

# Sigart Newsletter

No. 100

April 1987

The **SIGART Newsletter** is a quarterly publication of the Special Interest Group on Artificial Intelligence of the Association for Computing Machinery, and is published each January, April, July, and October.

## Contributions

The editors encourage **contributions**, including letters to the editor, technical contributions (1 to 6 pages), comments, abstracts, book reviews, bibliographies of special topics in **AI**, news items, conferences, puzzles, poems, cartoons, problems for **AI** courses, etc. Material may be reproduced from the *Newsletter* for non-commercial use with credit to the author and **SIGART**. The **deadline** for each issue is the beginning of the month *before* the date on the issue (January, April, July and October). 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 the opinions expressed are those of the individual author and not the official position of **SIGART**, the **ACM**, or any organization with which the writer may be affiliated. For those with access to the ARPAnet, materials may be submitted by netmail to the editor, and in SCRIBE format if possible. Camera ready copy in 4.25 inch (10.795cm) columns, **single spaced**, may be used as is.

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# OFFICER'S REPORTS

## Editor's Comments

This issue contains mostly the usual entries, book reviews, abstracts, dissertation list, announcements, etc. Some articles and abstracts have been received and were planned for this issue, but were not typed in time to be included. They will be in the next (July) issue. The end of the issue includes some late announcements to fill out the size a bit; forty-eight pages is relatively efficient to print.

The listing of books for review has 4 new books this month. From the past experience, you have to be very quick to get a book (netmail is the most reliable method). These books will probably be very popular with potential reviewers.

By now, the election should be under way (or at least it will be soon). The candidates were listed in the January issue. The results should be known before the meeting at the AAAI conference in July in Seattle (we plan to hold our annual meeting there -- details are not ready yet). No matter who wins, there will be a new set of officers (vote early, vote often, don't vote for me since I'm not running).

The locals continue to be active; see the inside back cover for a listing of the various locals. The listing has grown to the point that it does not all fit on the single page. The pending approval local groups are given on this page. Later versions will remove some of the extra information, or expand it to two pages or more. Several changes and additions are included in this issue.

Conferences, workshops, journals, and magazines continue to proliferate to such an extent that it is impossible to keep up, even in limited research areas. Part of the growth comes from the true growth of the field (or subfields within AI). Increasing the available number of journal pages is good for people who need to publish (e.g. professors), but not good for people looking for how things have been done (e.g. students). Unfortunately, the major journals for AI cannot grow to accommodate all the good work (assuming that the quantity of good work has also increased), so new, more specialized journals are being created. As more authors submit papers, good papers must be rejected from the older (more established, better reputation, more widely read) journals. On the conference front, this year AAAI accepted about 157 papers of 715 submitted. This leads to three questions: Are there that many good papers written in one year (i.e. the 715)? Should other sub-areas of AI start their own strong conferences so that the good work can be published? Were the rejected papers really bad, or were there just too many good papers to fit in the conference schedule?

*Keith Price*  
April 1, 1987

## APPROVAL PENDING

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512/448-9711

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**Chair:** Elizabeth J. Mattson [Symbolics]  
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## Books Available for Review

The following books are available for review. If you are interested send your request to the editor (include alternate books if available, the number is for my internal reference, but you may use it in your letter). You will receive a copy of the book with the expectation that you will prepare a review for a future issue. The review should focus on content and usefulness for researchers, teachers, and others interested in various aspects of AI.

1. **Expert Critiquing Systems, Practice-Based Medical Consultation by Computer**, Perry L. Miller, Springer-Verlag. (47)
2. **Neural Networks for Computing**, AIP Conference Proceedings (1986), American Institute of Physics. (48)
3. **The T Programming Language, A Dialect of Lisp**, S. Slade, Prentice-Hall Publishers. (45)
4. **The Elements of Artificial Intelligence**, S. Tanimoto, Computer Science Press. (Note that this book will include a disk with the programming examples, be prepared to review it also.) (46)
5. **Molecular Electronics: Beyond the Silicon Chip**, M. Jarvis, SEAI Tech Pubs. (38)

