

EXTENSION OF PERFORMANCE 8d

The performance programs developed in the past, for several subclasses of compounds, have been given a unified presentation in [1]. Since that time much effort has been put into extending the performance level of the program by

(i) the successful application for the first time to a problem of biological relevance, namely, the analysis of the high resolution mass spectra of estrogenic steroids. Of particular significance in the effort were, in addition to exceptional performance, the capability for analyzing spectra of mixtures of estrogens without prior separation.

(ii) the completion of the design and programming of a CYCLIC STRUCTURE GENERATOR. Whereas the original DENDRAL algorithm could only generate molecules that do not contain any cycles, the new generator can produce all molecules of a given chemical composition in a prospectively irredundant manner. This problem has defied solution for nearly 100 years and is considered significant in defining the scope and limits of all of chemistry. A substantial effort is now being mounted to flexibly constrain the generator with heuristics.

EXTENSION OF THE THEORY OF MASS SPECTROMETRY 8e

The task of theory formation in science (Meta-DENTRAL) was described in [2], and partial implementation was detailed in [3]. Our objective is to explore the theory formation problem within the context of AI research. The difficulty of the problem is indicated by noting that (i) mass spectrometry has not been formalized to any great degree, (ii) existing theories are not systematic and quite incomplete, and (iii) progress is slow and difficult, even for the chemists.

The present program is at the level of being a very useful aid to the chemist in comprehending the great volume and richness of data that mass spectra contain. The two completed parts of the program are:

(i) Data Interpretation and Summary -- a heuristic search that transforms raw data (spectra and structures) into a representation amenable to rule-formation.

(ii) Rule-Formation -- a process of successive refinement with heuristic guidance that formulates the first-order rules of mass spectrometry.

The formation of sophisiticated rules and their subsequent unification lies in the future. The problem is interesting and nevertheless difficult. There are prolific instances where AI issues like the representation of data, representation of processes, and selection of paradigms are involved. The possibility of introducing a "model" to guide theory formation brings in several other key AI questions.

Copies of articles referenced above are available by writing to the: 8f

Heuristic Programming Project
Serra House
Computer Science Department
Stanford University
Stanford, California 94305

[1] Buchanan, B. G. and Lederberg, J. [1971] "The Heuristic DENDRAL Program for Explaining Empirical Data," Proc. IFIP Congress 71, Ljubljana, Yugoslavia. (Also AI Memo 141, Stanford AI Project, Stanford University.) 8g

[2] Buchanan, B. G., Feigenbaum, E. A., & Lederberg, J. [1971] "A Heuristic Programming Study of Theory Formation in Science," Proc. Second Int. Joint Conf. on Art. Int., Imperial College, London. (Also AI Memo 145, Stanford AI Project, Stanford University.) 8h

[3] Buchanan, B. G., Feigenbaum, E. A., & Sridharan, N. S. [1972] "Heuristic Theory Formation: Data Interpretation and Rule Formation," Machine Intelligence 7, Edinburgh University Press. 8i

[4] Papers on the Cyclic Structure Generator are in various stages of preparation. 8j

CHESS 9

1. A META COMMENT ABOUT THE I.J. GOOD - SAM RASHEVSKY INTERCHANGE

by
Hans J. Berliner
Former World Correspondence
Chess Champion

9a

Though I usually prefer to smile (benignly) when chess amateurs discuss computer problems, the discussion in the SIGART Newsletter of February 1973 was a little too much for me.

First of all, I would think that Mr. Good would know better than to challenge the judgment of Mr. Reshevsky when it comes to chess. I am sure Mr. Reshevsky would have the good sense not to get into a statistics debate with Mr. Good.

Secondly, such positions should be analyzed for the general public at a level commensurate with the play of the competitors in the game. To measure the outcome of a position by grandmaster standards when Class C players are involved, is ludicrous. It is done only in tournaments when a game cannot be finished and must be adjudicated, and I wince every time I am called upon to do that.

Thirdly, Mr. Fischer and Mr. Reshevsky should be informed that chess players of great reputation and ability are working on the chess programming problem. They may not want to include me, since their joint over the board score against me is 6 1/2 - 1/2. However, the credentials of Dr. M. M. Botvinnik of the Soviet Union are impeccable. Besides being probably the greatest player of all times (unless now eclipsed by Fischer) he has outstanding contributions credited to him in the field of electrical engineering. Further, I think all persons interested in chess programming ought to be informed that for any of today's chess programs, it would be impossible to encode 90% of what I know about chess. The problem is the usual semantic data base problem.

P.S. I like your new format of informal presentations along with the technical stuff very much. Please don't take this as a criticism of that.

2. LETTERS TO GEORGE KOLTANOWSKI

[Ed. Note: The following two letters were published in a recent issue of the San Francisco Chronicle in the Chess Column edited by George Koltanowski, a grand master and former world, blind-fold champion.] 9b

WISDOM V

by
Kerry K. Takew
Chicago, Illinois

I noted with interest an article in one of your recent columns concerning the 1972 ACM Computer Chess Tournament. I was disappointed that the author (and, perhaps, you yourself) shares the popular disdain for computer chess among professional players. Admittedly, the playing algorithms which have been profusely developed by programmers to date have not shown success proportional to the time devoted to them.

Two of my collegues and I have therefore been working on chess projects of more limited goals, in order to provide a foundation for more advanced projects. In the process, we have been able to progress more rapidly than if we plunged directly into game-players, and have developed programs which I think are of immediate interest to human players.

Our machine WISDOM V can solve any two-move problem easily. It is more than a match for any human problem solver. I am now in the process of extending the algorithm to three-movers, but will not speculate on its efficiency as yet.

The computer can mean more to chess than most people realize.

Recent Game By MAC HACK

by
Robert Uommi
Berkeley, California

Here is a game which three of us played in consultation last week, at the Stanford Artificial Intelligence Project. The sacrifice on move 11 is apparently unsound, but although White had us busted, it finally blundered in the end thus proving once again the superiority of Man over Machine.

The program which we played, the Greenblatt Chess Program, is said to be the strongest in the world. It is presently about 1580 in strength (High C rating)...

White: MAC HACK.

Black: Cyril Grivet, Tony Marshall*, and Robert Uommi.

FRENCH DEFENSE

1.	P-K4	P-K3	17.	K-K2	QxPch
2.	P-Q4	P-Q4	18.	K-K1	N-R7
3.	PxP	PxP	19.	R-B2	Q-N8ch
4.	B-Q3	B-Q3	20.	B-B1	B-N5
5.	N-KB3	N-KB3	21.	Q-Q3	N-B6ch
6.	O-O	O-O	22.	RxN	BxR
7.	N-K5	P-B4	23.	N-R3	P-KR4
8.	P-QB3	N-B3	24.	K-Q2	P-R5
9.	NxN	PxN	25.	N-B2	P-R6
10.	B-K3	R-K1	26.	Q-B5(a)	Q-B7ch
11.	PxP	BxPch	27.	K-B1	QxBch
12.	KxB	N-N5ch	28.	N-K1	QxNch
13.	K-N1	RxB	29.	K-B2	Q-B7ch
14.	PxR	Q-R5	30.	K-B1	Q-B8ch
15.	R-B3	Q-R7ch	31.	K-Q2	Q-K7ch
16.	K-B1	Q-R8ch	32.	K-B1	Q-Q8 mate

(a) This loses fast. With

26. B-K2, Q-N7 27. N-K1 or

26. ... Q-B7 27. N-Q4

White can still get out of the mess. By the way a computer never resigns. It always plays on until "It's mate."

*[Ed. Note: For reference, Tony is one of my frequent lunch-hour chess adversaries, and I know he has a "B" tournament rating.]

