STAFF

EDITOR
Dick Hamlet

TYPING
Eleanor Waters

PRINTOUT

Volume 3
Number 3

CONTENTS

MINKER'S TRAVELS

1. Research

At the start of my sabbatical I had a grant from NASA and a grant from the NSF. During my sabbatical we completed all of the research that was committed under the NASA grant, and a follow-on proposal was submitted and accepted by NASA. Sufficient progress has been made in the past three months so that there will be no problem in meeting the full commitments to NASA. In particular, we expect to have a Question-Answering System which, given questions that may need deductive search to find the answer, will provide a natural language-like answer, a voice synthesized English answer, and if desired, the reasons that led to the answer.

With respect to NSF effort, we requested and received a no cost extension to the grant to complete the work. All of the commitments under the NSF grant have been met. A continuation proposal has been approved by the NSF. This grant was to investigate how to incorporate semantic information into a theorem proving environment. A semantic network concept was developed which looks promising, but continued research and experimentation to determine its utility are needed.

Six technical reports were written during the sabbatical period, one paper written prior to the sabbatical was published in August, 1976, and a second paper also written prior to the sabbatical period was revised. These publications concern (1) an experimental study of theorem proving techniques, perhaps the largest made to date; (2) an efficient algorithm to extract answers from theorem-proving graphs; (3) optimization of evaluation of boolean expressions; (4) binary relations, matrices, and inference methods; (5) the relationship between techniques developed in artificial intelligence and data-base systems; (6) semantic networks; (7) use of semantic networks in deductive question-answering systems; and (8) the control structure of the Maryland Refutation Proof Procedure System.

2. Visits to Other Organizations

(a) Bell Research Laboratories

I presented a talk and held discussions with researchers at the Laboratory.

(b) National Bureau of Standards

The National Bureau of Standards graciously provided me with a private office, secretarial support, library facilities and materials. As an advisor to the Software Engineering Handbook under development at the·NBS I was able to provide some guidance on the Handbook. In addition, as ACM/NBS Coordinator, I advised NBS on joint efforts between NBS and the ACM. The results of one joint effort have recently been published, and a second joint effort is in the planning stage.

(c) European Visits

I visited three institutions, each for four days, and presented both formal and informal talks.

At the University of Paris, work is starting in the area of relational data bases and in the evaluation of such systems. Dr. Gerard Huet of IRIA came to Paris to attend my lecture and to spend time discussing our mutual interests.

The Centre D'Etudes de Rescherche de Toulouse (CERT) is performing work in relational data bases, inferential systems, robotics and artificial intelligence. The inferential system being developed is termed Synthex. Three full days were devoted to a detailed exposition of all of the efforts on inferential systems at Maryland. Mr. Guy Zanon will be coming to the University of Maryland for a year (supported by IRIA) and will work under my direction on the NSF grant and related efforts. This will provide useful liason with the CERT group at Toulouse.

There is a second laboratory at CERT also working in the area of artificial intelligence. Work is being done there on prosthesis devices. They are working on a Belgrade hand (developed in Belgrade, Yugoslavia). An interesting project being worked on is that of fault tolerant detection. The work is being formalized in terms of the predicate calculus and theorem proving techniques apply. There was interest in using the Maryland Theorem Prover on their efforts and it is expected that they will send their axioms to be run at Maryland within the next six months.

The Imperial College of London is heavily engaged in work on theorem proving and artificial intelligence. Professor Kowalski is the prime researcher in this area. During my visit, there were several other visitors from Queen's Mary College, Stockholm University, the University of Santa Cruz, Marseille University, and the University of Edinburgh. A major thrust of work at the Imperial College is the use of predicate logic and theorem provers as a programming language.

3. Service

During the sabbatical I contributed to a number of service activities on behalf of scientific organizations.

(a) ACM/NBS Coordinator.

(b) Advisor to the NBS/NSF Software Engineering Handbook.

(c) Member, Program Committee International Federation of Information Processing Societies, and Assistant Chairman for Programming and Software.

(d) Member, Program Committee for the Jerusalem Conference on Information Technology and on the Conference Advisory Board.

(e) Member, Program Committee for Data Base Conference to be held in Jerusalem, 1978.

(f) Ad Hoc Member of the Computer and Biomathematical Sciences Study Section of the National Institute of Health.

(g) Member, Advisory Board of Who's Who in World Jewry.