# CALENDAR OF EVENTS

## AI Related Conferences and Paper Deadlines of the Recent Past and Future

- March 22-26, 1987** - NCGA Computer Graphics '87, Philadelphia, PA.
- March 23-25, 1987** - 6<sup>th</sup> Symposium on Principles of Database Systems, San Diego, CA. See Sigart #97.
- April 1-3, 1987** - 3<sup>rd</sup> Conference of the European ACL, Copenhagen, Denmark. See Sigart #98.
- April 5-9, 1987** - CHI'87 and GI'87, Toronto. See Sigart #99.
- April 6-10, 1987** - 2<sup>nd</sup> Intl. Symposium on Knowledge Engineering, Madrid, SPAIN. See Sigart #99.
- April 6-10, 1987** - AISB-87, Univ. of Edinburgh. See Sigart #98.
- April 18, 1987** - Professional Development Seminar on AI. Sponsored by LA ACM, and Sigart. Los Angeles.
- April 22-24, 1987** - AI 1987 Conference and Exposition, Long Beach, CA. Tower Conference Management.
- May, 1987** - 4<sup>th</sup> Intl. Conference on Logic Programming, Melbourne, Australia. See Sigart #98.
- May 11-13, 1987** - Intl. Conference on Expert Systems and the Leading Edge in Production Planning and Control, Charleston, SC. See this issue.
- May 13-15, 1987** - Expert Systems and Their Applications, Avignon, France. See Sigart #98.
- May 15-15, 1987** - 3<sup>rd</sup> Australian Conference on Applications of Expert Systems, Sydney. See Sigart #99.
- May 25-27, 1987** - 2<sup>nd</sup> Intl. Conference on Rewriting Techniques and Applications, Bordeaux, France. See Sigart #98.
- May 27-29, 1987** - 1<sup>st</sup> Intl. Conference on AI and Law, Northeastern Univ., Boston. See Sigart #98.
- June 2-4, 1987** - The IEEE Second Western Expert Systems Conference, Anaheim, CA.
- June 2-5, 1987** - Intl. Symposium on Symbolic and Algebraic Computation, Leipzig, GDR. See Sigart #99.
- June 3-5, 1987** - 1987 SIGIR International Conference on Research and Development in Information Retrieval, New Orleans, LA. See this issue.
- June 3-5, 1987** - AI Europa, Frankfurt, West Germany.
- June 4-5, 1987** - 4<sup>th</sup> Workshop on Theoretical Issues in Conceptual Information Processing, Washington, DC. See this issue.
- June 8-11, 1987** - ICCV-87, London, England. See Sigart #97.
- June 15-17, 1987** - European Conference on Object Oriented Programming, Paris. See Sigart #99.
- June 21-24, 1987** - 1<sup>st</sup> Intl. Conference on Neural Networks, San Diego, CA. See Sigart #99.
- June 22-25, 1987** - 4<sup>th</sup> Intl. Workshop on Machine Learning, UC Irvine, CA. See this issue.
- June 24-26, 1987** - NECC87, Philadelphia, PA. See Sigart #98.
- June 29-August 7, 1987** - Stanford Linguistics Institute. See Sigart #96.
- July 6-9, 1987** - ACL Annual Meeting, Stanford, CA. See Sigart #98.
- July 12, 1987** - Directions and Implications of Advanced Computing, Seattle, WA. See Sigart #99.
- July 12-18, 1987** - AAAI-87, Seattle, WA.
- July 13, 1987** - Workshop on Blackboard Systems: Implementation Issues, Seattle, WA. See this issue.
- July 16-18, 1987** - Cognitive Science Society, 9<sup>th</sup> Annual Conference, Seattle, WA. See this issue.
- July 20-24, 1987** - Workshop on Coupling Symbolic and Numeric Computing in Knowledge-Based Systems, Bellevue, WA. See this issue.
- July 27-31, 1987** - SIGGRAPH '87, Anaheim, CA.
- July 28-31, 1987** - 2<sup>nd</sup> Intl. Conference on Genetic Algorithms, Cambridge, MA. See this issue.
- August 4-7, 1987** - 2<sup>nd</sup> Intl. Conference on Applications of AI in Engineering, Boston, MA. See Sigart #98.
- August 10-15, 1987** - Human Computer Interaction, Honolulu, HI. See Sigart #97.
- August 17-20, 1987** - 2<sup>nd</sup> Intl. Workshop on Natural Language Understanding and Logic Programming, Vancouver, BC. See Sigart #99.
- August 23-28, 1987** - IJCAI 87, Milan, Italy. See Sigart #97.
- August 24-26, 1987** - Intl. Workshop on Petri Nets, Madison WI. See Sigart #99.
- August 31-September 3, 1987** - European Conference on AI in Medicine, Marseilles, France. See this issue.
- October 5-7, 1987** - Workshop on Computer Architecture for Pattern Analysis and Machine Intelligence, Seattle, WA. See this issue.
- October 5-7, 1987** - Workshop on Spatial Reasoning and Multi-Sensor Fusion, St. Charles, IL. See this issue.
- October 14-17, 1987** - 2<sup>nd</sup> Intl. Symposium on Methodologies for Intelligent Systems, Charlotte, NC. See Sigart #99.
- October 28-30, 1987** - AI East, Atlantic City, NJ. Tower Conference Management.
- November 1987** - Australian Joint AI Conference, Sydney, Australia. See this issue.
- November 9-12, 1987** - Intl. Conference on Computer-Aided Design, Santa Clara, CA. See this issue.
- November 30-December 2, 1987** - IEEE Workshop on Computer Vision, Miami, FL. See this issue.
- December 9-11, 1987** - Frontiers in Computing, Amsterdam, The Netherlands. See this issue. **January 5-8, 1988** - 21<sup>st</sup> Hawaii International Conference on System Sciences, Kona, HI. See this issue.