CONFERENCES 10

1. IJCAI-73 DEMONSTRATIONS 10a

We would like to have live demonstrations of AI programs at the IJCAI next August. We plan to provide teletype access to a local PDP-10 as well as to remote computers as necessary via the ARPA Net. If you have an interesting program that can be demonstrated with the above facilities, please contact:

Dr. Jay Tenenbaum
Artificial Intelligence Center
Stanford Research Institute
Menlo Park, California 94025

2. 1973 IEEE SYSTEMS, MAN, AND CYBERNETICS CONFERENCE
November 5-7, Boston, Massachusetts. 10b

CALL FOR PAPERS

Papers are solicited on the broad range of desciplinary frontiers that comprise systems science and cybernetics including decision and utility theory, modeling and simulation, man-machine interaction, control theory, pattern recognition, social choice theory, game theory, adaptive and learning systems, etc. A major theme of the Conference will be the role of systems analysis in solving societal problems. Papers addressed to the application of systems analysis to the analysis, delivery, or planning of public services (transportation, medicine, justice, water resources, etc.) are especially appropriate.

Two types of papers are being solicited: (1) regular papers describing more complete work in some detail, and (2) short papers describing recent and perhaps preliminary work. Authors should submit five copies of the complete manuscript for the regular papers. Deadlines are April 1, 1973 for regular papers and June 1 for short papers. Send manuscripts or summaries to

Dr. Sheldon Baron
Bolt Beranek and Newman, Inc.
50 Moulton Street
Cambridge, Massachusetts 02138.

Each regular paper will be reviewed for possible publication in the IEEE Transactions on Systems, Man, and Cybernetics. All papers accepted for presentation will be published in the Conference Proceedings. Copies of the Proceedings will be available to Conference participants at the time of the meeting and can also be ordered directly from IEEE Headquarters after the Conference.

3. 1973 SYMPOSIUM ON THE HIGH-LEVEL-LANGUAGE COMPUTER ARCHITECTURE
November 7 and 8; University of Maryland; College Park, Md.
Conference Chairman: Prof. Elliott I. Organik
Program Chairman: Prof. Yaohan Chu 10c

CALL FOR PAPERS

This Symposium is sponsored by the TCCA of the IEEE Computer Society, SIGPLAN, and SIGARCH. The objective is to identify and focus on a new kind of computer architecture whereby machines are designed to accept high-level languages and/or direct-users' languages. The topics of interest include, but are not limited to:

** Evaluation of current compilation and execution processes
** Architecture for high-level-language processors
** Architecture for high-level-language control processors
** High-level-language I/O architecture
** Evaluation of high-level-language architecture
** High-level machine languages
** User languages and user-directed architecture
** Semantic modeling of high-level languages
** Symbiosis of semantics and architecture
** Direct implementation of semantic models
** Impact of high-level-language computer systems

Tutorial as well as research papers are solicited. These should be limited to twenty, double-spaced, typed pages including charts, tables, and diagrams. These papers will be refereed. A Proceedings will be published and distributed during the registration at the Symposium.

There will be a special session for researchers to present five-minute research snapshots. Those who wish to include a one-page summary in the proceedings should submit this summary before the deadline.

Deadline for submitting a paper: June 30, 1973

Deadline for submitting research snapshots to be included in the Proceedings: Sept. 15, 1973

Notification of acceptance to the authors: August 15, 1973

Submit papers to:

Dr. Yaohan Chu
Computer Science Center
University of Maryland
College Park, Md. 20742

4. AISB SUMMER SCHOOL 10d

An AISB Summer School is to be held at St. Catherine's College, Oxford, England from July 16 to July 20, 1973. The plan is to bring together a fairly informal mix of four or five leading British researchers in artificial intelligence and about fifty other participants eager to learn from them. The program of instruction will be flexible and will focus on the topic "knowledge systems." Such basic questions will be asked as "How we and intelligent machines do or can acquire, store, and use knowledge?" Participants can expect historical perspectives and detailed and varied insights into current research. Reading lists and notes will be circulated in advance of the meeting itself.

Accommodation will be provided in the College. The basic charge to each participant, including accomodation and all meals, will be about $75.00. It is likely, however, that a number of scholarships will be available for suitable participants. Anyone wishing to attend the School (whether or not a member of AISB) should write for further details to:

James Doran
AISB Summer School
SRC Atlas Computer Laboratory
Chilton, DIDCOT, Berkshire
OX11 OQY, England

5. IFIP CONGRESS '74
August 5-10, 1974; Stockholm, Sweden
CALL FOR PAPERS 10e

This triennial meeting is sponsored by the International Federation for Information Processing (IFIP), which represents the information science interests of its 33 member countries throughout the world. Past congresses, which have been held in Paris, Munich, New York, Edinburgh, and Ljubljana, have been the major international media for the world-wide exchange of information among developers and users of information processing techniques and technology.

The program for IFIP Congress 74 will span the broad field of information processing and will consist of three kinds of presentations:

Invited papers, consisting of one-hour surveys of broad fields, and half-hour presentations of recent advances in specific areas.

Submitted papers, making up the major part of the program, reporting on original work in information processing.

Panel discussions, exploring the present state of the art and current trends.

Papers for the submitted-paper part of the program are solicited throughout the whole range of the information processing field.

Papers dealing with new techniques or new theoretical advances are particularly looked for, but papers describing practical experiences with information processing systems will also be welcome. Papers should be strongly related to the design or use of computer systems. All submitted papers will be reviewed.

For more information write to:

Dr. Herbert Freeman
IFIP Congress '74
c/o AFIPS
210 Summit Avenue
Montvale, New Jersey 07645

AI JOURNAL: SPECIAL ISSUE ON KNOWLEDGE 11

The journal ARTIFICIAL INTELLIGENCE hereby invites papers on the topic of Representation of Knowledge. The first issue of 1974 is intended to be a special issue, exclusively devoted to this topic. 11a

The issue will be concerned with such "knowledge" which is incorporated in human common sense and with such "representations" as are suitable for expressing that knowledge in a computer, and which are also suitable for semantic operations on that knowledge, such as learning, deduction, generalization, or other operations which are of interest and within the reach of computer programs. The "computer" may then be an existing or proposed hardware or hardware-software system. The primary emphasis is on knowledge about the physical world, which among humans is usually conveyed in natural language. 11b

In particular, papers addressing the following topics are within the intended scope of the issue: 11c

1. Principles for the design, criteria for adequacy, and methods for verifying adequacy of a proposed Representation of Knowledge (R of K);

2. Descriptions of specific systems for representation of knowledge;

3. Work in logic, linguistics, and/or psychology, if its relevance to the problem of R of K is carefully explained in artificial intelligence-oriented terms;

4. Experiments with, experience from, analyses of, and opinions about previously proposed systems for R of K;

5. Surveys and syntheses of previously proposed systems for R of K.

Papers addressing the following topics are not within the intended scope of the issue, and will normally be considered for conventional issues of the Journal: 11d

1. Representations for the study of "logical truth" rather than "knowledge";

2. Methods of transformation between natural language or digitized pictures on one hand, and an R of K on the other;

3. Methods for performing or guiding search in a data base with a given R of K;

4. Methods for collecting knowledge in a given R of K (e.g., dealing with informants).

Complete manuscripts must be recieved by August 1, 1973. Manuscripts should be in English, and submitted with original and two copies conforming to the rules of the Journal. Each paper will be reviewed; acceptable papers will be returned to the author by October 15, 1973 for recommended modifications, and must then be resubmitted no later than December 1, 1973. Contributions can be sent to any member of the Committee for this issue: 11e

John McCarthy
Artificial Intelligence Project
Stanford University
Stanford, Calif. 94305
U.S.A.

Erik Sandewall
Datalogilaboratoriet
S-752 23 Uppsala
Sweden

Pat Winston
MIT Project Mac
545 Technology Square
Cambridge, Mass. 02139
U.S.A.