(h) Vice-Chairman for Computer Science of the Committee of Concerned Scientists.

(i) Wrote reviews for two books for Computing Reviews.

(j) Wrote a review article for the Transaction on Data Base Management Systems, and reviewed a paper.

(k) Reviewed three technical proposals for the NSF.

(l) Reviewed several papers submitted to Information Systems.

A REQUEST FOR FURTHER FUNDING

Computer simulation of the soul
Has recently revealed the source
Of immorality and mortality.

Further application surely shall
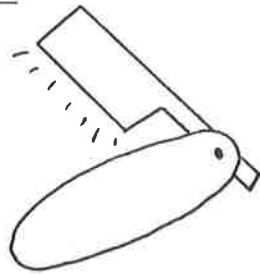Achieve a like delineation
Of immortality and morality

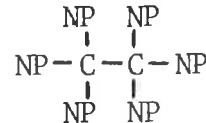(As was originally intended).

--Bert Shaw

"But why do you call them 'L-sets' Professor LaGarsh?"

"Because I suspect that my grateful students and colleagues will one day name them after me, and I want to start them off right."

OCCAM'S RAZOR

FOURIER TRANSFORM

OURIERF

LEGENDRE POLYNOMIAL

$(\text{Legendre})^3 + 2(\text{Legendre})$
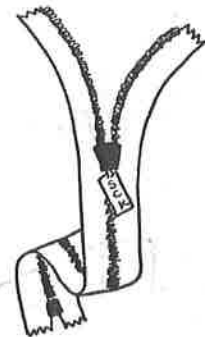
DIRAC DELTA
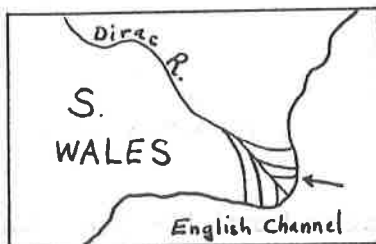
HOARE AXIOMS

1. Get the money first.
2. Have regular checkups.

FERMAT'S LAST THEOREM

$\forall x[x \text{ is a cobbler} \Rightarrow$
$\quad x \text{ should stick to his last}]$

NP-COMPLETE

$$\begin{array}{ccc} NP & & NP \\ | & & | \\ NP-C & - & C-NP \\ | & & | \\ NP & & NP \end{array}$$

SOLUTION OF THE HALTING PROBLEM

Disolve one HP in 3 gal. muriatic acid. Do not breathe fumes.

KLEENE CLOSURE

GAUSSIAN ELIMINATION

photo for hit man

A Dissertation Presented
in Partial Fulfillment of
the Requirements of the
Graduate School

by

A. Church

REDUCTION OF THE HALTING PROBLEM

HALTING
PROBLEM
HALTING
PROBLEM

EXEC 8

ARPANET

ARPABALL

— R. Hamlet & P. Zave

Professional News

Dr. Werner Rheinboldt and Dr. James Vandergraft received a continuation of their present NSF contract entitled "Numerical Solution of Nonlinear Systems of Equations" in the amount of $55,300.00 for the period 1/1/77-6/30/78.

Dr. Jack Minker has been awarded a grant supplement from NSF for Proposal "Question-Answering and Relational Data Base Systems 6/1/74 to 7/31/79 in the amount of $68,400.00... making a total award of $138,600.00. Dr. Minker presented a talk entitled "A predicate-calculus based semantic network for question-answering systems" at Johns Hopkins University in April, and an invited talk "A survey and functional description of information storage and retrieval" at the VPI Blacksburg Conference.

Dr. G. W. Stewart has received a renewal on the present Office of Naval Research contract entitled "Research in Numerical Linear Algebra". The Office of Naval Research will provide Dr. Stewart with $19,696 for the extension of research to 12/3/77.

You will be pleased to learn that Dr. A. Agrawala has been awarded a National Aeronautics and Space Administration contract entitled "Analysis and Modeling of Distributed Computing Environment". The National Aeronautics and Space Administration has awarded Dr. Agrawala $62,137.00 for the year-long research 3/15/77 to 3/15/78.