ABSTRACTS 12

MACHINE INTELLIGENCE IN THE CYCLE SHED *

by
Donald Michie
Prof. of Machine Intelligence
Univ. of Edinburgh

12a

In the shadow of the British Science Research Council's controversial Lighthill Report on the future of machine intelligence, the head of the biggest AI group in Britain argues that the cost of such research, with its anticipated pay-off for industry, is trivial compared with England's concorde-like commitment to nuclear physics. During the later 1970's, computing in its various forms is expected to become the world's third largest industry, with the software component predominating.

WHY BUILD ROBOTS +

by
Rex Malik
Freelance Computer Journalist

12b

Artificial intelligence researchers are being branded simply as robot builders. But the bulk of their work today concerns programming computers with strategies for solving a whole range of open-ended tasks. And the robot--really a computer peripheral--is merely their "talking workbench."

A PROGRAM WHICH PLAYS PARTNERSHIP DOMINOES -

by
Michael H. Smith
Department of Electrical Engineering
and Computer Sciences
University of California at Berkeley

12c

A learning program has been written in BASIC to play 4-player partnership dominoes. Because dominoes is a game of incomplete information, the program uses somewhat different principles of artficial intelligence from those used in programs for games of complete information, such as checkers, chess, and go. The program was constructed to use a "strategy signature table," which classifies board situations through the interactions of game parameters. Each entry in the table contains adaptively determined weights indicating the advisability of various strategies. Once chosen, a strategy then employes probability analysis and linear polynomial evaluation to chose a move. Our program wins approximately two-thirds of its games in tournament situations, and has defeated two champion players.

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* pp. 422-423, THE NEW SCIENTIST, Feb. 22, 1973.

\+ pp. 478-480, THE NEW SCIENTIST, March 1, 1973

\- Mr. Smith, an undergraduate student in EECS at Berkeley, has just learned that this paper has won first place in the 1972-73 ACM Communications National Student Paper Competition (now renamed the George E. Forseyth Student Paper Competition). It will be presented at the Annual ACM Conference this August in Atlanta and will probably be published in the Communications at a later time. 12d

REPORT ON A WORKSHOP IN NEW TECHNIQUES IN COGNITIVE RESEARCH

by
A. Newell, H. A. Simon,
R. Hayes, and L. Gregg
Carnegie-Mellon University
January 1973

12e

A nine day Workshop on New Techniques in Cognitive Research was held at CMU in June 1972 under the sponsorship of the Mathematical Social Science Board. The workshop involved continuous on-line interaction with a set of theory-laden program systems (production systems, natural language understanding systems, simulation, automatic protocol analysis systems, and experimentation systems). A guide system (ZOG) was used to mediate the use of these systems. This paper is the final report on the Workshop to the MSSB.

BEYOND REF-ARF: TOWARD AN INTELLIGENT PROCESSOR FOR A NONDETERMINISTIC PROGRAMMING LANGUAGE

by
G.D. Gibbons.
Computer Science Dept.
Carnegie-Mellon University
January 10, 1973

12f

This document reports work on two heuristic problem solving systems, Ref2 and POPS. Both systems accept problems stated as programs in a nondeterministic programming language, and solve the problems by applying heuristic methods to find successful executions of the programs. Ref2 is patterned after Rich Fikes' system, REF-ARF, and contains the problem solving methods of REF-ARF, as well as additional methods based on an alternative representation for the problem context. Ref2 is also able to solve a class of integer programming problems. POPS is a revised and extended version of Ref2, obtained by the addition of goal directed methods based on concepts from GPS.

COMPUTER ANALYSIS OF NEURONAL STRUCTURE

by
D. R. Reddy, W. J. Davis,
R. B. Ohlander, and D. J. Bihary
Computer Science Dept.
Carnegie-Mellon University
March 1973

12g

This paper describes research to date on SYNAPS (Symbolic Neuronal Analysis Programming System), for the analysis of the geometry of single nerve cells and of neuronal networks. Images of dye-injected serial sections are digitized and analyzed to determine the profiles of dentritic branches crossing each section. These sectional profiles are used to reconstruct a three dimensional structure of the dentritic branches. A 3-D display program permits the researcher to look at the structure from different points of view. The eventual goal of this research is to assemble a 3-D model (the wiring diagram) of an architypical ganglion containing select, identified neurons and to correlate neuronal structure with neuronal function within such a system.

SEMANTIC MEMORY OF A PROBLEM SOLVER GENERATOR

by

Franco Sirovich
Computer Science Dept.
Carnegie-Mellon University

September 1972

12h

The 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 semantic 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.

CAN EXPERT JUDGES, USING TRANSCRIPTS OF TELETYPED PSYCHIATRIC INTERVIEWS, DISTINGUISH HUMAN PARANOID PATIENTS FROM A COMPUTER SIMULATION OF PARANOID PROCESSES?

by

Kenneth Colby and Franklin Hilf
Stanford Artificial Intelligence
Project MEMO AIM-182
December 1972

12i

Expert judges (psychiatrists and computer scientists) could not correctly distinguish a simulation model of paranoid processes from actual paranoid patients. Two interviews between a psychiatrist and an actual patient on the one hand and the computer model on the other are presented.

AN APPLICATION OF ARTIFICIAL INTELLIGENCE TO ORGANIC CHEMICAL SYNTHESIS

by

N. S. Shridharan
Ph. D. Thesis*
Computer Science Dept.
S.U.N.Y. at Stony Brook
August 1971

12j

Organic chemical synthesis is found to be a suitable problem for developing machine intelligence where the resulting system promises to be of genuine utility. The aim of the program is to take as input the name of a chemical compound and, utilizing its base of chemical data and chemical reactions, to specify a set of complete synthesis sequences and their evaluation of merit.

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* Available only through University Microfilms, Ann Arbor, Michigan.

The program has successfully discovered multi-step syntheses for relatively complex organic structures without on-line guidance or intercession on the part of the chemist-user. The program is able to deal with a wide variety of functional and structural features. Information concerning organic synthesis reaction mechanisms is provided to the computer in a tabular-form reaction library containing, for each reaction, structural schema for the target and subgoal molecules and a set of tests, largely heuristic, to govern the choice of reaction. With its initial limited library of reactions, problem-solving heuristics, and subgoal evaluation functions, the program developed a conceptually correct synthesis for the complex polycyclic structure of a ketone derivative of twistane and several suggested syntheses for Vitamin A.

The computing effort is divided between the tasks of solution generation (the subject of the thesis) and solution evaluation. The present program uses a heuristic search procedure leading from the target molecule to terminal compounds (the Aldrich Chemical Catalog of commercially available compounds) to investigate partial reaction sequences and stores partial results in a tree structure. There are complex heuristics to prune the tree and to set strategies in developing the tree. Since the program is to specify more than one synthesis sequence, the techniques of tree development are interesting. The problem solving tree, reaction list, and the compound catalog are very large and require the use of auxiliary storage.

The program is written mostly in PL/1(F) applicable to an IBM 360/67, and program timings indicate that we have a fast and efficient practical system.

Inquiries may be sent to:

Dr. N. S. Shridharan
Computer Science Department
Stanford University
Stanford, California 94305

Prof. H. Gelernter
Computer Science Department
State University of New York at Stony Brook
Stony Brook, New York 11790

References:

1. Gelernter, H., Sridharan, N. S., et al. "Computer Methods in Organic Synthesis" (accepted in) TOPICS IN CURRENT CHEMISTRY, Volume 37, Springer-Verlag, Berlin and New York.

2. Sridharan, N. S., "Search Strategies for the Task of Organic Chemical Synthesis" (Submitted to IJCAI-73).

INFANTS IN CHILDREN STORIES - TOWARD A MODEL OF NATURAL LANGUAGE COMPREHENSION

by
Garry S. Meyer
MS Thesis, MIT AI Lab Memo 265
August 1972

12k

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.

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 successfully 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.

A MODEL FOR ADAPTIVE PROBLEM SOLVING APPLIED TO NATURAL LANGUAGE ACQUISITION

by
Larry R. Harris, Ph.D. Thesis, TR 133
Computer Science Dept.
Cornell University (August 1972)

12l

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 this theory, the Natural Language Acquisition Problem is formulated in terms of the adaptive model.

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 alpha-beta minimax process.

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* See SIGART Newsletter, p. 21, (Feb. 1973) for abstract. 12m

The model is applied to the Natural Language Acquisition Problem in order to force an encounter with several critical problems involved with computer learning. The Natural Language Acquisition Problem is the problem of providing a robot the adaptive mechanisms sufficient to learn to converse with a human teacher using natural language. The robot first learns the lexicon of the language by correlating the teacher's description of the robot's actions with the robot's internal description. Then the robot infers a grammar that reflects the structure of the teacher's sentences. At this point the robot can begin conversing using a natural language. The linguistic capability of the robot includes the ability to disambiguate lexical and structural ambiguities, and the ability to formulate full sentence replies. After several learning sessions the robot converses in English using nested dependent clauses.

This adaptive linguistic system successfully copes with many of the critical problems involved in computer learning and serves as an example of an adaptive program in which the learning, rather than yielding only minor improvements, provides the primary basis for successful performance.

THE ROLE OF THEOREM PROVING IN ARTIFICIAL INTELLIGENCE
by
H. G. M. Huber
U.S. NWL Technical Report No. 2864
Dahlgren, Virginia
November 1972

12n

This paper describes and evaluates theorem proving and its role in artificial intelligence in non-technical terms. It discusses the general principles underlying automatic theorem proving on the computer and considers the different strategies and techniques that are used for improving performance. It is shown by examples that theorem proving plays a central role in artificial intelligence. The application of theorem proving to automatic program writing is treated in detail. A candid evaluation of the situation will reveal that further research in specific directions is desirable and that certain other areas do not appear to be promising in the near future.

PROVING THEOREMS ABOUT LISP FUNCTIONS
by
Robert S. Boyer and J Strother Moore
Memo. 60
School of Artificial Intelligence
Edinburgh University

12o

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.

REPRESENTATION OF KNOWLEDGE FOR VERY SIMPLE PAWN ENDINGS IN CHESS

by
S. T. Tan
School Of Artificial Intelligence
University of Edinburgh

MIP-R-98
November 1972

12p

For the purpose of studying how knowledge might be represented, organized, and used, we consider the example of single-pawn endings in chess and develop a program written in the POP-2 language to play these endings. Here, knowledge is represented as associations between predicates over board situations and action schemes, and organized to form a decision tree. To use knowledge to find a move in a given situation, the program retrieves the action scheme associated with the class of situations to which the given one belongs. Only very simple partial evaluation functions are used.

IN THE FOOTSTEPS OF THE AMOEBA - OR MULTI-PROCESSING WITHOUT TEARS

by
H. R. Townsend
Dept. of Machine Intelligence
University of Edinburgh

12q

The difficulty of analysing data from electroencephalogram recordings stems from the stochastic nature of the signals that we are able to record. A large amount of data must be processed in order to derive any useful quantitative estimates. The complex nature of this 'filtering' process makes it necessary to use digital computer techniques, while at the same time something at least approaching real-time processing is necessary to make E.E.G. analysis a practical proposition.

BEYOND OMNIPOTENT ROBOTS

by
Gary G. Hendrix
Department of Computer Sciences
University of Texas at Austin

Technical Report NL 14
March 1973

12r

A new methodology for the construction of world models is presented. The central feature of this methodology is a mechanism which makes possible the modeling of (1) simultaneous, interactive processes, (2) processes characterized by a continuum of gradual change, (3) involuntarily activated processes (such as the growing of grass), and (4) time as a continuous phenomenon.

A HIERARCHY-DRIVEN ROBOT PLANNER WHICH GENERATES ITS OWN PROCEDURES

by
L. Siklossy and J. Dreussi
Department of Computer Sciences
University of Texas at Austin

TR-10
February 1973

12s

LAWALY is a LISP program which solves robot planning problems. Given an axiomatic description of its capabilities in some world, it generates its own procedures to embody these capabilities. It then executes these procedures to solve specific tasks in the world. Hierarchies of subtasks guide the search for a solution. In sufficiently large worlds, LAWALY has routinely solved tasks requiring several hundred steps without needing to learn from previous tasks. The times to solution usually grow about linearly with the number of steps in the solution. LAWALY is extensively compared to another robot planner based on a theorem prover.

PROVING THE IMPOSSIBLE IS IMPOSSIBLE IS POSSIBLE, WITH APPLICATIONS TO ROBOT WORLDS

by
L. Siklossy and J. Roach
The Department of Computer Sciences
University of Texas at Austin

TR-11
February 1973

12t

A novel technique, called hereditary partitions, is introduced. It permits the rigorous proof that, in a given axiomatization, certain states can never be reached. The technique is implemented in a compter proram, DISPROVER, and is applied to robot worlds. DISPROVER cooperates with a path-finding program when the latter encounters difficulties.

GOLEM: GENERATOR OF OBSERVATIONAL LAWS FROM EXPERIMENTS AND MODELS

by
Alois Glanc
Department of Computer Science
Queens College
of the City University of New York

12u

This paper describes a design and evaluation of an interactive computer system, called GOLEM, for generation and verification of laws (hypotheses) valid on the basis of given experimental data and/or mathematical models. In the buidling of GOLEM methods of mathematical logic (predicate calculus and theorem provers), statistics, and Methodology of Science with heuristic techniques have been combined.

A variant of the applied monadic predicate calculus is used for the description (input) of experiments (data sets) and for the expression (output) of laws and hypotheses valid on the basis of the given data sets. The monadic predicate calculus is embedded into an applied second-order predicate calculus with methodological relations, e.g., the causality relation, the correlation relation, etc. The methodological relations form the basis of a query language. GOLEM's basic task is to generate all or some of the formulas which satisfy given methodological relations.

GOLEM can be useful in such areas as: theory formation (e.g., in biology, medicine, or sociology), experimental design, hypothesis formation, or as a component in a robot control program. GOLEM is tested on the problems of finding logical relations between concepts (properties) of 'large' mathematical models and 'discovering' axiomatic systems describing these models.

AI ON TV 13

1. Martin Cardin's novel CYBORG* has now been made into a TV pilot film (by Universal) for a possible series on ABC-TV next Fall. Aired on March 7th and entitled "The Six Million Dollar Man" with Lee Majors as Lt. Col. Steve Austin and Martin Balsom as Dr. Rudy Wells, the film was an excellent and faithful recreation of the original novel. As you may recall, the story concerns a test pilot mutilated in the crash of an experimental NASA plane -- and then turned into a superman by means of incredibly powerful artificial limbs and advanced sensors. Locations included Edwards Air Force Base, and appropriate credit was given at the end to the UCLA Prosthetics Laboratory for their technical assistance. 13a

2. "Genesis II," shown on CBS on March 23rd, is also a pilot for a possible series next Fall. The year is 2133; the world as we know it has long been destroyed by nuclear holocaust. The technologically-based civilization of our own time, dating from before The Great Conflict, has all but disappeared. Moreover, the ecology has become revitalized. Distributed around the globe now are fragments of ancient human culture, wild hordes of savages, and autocratic police states. 13b

Dylan Hunt (played by Alex Cord) is a handsome NASA scientist from our own generation, who was frozen in a suspended animation experiment in 1979 and awakens 154 years later to find that a rock slide has trapped him all this time in an underground laboratory deep under the Carlsbad Caverns. He quickly becomes a pawn in a power struggle between two civilizations vying for access to his immense technical knowledge.

The Tyranians are a race of mutants-- stronger, more intelligent, and disdainful of humans, whom they believe are crippled by emotions. They live under an Ancient Roman-Empire-style dictatorship, located near Phoenix, Arizona, where human slaves are controlled by (supersonic) "pleasure sticks."

Their rivals are a group called PAX, composed of strange, but true human, people in unisex garb and whose patron saint is St. Sigmund (Freud). PAX controls the only advanced system of transportation left--the massive, underground "Subshuttle" whose transcontinental trains whiz down tunnels bored by nuclear power at incredible supersonic speeds.