Dr. Laveen Kanal has been awarded a Public Health Service, National Institute of General Medical Sciences contract entitled "Resource-Related Research Graphic Formulat Translation". Dr. Kanal has been awarded $42,000.00 for the 12-month research contract, 5/1/77 to 4/30/78.
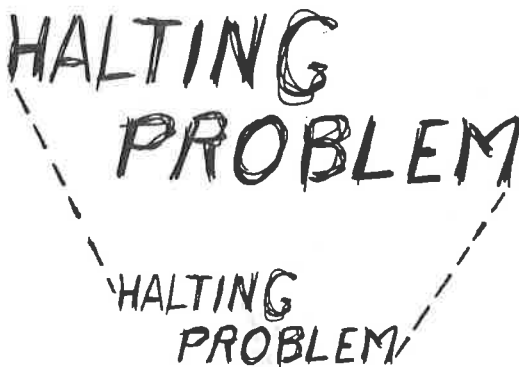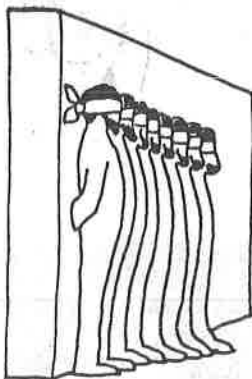
A prof. we shall call Dr. Z.,
Viewed the fruit of his labor proudly,
    He turned up his thumb,
    And declared it a PLUM,
"Would you rather an APL?" quipped he.

--G. Frederickson

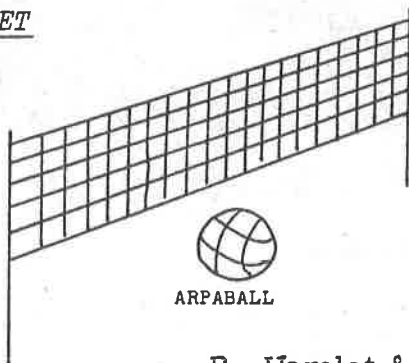*About fifteen years ago Robert Sommer wrote a book called* Expertland
where he described life as an expert in industry and academia. Although
he probably never visited Maryland, he accurately described many faculty
members here. Can you guess who goes along with each description?

EXP

First prize - one year's subscription to "PRINTOUT".

Second prize - Two year's subscription to "PRINTOUT".

ERT

In case of ties, earliest entry wins. ---M. Zelkowitz.

1. In many parts of Expertland, the roads to success are paved with publications. Thick manuscripts with heavy covers make the best paving material. Brief papers and reviews will be inadequate unless they are produced in enormous quantities. A successful journey requires tremendous energy and agility. The successful researcher has bicycled down the road throwing his papers on every doorstep. Whenever he saw an empty space, he filled it joyously. In the end his productions covered the billboards, obscured the sidewalks, and stuffed up the sewers until there was no room left for anything else. He isn't to blame completely for trying to monopolize the various media of communication any more than the businessman can be blamed for trying to sell as much of his product as he can. In each case the road to success was clearly marked and the toll was known beforehand. If a person objects to paying the toll, he should search for a detour or decide that the trip isn't worth the fare.

2. When a scientist reaches senility, he is one of two things, either a consultant or a failure. If he is a consultant then he can live on a generous per diem allowance, travel from Texas to Tahiti at someone else's expense, timing his visits to coincide with various celebrations, and be entertained at numerous parties, dinners, and university clubs. An elder stateman of science is not expected to do original research. The squire simply drops ideas or hints of ideas at various universities and the graduate students will eagerly pick them up as thesis material. One caution heeded by most consultants is never to return to a place until the current crop of graduate students has moved on. It is then possible to repeat a previous lecture and also to avoid recriminations from students who tried unsuccessfully to confirm the theories proposed in the previous lecture.

3. There is a special building set aside for grant-eaters, a species for whom the quest for larger stipends is a way of life. They feed on application forms and foundation brochures and keep themselves and the other animals in a constant turmoil by their ceaseless efforts to push completed applications out of their cages and to snare any hapless philanthropoid who passes by. No grant is too small or too lean for their voracious appetites. By instinct they will eat anything that is green and has no strings attached to it. No matter how much is presently on their plates, they are still looking for more.

The mark of a mature grant-eater is evident to all-his enormous cage, his hoard of uneaten grants, and the parasites feeding off him.