---

* Now reprinted in paperback by Werner Publications ($1.25). Cf. review in the Oct. '72 SIGART Newsletter, No. 36, p. 45.

Before the film ends our hero must contend with a giant savage, a slave uprising, two kidnappings, a nuclear explosion, and a magnificently beautiful mutant renaissance woman (her mother was true human, and the only evidence of her mutation is a double navel) galloping on horseback, long hair and full cape blowing in the wind. I'm sure that you can instantly perceive the endless possibilities for blending the distant past with the remote future. Although this particular movie did not explicitly involve computers, I'm sure that its creator, Gene Roddenberry ("Star Trek"), is sure to include them in future installments, if it ever reaches our screens next fall.

If you would like to add your voice in helping to make these pilots into full series, I would suggest that you write to ABC and/or CBS-TV in New York. Every little bit helps.

ADVERTISEMENT

14

PROPOSAL FOR AN ARTIFICIALLY INTELLIGENT COMPUTER SCHEDULER

by
Joseph Sharp
General Electric Co.

14a

Why not make scheduling decisions by sophisticated methods? More specifically why not apply the look-ahead techniques, which improve the quality of node evaluation by tree-searching, to the scheduling decisions used in a time-sharing system? The scheduling problem is formulated as a game against nature. Statistics about the past behavior of each job are used to forecast the most probable consequence of a decision; the next decision is made; and then the cycle is repeated. The improvement contributed by the next level of look-ahead is eventually cancelled by the increasing number of forecast errors.

In addition to a more powerful use of the present algorithm, this procedure permits the use of two conflicting objectives. An urgency-oriented algorithm may be used to select admissable decisions, while resource utilization may be improved by selecting the terminal node with the best overlap of resource consumption.

The main evidence in favor of this proposal so far is the significant improvement which James Slagle has obtained by applying a similar approach to sequential pattern recognition, as reported in the February 1971 Communications of the ACM.

Anyone, perhaps a student, who wishes to pursue this topic should contact

Joseph Sharp
General Electric Research and Development Center
P.O. Box 8
Schenectady, New York 12305
518-346-8771, ext. 6346 or 6476.

SIGART NEWSLETTER Number 39 April 1973

(J15670) 9-APR-73 22:52; Title: Author(s): Coles, L. Stephen /LSC ;
Sub-Collections: NIC; Clerk: KIRK;
Origin: <SIGART>APRIL73.NLS;39, 5-APR-73 19:36 KIRK ;

Comments on CFD's command language paper

What surprises me about CFD's command language memo (MJOURNAL,15628,) is that I assumed that all of ARC understood and agreed with the observations made therein. 1

It is clear that the scheme presented therein is precisely a cleaned-up implementation of essentially the present scheme, with the added (very desirable) property that, assuming centralized parsing, BW, BC, and "help" are always possible. 2

However, even though I believe that the scheme of CFD's memo is the logical next step for NLS, it does not attack the following problems, which seem to me to be at the heart of NLS's command language difficulties: 3

1) Ability to respecify parameters without respecifying command. This places certain constraints on non-overlapping of command and parameter syntax (most notable in commands like Replace). I would be in favor of "space" as a command which meant "redo the last command": this would eliminate the difficulty. 3a

2) Parameter syntax, including embedded recognition and feedback. This shows up in a minor way in Substitute and Assimilate and in a major way in subsystems (Journal, debugger). If NLS is ever to be "programmable" (as discussed in a Journal memo of mine last year), it is essential that all commands receive their parameters in a fairly uniform way. However, when subsystems are involved, it is hard to say where a "command" ends. I would be in favor of a scheme which essentially cleans up the present "GOTO STATE" implementation, i.e. which allows any command to say "I am a subsystem" and, meaning: 3b

i) Backup beyond this point would require a command, rather than a CD; 3b1

ii) CD would return control to this point. 3b2

3) As a corollary of 2, "help" for parameters. TNLS has this, of course (or could); I favor a scheme which is like the present arrow-moving and +-↑ dichotomy, but more consistent. 3c

4) Where to draw the line. In the 940 system, for example, the subsystem names were commands, and recognized like the built-in ones; so every time a subsystem was added, the number of characters required to specify some old commands was liable to change, and the "instant recognition scheme" imposes penalties for typing too many characters. In NLS, an

uncomfortable line has been drawn which recognizes everything but the names of user programs. This is a very hard problem, and I don't have a solution to it. If feedback is fast enough, I would favor a "menu" scheme for Goto and Execute. 3d

CFD's scheme is worth considering even for the present NLS because of the incredible volume of adhoc code currently used to implement command recognition (I had to look at it for my work on Substitute) -- I don't believe it would be such a mammoth job. 4

Comments on CFD's command language paper

(J15671) 9-APR-73 23:44; Title: Author(s): Deutsch, L. Peter /LPD;
Distribution: /CHI WLB RWW PR MDK JCN DCE MFA CFD; Sub-Collections: NIC;
Clerk: LPD;
Origin: <DEUTSCH>CL.NLS;2, 9-APR-73 23:43 LPD ;

I do not wish to receive the WEEKLY ANALYSIS REPORT in my journal mail. (I can check the catalog when I'm interested.) Thanks.
Dean

1

(J15672) 10-APR-73 16:53; Author(s): Meyer, N. Dean /NDM;
Distribution: /BAH; Sub-Collections: SRI-ARC; Clerk: NDM;

WLB 10-APR-73 12:48 15673

Feedback to CFD on Command Recognition and Feedback

I want to give you some more extensive feedback on "Command Recognition and Feedback" (re -- 15628,) at a later time; here's just a short note to keep the dialog perking. I agree completely with your comments and think that you are on the right track in developing a framework for command recognition and feedback, and what I have to add is in the way of further elaborating that framework. My intuitive feeling is that as the NLS command repertory grows it is going to be necessary for users to be able to individualize the command language which they use -- this is in addition to being able to extend the language, although most the the same mechanisms apply. This individualization would involve allowing the user to define synonyms (and acronyms) for frequently used commands, indicate relative frequencies of particular command uses so that fewer characters need to be typed for command specification (on the average for each individual user), define subsets of commands where the subset is entered as a "mode" or "subsystem" and commands within the subset are selected by even shorter than normal strings of characters, etc. There is also a need for treating command PHRASES as well as command words in the framework -- for example, how do you handle "Execute Journal" and "Eject Page" in a clean manner? ... more later ... Walt

1

WLB 10-APR-73 12:48 15673

Feedback to CFD on Command Recognition and Feedback

(J15573) 10-APR-73 12:48; Title: Author(s): Bass, Walt /WLB;
Distribution: /cfd chi lpd rww pr mdk jcn dce mfa ;
Sub-Collections: SRI-ARC; Clerk: WLB;

WLB 9-APR-73 20:16 15674

Re Journal Headers

Dean: I surrupticiously changed the OP so the HJ is handled the same as any other header -- i.e., it can be changed by the user at any time. -- Walt 1

WLB 9-APR-73 20:16 15674

Re Journal Headers

(J15674) 9-APR-73 20:16; Title: Author(s): Bass, Walt /WLB;
Distribution: /ndm ; Sub-Collections: SRI-ARC; Clerk: WLB;

MLK 16-APR-73 07:49 15676

Transmittal to Michael A. Padlipsky

ARPA Network Information Center
Stanford Research Institute
Menlo Park, California 94025

NIC 15676
12-APR-73

1

TRANSMITTAL TO: Michael A. Padlipsky
Project MAC
545 Technology Square, Room 508
Cambridge, Massachusetts 02139

2

FROM: Marcia Keeney
Station Agent

3

At the request of Dave Walden (BBN), your name has been placed on the TIP User's Group mailing list.

4

Enclosed are TIPUG notes 1-9. You will receive all future notes on regular distribution.

5

Also enclosed is the Keynote Speech by Ruth Davis at COMCON '73.

6

Encl.

7

NIC 13027
13028
13029
12403
13480
13486
13887
14207
14763
14758

7a

Transmittal to Michael A. Padlipsky

(J15676) 16-APR-73 07:49; Title: Author(s): Keeney, Marcia Lynn /MLK; Distribution: /SA; Sub-Collections: SRI-ARC; Clerk: LLL; Origin: <LANE>NIC15676.NLS;3, 16-APR-73 07:48 LLL ;

MLK 18-APR-73 19:03 15679

TRANSMITTAL TO: Station Agents

TRANSMITTAL TO: Station Agents

FROM: Marcia Keeney (NIC)
Station Agent 1

At the request of Mike Kudlick, I am sending 15 copies of NIC 14796, the TNLS Quick Reference Card to each station agent. Please distribute them at your own discretion; if you need more please contact me at the NIC and I will send them. 1a

MLK 18-APR-73 19:03 15679

TRANSMITTAL TO: Station Agents

(J15679) 18-APR-73 19:03; Title: Author(s): Keeney, Marcia Lynn /MLK ; Distribution: /SA ; Sub-Collections: NIC ; Clerk: KIRK ;

MLK 18-APR-73 19:04 15680

TRANSMITTAL TO: Terry Sack

TRANSMITTAL TO: Terry Sack
Harvard University
Aiken Computation Laboratory
33 Oxford Street
Cambridge, Massachusetts 02138

FROM: Marcia Keeney (NIC)
Station Agent 1

At your request, I am sending 10 copies the TNLS quick reference card, NIC 14796: 1a

MLK 18-APR-73 19:04 15680

TRANSMITTAL TO: Terry Sack

(J15680) 18-APR-73 19:04; Title: Author(s): Keeney, Marcia Lynn /MLK ; Distribution: /SA ; Sub-Collections: NIC ; Clerk: KIRK ;

MLK 18-APR-73 19:06 15681

TRANSMITTAL TO: Barbara Barnett

TRANSMITTAL TO: Barbara Barnett
Stanford University
Artificial Intelligence Project
D.C. Power Lab
Stanford, California 94305

FROM: Marcia Keeney (NIC)
Station Agent 1

At your request, I am sending a copy of NIC 11621 Sur Note #43 1a

MLK 18-APR-73 19:06 15681

TRANSMITTAL TO: Barbara Barnett

(J15681) 18-APR-73 19:06; Title: Author(s): Keeney, Marcia Lynn /MLK ; Distribution: /SA ; Sub-Collections: NIC ; Clerk: KIRK ;

ARPA Network Information Center
Stanford Research Institute
Menlo Park, California 94025

NIC 15682
16-APR-73

TRANSMITTAL TO: Peter Kirstein
University of London
Institute of Computer Science
44 Gordon Square
London, W.C.1, England

FROM: Marcia Keeney
Station Agent

There have been no formal notes circulated in the IMLAC group to date. However, I am enclosing some documents concerning the IMLAC which may be of interest to you.

Your name has been added to the group you requested and should appear in the next update to the directory.

encl:

NIC 7493 Imlac Configuration Guide

NIC 7135 DEC PDP-10 -- Imlac Communication System

NIC 7170 Imlac Display Terminals

NIC 8719 Request for Imlac Configuration Data

NIC 8748 Reply to Imlac Info Request

NIC 7711 Imlac Display Terminals at UCLA-NMC

get copies for me

ARPA Network Information Center
Stanford Research Institute
Menlo Park, California 94025

NIC 15686
17-APR-73

1

TRANSMITTAL TO: Professor E. M. Aupperle
MERIT Computer Network
University of Michigan
1037 North University Building
Ann Arbor, Michigan 48104

2

FROM: Marcia Keeney
Station Agent

3

At the request of Vint Cerf, your name has been added to the INWG mailing list.

4

Enclosed are all back issues of INWG Notes, excluding 1, 3, 7, 8, 9, and 11, which are out of date.

5

15686 Distribution
Station Agent,

MLK 18-APR-73 18:59 15689

TRANSMITTAL TO: Carolyn Huntsman

TRANSMITTAL TO: Carolyn Huntsman
Stanford University
Electronics Research Laboratory
Stanford, California 94305

FROM: Marcia Keeney (NIC)
Station Agent 1

At your request, I am sending the following documents: 1a

NIC 8246 Host/Host Protocol for the ARPA Network
NIC 13491 Socket Number List 1a1

MLK 18-APR-73 18:59 15689

TRANSMITTAL TO: Carolyn Huntsman

(J15689) 18-APR-73 18:59; Title: Author(s): Keeney, Marcia Lynn /MLK ; Distribution: /SA ; Sub-Collections: NIC ; Clerk: KIRK ;

MLK 18-APR-73 19:02 15690

TRANSMITTAL TO: Ralph Alter

TRANSMITTAL TO: Ralph Alter
Packet Communications Inc.
176 2nd Avenue
Waltham, Massachusetts 02154

FROM: Marcia Keeney (NIC)
Station Agent 1

I am enclosing most of the RFC's you requested. Some of the RFC's (those which are not enclosed) have not yet been issued. I will send your Resource Notebook the minute it's ready -- we are now waiting for dividers due to arrive Thursday; so you should have your Notebook by the end of next week. 1a

MLK 18-APR-73 19:02 15690

TRANSMITTAL TO: Ralph Alter

(J15690) 18-APR-73 19:02; Title: Author(s): Keeney, Marcia Lynn /MLK ; Distribution: /SA ; Sub-Collections: NIC ; Clerk: KIRK ;

MLK 31-MAY-73 16:13 15691

TRANSMITTAL TO: Dr. Adrian V. Stokes

TRANSMITTAL TO: Dr. Adrian V. Stokes
Institute of Computer Science
44 Gordon Square
London, W. C. 1
ENGLAND

FROM: Marcia Keeney (NIC)
Station Agent 1

Dear Mr. Stokes: 1a

We have received notice that your office is now a Site on the ARPA Network. As such, you will be receiving documents on distribution from the Network Information Center (NIC). 1b

We are sending you a core collection of existing documents, including the following Functional Documents for which we will provide updates: 1c

NIC 5145	Current Catalog of the NIC Collection	1-DEC-72
NIC 5150	Current Directory of Network Participants	29-JAN-73
NIC 7590	Network Information Center User Guide	2-MAR-73
NIC 7104	Current Network Protocols	22-JAN-73 1c1

NIC 6740 Network Resource Notebook is being revised. I will send a copy as soon as they are ready -- probably within 2 weeks. 1d

We are also sending you a number of documents which you may need as background (see list below). 1e

We will be glad to supply copies of particular documents indicated by a back arrow in the Catalog Listings, and will loan or direct you to sources of other documents in the Listings. 1f

Marcia Keeney, our Station Agent, accomplishes NIC distribution, and has now put you on distribution for all documents sent to Site Liaisons. 1g

c: S. Crocker (ARPA) 1h

encl: 1i

NIC 7542 1i1
NIC 7750 1i2
NIC 10507 1i3
NIC 11681 1i4
NIC 12324 1i5
NIC 11626 1i6
NIC 11768 1i7

15691 Distribution
Station Agent,

MLK 31-MAY-73 16:13 15691

TRANSMITTAL TO: Dr. Adrian V. Stokes

(J15691) 31-MAY-73 16:13; Title: Author(s): Marcia Lynn Keeney/MLK ; Distribution: /SA ; Sub-Collections: NIC ; Clerk: KIRK ;

Transmittal to Station Agents -- 81 NIC 15695
Jeanne North 26 APR 73 1

1a

Enclosed: 1b

NIC 15065 *NWG/RFC #487 Free File Transfer; Bob Bressler (BBN) 1b1

NIC 15356 *NWG/RFC #491 What is "Free"?; M. A. Padlipsky (MIT-MULTICS) 1b2

NIC 15651 *NWG/RFC #497 Traffic Statistics (March 1973); A. McKenzie (BBN-NET) 1b3