4. After several hundred years of poverty, university professors have found how to make their vacations pay off. Though evening work can be quite remunerative, it is frowned upon by the administration because it interfers with the professor's regular duties. However, the long unbroken block of summer holidays is something entirely different. This is when the money can be made. Some jobs are more remunerative for this purpose than others. Teaching summer school pays the least, followed by field trips (but here the small stipend may be supplemented by a generous travel allowance); next would come a full-time outside job; and most remunerative of all, consulting for a private firm. Some men spend half the winter trying to find remunerative summer employment. The ideal arrangement includes a good salary, a second private office, and a full-time secretary in a place with a comfortable summer climate.

Winter means hard times in the academic community, except for those people

others that they don't have the time. If these men ever had the time to do research, with their knowledge of design and methodology, a new rennaissance would surely be upon us. Only their firm desire to teach others how to do research prevents them from trying their hands at it.

Publications, Etc.

Blumenthal, A. I., L. S. Davis, and A. Rosenfeld, Detecting natural "plateaus" in one-dimensional patterns, IEEE Trans. on Computers C-26, 1977, 178-179.

Davis, L. S. and A. Rosenfeld, An application of relaxation labelling to spring-loaded template matching, Proc. 3rd Intl. Joint Conf. on Pattern Recognition, Nov. 1976, 591-597.

Dyer, C. R. and A. Rosenfeld, Fourier texture features: suppression of aperture effects, IEEE Trans. on Systems, Man, and Cybernetics SMC-6, 1976, 703-705.

Fu, K. S. and A. Rosenfeld, Pattern recognition and image processing, IEEE Trans. on Computers C-25, 1976, 1336-1346.

Rosenfeld, A., Array and web languages: an overview, in A. Lindenmayer and G. Rozenberg, eds., Automata, Languages, Development, North-Holland, Amsterdam, 1976, 517-529.

Rosenfeld, A. and G. J. VanderBrug, Coarse-fine template matching, IEEE Trans. on Systems, Man, and Cybernetics SMC-7, 1977, 104-107.

Ullman, J. R. and A. Rosenfeld, Picture recognition and analysis, The Radio and Electronic Engineer 47, 1977, 33-48.

Weszka, J. S. and A. Rosenfeld, An application of texture analysis to materials inspection, Pattern Recognition 8, 195-200.

McClellan, M. T., Exact Solution of Linear Equations with Rational Function Coefficients, ACM TOMS 3, (March 1977), 1-25.

McClellan, M. T., A Comparison of Algorithms for the Exact Solution of Linear Equations, ACM TOMS (to appear, 1977).

Minker, J., Control structure of a pattern-directed search system, Workshop on Pattern-directed Inference Systems, Hawaii, May 1977.

Norts Spews

Center and Departmental personnel combined to produce entries for 6 teams in the 1976-1977 Grad-Faculty-Staff division of the Intramural Sports Program. Playoffs are still in progress in some sports, so final standings are not known, but current standings are available. As of April 15th CMSC teams ranked 6th out of 41 GFS entries in total points over all events. Phys. Ed. ranked first with 482 points, CMSC totaled 144 points, while Accounts Payable brought up the rear with -6 points (-1 point is "Awarded" for forfeiting a contest).

Fall Semester saw 3 teams representing CMSC in football, cross country, and basketball. The CMSC football team, coached by Steve Rochelle of the Center, battled its way to 3rd place with 3 W, 2 L record. CMSC outpointed Botany, AFROTC, and English behind the defensive play of George "Lightning" Baltz, and Harold "Hands" Foster of the Center, while Flankers Chul "Windsprint" Kim and Steve "Flash" Kopstein of the Department provided the offensive punch with their pass catching. Only once were our stalwarts blitzed by the opposition. In a 34-0 losing effort against Civil Engineering, the lone CMSC first down came on a interference call when a defensive lineman tripped over "Flash" as he ran his pattern.

It is often said that long distance running is a lonely sport. This proved true when Chuck Dyer was the sole CMSC representative in the Cross Country event. But lonliness notwithstanding, Chuck showed the stamina and fortitude characteristic of the long distance runner by turning in a time of 9:41:3 for the 1.75 mile event to capture first place as an individual. Kudos for Chuck and his outstanding efforts (all you other CMSC joggers - take note).

The swing from Fall to Spring Semester was heralded by cries of "foul" as the CMSC basketball team, coach by Greg Frederickson, clawed its way to a 2 W, 4 L record in the face of much taller opposition. Despite a tie for 5th place in their division, our boys held their own in the 4 losing efforts. Going 0 and 4 into the last 2 games of the season, CMSC finally came alive on the in-