NIC 15747 *NWG/RFC #503 Socket Number List; Nancy Neigus, Jon Postel 1b4

NIC 11796 *NWG/RFC #396 Network Graphics Working Group Meeting - Second Iteration; Steve Bunch (ILL-ANTS) 1b5

1c

*sent to Liaisons 1d

Transmittal to Station Agents -- 81

(J15695) 25-APR-73 17:42; Title: Author(s): North, Jeanne B. /JBN ;
Distribution: /SA MDK JEW ; Sub-Collections: NIC ; Clerk: KIRK ;

MLK 31-MAY-73 16:50 15696

TRANSMITTAL TO: Robert Lieberman

TRANSMITTAL TO: Robert Lieberman
Naval Ship Research and Development Center
Code 183
Bethesda, Maryland 20034

FROM: Marcia Keeney (NIC)
Station Agent 1

At your request, I am sending the following documents: 1a

NIC 13950 ARPA NETWORK NIC ANNOUNCEMENT BULLETIN NO.1
NIC 14624 ARPA NETWORK NIC ANNOUNCEMENT BULLETIN NO.2
NIC 14797 ARPANET NEWS Issue 1
NIC 15337 ARPANET NEWS Issue 2 1a1

15696 Distribution
Station Agent,

MLK 31-MAY-73 16:50 15696

TRANSMITTAL TO: Robert Lieberman

(J15696) 31-MAY-73 16:50; Title: Author(s): Marcia Lynn Keeney/MLK ; Distribution: /SA ; Sub-Collections: NIC ; Clerk: KIRK ;

MLK 31-MAY-73 16:49 15697

TRANSMITTAL TO: Robert Lieberman

TRANSMITTAL TO: Robert Lieberman
Naval Ship Research and Development Center
Code 183
Bethesda, Maryland 20034

FROM: Jeanne B. North (NIC)
Information and Station Agent Coordinator 1

We have received notice that your office is now a Site on the ARPA Network. As such, you will be receiving documents on distribution from the Network Information Center (NIC). 1a

We are sending you a core collection of existing documents, including the following Functional Documents for which we will provide updates: 1b

NIC 5145	Current Catalog of the NIC Collection	1-DEC-72	1b1
NIC 5150	Current Directory of Network Participants	29-JAN-73	1b2
NIC 7590	Network Information Center User Guide	2-MAR-73	1b3

The Network Resource Notebook (NIC 6740) and the Current Network Protocols (NIC 7104) are in the process of being revised. A copy will be sent to you in a couple of weeks. 1c

We are also sending you a number of documents which you may need as background (see list below). 1d

We will be glad to supply copies of particular documents indicated by a back arrow in the Catalog Listings, and will loan or direct you to sources of other documents in the Listings. 1e

Marcia Keeney, our Station Agent, accomplishes NIC distribution, and has now put you on distribution for all documents sent to Site Liaisons. 1f

c: S. Crocker (ARPA) 1g

encl: NIC 7542 10507 11768 7750
11681 11626 12324 1h

15697 Distribution
Station Agent,

MLK 31-MAY-73 16:49 15697

TRANSMITTAL TO: Robert Lieberman

(J15697) 31-MAY-73 16:49; Title: Author(s): Marcia Lynn Keeney/MLK ; Distribution: /SA ; Sub-Collections: NIC ; Clerk: KIRK ;

MLK 31-MAY-73 15:32 15698

TRANSMITTAL TO: Donald Price

TRANSMITTAL TO: Donald Price
2270 1/2 W 18th Ave Apt #2
Eugene, Oregon

FROM: Marcia Keeney (NIC)
Station Agent 1

At your request, I am sending the section on graphics from our Network Catalogue. I hope it will be of elp to you. 1a

15698 Distribution
Station Agent,

MLK 31-MAY-73 15:32 15698

TRANSMITTAL TO: Donald Price

(J15698) 31-MAY-73 15:32; Title: Author(s): Marcia Lynn Keeney/MLK ; Distribution: /SA ; Sub-Collections: NIC ; Clerk: KIRK ;

MLK 31-MAY-73 15:27 15699

TRANSMITTAL TO: Dr. M. R. Leavitt

TRANSMITTAL TO: Dr. M. R. Leavitt
Consolidated Analysis Centers Inc.
1815 North Fort Myer Drive
Arlington, Virginia 22209

FROM: Marcia Keeney (NIC)
Station Agent 1

At the request of Dave Walden (BBN), your name has been placed on the TIP User's Group mailing list. 1a

Enclosed are TIPUG notes 1-9. You will receive all future notes on regular distribution. 1b

Also enclosed is the Keynote Speech by Ruth Davis at COMPCON '73. 1c

Encl. 1d

NIC 13027
13028
13029
12403
13480
13486
13887
14207
14763
14758 1d1

15699 Distribution
Station Agent,

MLK 31-MAY-73 15:27 15699

TRANSMITTAL TO: Dr. M. R. Leavitt

(J15699) 31-MAY-73 15:27; Title: Author(s): Marcia Lynn Keeney/MLK ; Distribution: /SA ; Sub-Collections: NIC ; Clerk: KIRK ;

MLK 24-APR-73 13:37 15705

Transmittal to Steve Crocker

ARPA Network Information Center
Stanford Research Institute
Menlo Park, California 94025

NIC 15705
23-APR-73

1

TRANSMITTAL TO: Steve Crocker
Advanced Research Projects Agency
1400 Wilson Boulevard
Arlington, Virginia 22209

2

FROM: Marcia Keeney
Station Agent

3

At your request I am sending 25 TNLS Quick Reference Cards 4

Transmittal to Steve Crocker

(J15705) 24-APR-73 13:37; Title: Author(s): Keeney, Marcia Lynn /MLK; Distribution: /SA; Sub-Collections: SRI-ARC; Clerk: LLL; Origin: <LANE>NIC15705.NLS;3, 24-APR-73 13:13 LLL ;

MLK 24-APR-73 13:04 15706

Transmittal to Robert Thomas

ARPA Network Information Center
Stanford Research Institute
Menlo Park, California 94025

NIC 15706
23-APR-73

1

TRANSMITTAL TO: Robert Thomas
Bolt Beranek and Newman Inc.
50 Moulton Street
Cambridge, Massachusetts 02138

2

FROM: Marcia Keeney
Station Agent

3

At your request I am sending 30 copies of the TNLS Quick Reference Card.

4

Transmittal to Robert Thomas

(J15706) 24-APR-73 13:04; Title: Author(s): Keeney, Marcia Lynn /MLK; Distribution: /SA; Sub-Collections: SRI-ARC; Clerk: LLL; Origin: <LANE>NIC15706.NLS;1, 24-APR-73 13:01 LLL ;

MLK 24-APR-73 12:57 15709

Transmittal to Stan Golding

ARPA Network Information Center
Stanford Research Institute
Menlo Park, California 94025

NIC 15709
23-APR-73

1

TRANSMITTAL TO: Stan Golding
NASA Ames Research Center
Mail Stop 233-13
Moffett Field, California 94035 2

FROM: Marcia Keeney
Station Agent

3

At your request I am sending the following documents: 4

NIC 10685 THE EDUCATION LABORATORY AT SRI 4a

NIC 10324 SRI INFO UPDATE PER REQUEST 4b

NIC 11749 TERMINAL ACCESS TO THE ARPA COMPUTER NETWORK 4c

Transmittal to Stan Golding

(J15709) 24-APR-73 12:57; Title: Author(s): Keeney, Marcia Lynn /MLK; Distribution: /SA; Sub-Collections: SRI-ARC; Clerk: LLL; Origin: <LANE>NIC15709.NLS;2, 24-APR-73 12:56 LLL ;

Transmittal to Vint Cerf

ARPA Network Information Center
Stanford Research Institute
Menlo Park, California 94025

NIC 15710
23-APR-73

1

IRANSMITTAL TO: Vint Cerf
Electronics Research Laboratory
Stanford University
Stanford, California 94305

2

FROM: Marcia Keeney
Station Agent

3

At your request I am sending 2 copies of NIC 7958, Interface Message Processor.

4

Alex McKenzie of BBN is working on a revised version which should arrive here soon. You might call in a couple of weeks if you're interested in receiving it.

5

Transmittal to Vint Cerf

(J15710) 24-APR-73 12:55; Title: Author(s): Keeney, Marcia Lynn /MLK; Distribution: /SA; Sub-Collections: SRI-ARC; Clerk: LLL; Origin: <LANE>NIC15710.NLS;3, 24-APR-73 12:54 LLL ;

MLK 25-MAY-73 13:29 15711

Transmittal to Robert Silberski

ARPA Network Information Center
Stanford Research Institute
Menlo Park, California 94025

NIC 15711
23-APR-73

1

TRANSMITTAL TO: Robert Silberski
National Systems Design Dept., W185
the MITRE Corporation
Westgate Research Park
McLean, Virginia 22101

2

FROM: Marcia Keeney
Station Agent

3

At the request of Jeanne North, I am sending you a copy of NIC 10159, UCSB IMP Interface Specs.

4

15711 Distribution
Station Agent,

Transmittal to Robert Silberski

(J15711) 25-MAY-73 13:29; Title: Author(s): Marcia Lynn Keeney/MLK;
Distribution: /SA; Sub-Collections: SRI-ARC; Clerk: LLL;
Origin: <LANE>NIC15711.NLS;1, 30-APR-73 12:29 LLL ;

MLK 30-APR-73 08:19 15712

Transmittal to Robert O'Brien

ARPA Network Information Center
Stanford Research Institute
Menlo Park, California 94025

NIC 15712
23-APR-73

1

TRANSMITTAL TO: Robert O'Brien
Cabledata Associates, Inc.
701 Welch Road
Palo Alto, California 94304

2

FROM: Marcia Keeney
Station Agent

3

I am enclosing most of the documents you requested. We do not have copies for distribution of the following documents: 4

NIC 6033 which you can get from MITRE Corporation in McLean Virginia; NIC 8463, NIC 12016, and NIC 14187 which you can get from BBN in Cambridge; NIC 10111, a long document which you can get from ALOHA (University of Hawaii); NIC 13998 is a book published by Prentice-Hall which we do not distribute; and finally, NIC 8440 which I simply could not find. The other 20 odd papers are enclosed. 4a

Transmittal to Robert O'Brien

(J15712) 30-APR-73 08:19; Title: Author(s): Keeney, Marcia Lynn /MLK; Distribution: /SA; Sub-Collections: SRI-ARC; Clerk: LLL; Origin: <LANE>NIC15712.NLS;2, 30-APR-73 08:17 LLL ;

MLK 1-JUN-73 20:12 15713

TRANSMITTAL TO: Larry M. Masinter

TRANSMITTAL TO: Larry M. Masinter
Stanford University - Heuristic Programming
Department of Computer Science
Serra House
Stanford, California 94305

FROM: Marcia Keeney (NIC)
Station Agent 1

At the request of Dave Walden (BBN), your name has been placed on the TIP User's Group mailing list. 1a

Enclosed are TIPUG notes 1-9. You will receive all future notes on regular distribution. 1b

Also enclosed is the Keynote Speech by Ruth Davis at COMPCON '73. 1c

Encl. 1d

NIC 13027
13028
13029
12403
13480
13486
13887
14207
14763
14758 1d1

15713 Distribution 1
Station Agent, 1a

MLK 1-JUN-73 20:11 15714

TRANSMITTAL TO: Andres J. Zellweger

TRANSMITTAL TO: Andres J. Zellweger
Department of Transportation
Transportation Systems Center
TC - 55 Broadway
Cambridge, Massachusetts 02142

FROM: Marcia Keeney (NIC)
Station Agent 1

At the request of Dave Walden (BBN), your name has been placed on the TIP User's Group mailing list. 1a

Enclosed are TIPUG notes 1-9. You will receive all future notes on regular distribution. 1b

Also enclosed is the Keynote Speech by Ruth Davis at COMPCON '73. 1c

Encl. 1d

NIC 13027
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15714 Distribution 1
Station Agent, 1a

Stanford Research Institute
Augmentation Research Center
333 Ravenswood Avenue
Menlo Park, California 94025

Donald Atkinson
Bell Canada
Belmont Avenue
Montreal, Quebec

Dear Don:

I certainly enjoyed meeting you and your people last week. I was very impressed with them as people and as professionals--based on what I saw in those few hours. 1

Yours is really the kind of group that we want to establish close relationshiips with. We seem to have much to offer each other as things develop. 2

We are preparing a proposal for your use in looking for funding for use of the Workshop Utility--assuming you still are headed in that direction. 3

As I recall, you mentioned something about talking with others April 11th, about the Utility use. I hope it went well. I'll not be here next week, but hope to get the proposal out the following. If that is not early enough, let me know, please? 4

I think I'll call before you get this, but will send it anyway. 5

Sincerely,

James C. Norton
Augmentation Research Center

JCN/jcn

(J15719) 15-APR-73 17:31; Title: Author(s): Norton, James C. /JCN;
Distribution: /DCE RWW; Sub-Collections: SRI-ARC; Clerk: JCN;
Origin: <NORTON>TODON.NLS;1, 11-APR-73 20:11 JCN ;

Stanford Research Institute
Augmentation Research Center
333 Ravenswood Avenue
Menlo Park, California 94025

J. C. R. Licklider
Project MAC
545 Technology Square, Room 218
Cambridge, Massachusetts 02139
Massacusetts Institute of Technology
Cambridge, Mass.

Dear Lick:

I really enjoyed the time I spent with you last week. I was in a part of the country that I've never visited before, but felt like I had some friends there anyway. I appreciated your going out of your way to give me the lift. 1

I'd be interested in any reactions you have to the Augmented Knowledge Workshop (14724,) paper I left if you find time to get into it. 2

Regarding your Workshop Utility use, further SUR community development aided by Utility service appears most interesting. I have the impression that what we (at ARC) are now doing to aid the process is just a crude start. The focus of more specific attention to the communication flow, methodology to aid the process, and new features needed for improvement could come with use of the Utility computer and people support. 3

We are also wondering about the community aspects of the ARPA project under George Lawrence--Doug referred to as "Bio-Cybernetics"--I think. Is this a candidate for Utility dialog support, perhaps? 3a

Your own use of NLS for your office work sounds good to us. We will probably want most of our first "office users" to be in offices where there are 5-10 people starting to use the system together in their work. However, your involvement in the past, and now with the SUR and other Network activities probably means less "overhead" in getting you into Workshop use on a larger scale. 3b

We should discuss this again. Larry Roberts visited here this week to learn more of NLS (through his own use) and to discuss the ways his ARPA office would move much of their work onto the Utility in September. 3c

I am asking Ken Victor to look into the problem of getting our software into your IMLAC so that it can run Display NLS with mouse and keyset--assuming you still want it there. There are three IMLACS running DNLS at RADC. We are working on BBN and ARPA offices' IMLACs to get them up. The real power of NLS is certainly in the display version. When run through two IMPs and two computers, there is a speed problem, of course, but it seems worth a try. We are busy at work designing an interface between our mouse and keyset and "cheap" displays. We hope to have something the Utility users can get by Fall. More on this later. 4

Thanks again for your hospitality. 5

Sincerely,

James C. Norton
Augmentation Research Center

JCN/jcn

(J15720) 15-APR-73 17:34; Title: Author(s): Norton, James C. /JCN;
Distribution: /DCW RWW; Sub-Collections: SRI-ARC; Clerk: JCN;
Origin: <NORTON>TOLICK.NLS;1, 12-APR-73 09:51 JCN ;