June 5-8, 1988 - Computer Vision and Pattern Recognition, Ann Arbor, MI.

June 6-9, 1988 - NCC.

July 18-22, 1988 - IMACS World Congress, Second Generation Expert Systems, Paris. See this issue.

August, 1988 - AAAI Minneapolis, MN.

August 22-27, 1988 -- COLING-88, Budapest, Hungary. See this issue.

#### For those who plan ahead

August 20-26, 1989 - IJCAI-89. Detroit, MI.

Summer, 1991 - IJCAI-91, Site proposals due April 15, 1987.

June 8-11, 1992 - NCC-92.

August 2-6, 1993 - SIGGRAPH '93, Anaheim, CA.

July 27-31, 1987 - **Robot Manipulators, Computer Vision and AI** at MIT. Contact Office of the Summer Session at (617) 253-2101.

July 28-August 7, 1987 - 2<sup>nd</sup> **Advanced Course in AI** at Oslo, Norway. Contact ACAI'87 at Box 5030 Majorstua, N-0301 Oslo 3, Norway.

July-August 1987 - **Summer Institute in Computer Science** at Univ. of Calif. Santa Cruz. Topics include Artificial Neural Networks and Object Oriented Programming. Contact Karin Poklen of UC Extension at (408) 429-4535.

Various - **Expert Systems** at Dallas, TX. Topics include Expert systems and knowledge engineering. Contact Mind Path Technologies at (214) 770-5435.

Various - **Self Paced AI Video Course** at ---. Contact Carnegie Group at (412) 642-6900.

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### Short Courses

March 4-5, 1987 - **Fundamentals of AI** at Johns Hopkins Univ.. Contact Short Course Office at (301) 338-8302.

Spring, 1987 - **Introduction to AI; Lisp Programming** at Univ. of Calif. Los Angeles. Contact UCLA Extension at (213) 825-3985.

April 7-9, 1987 - **Computer Vision** at Johns Hopkins Univ.. Contact Short Course Office at (301) 338-8302.

April 20-24, 1987 - **Functional Programming** at Univ. of Calif. Los Angeles. Contact UCLA Extension at (213) 825-3985.

May 11-13, 1987 - **Industrial Robotics** at McGill University. Contact Research Centre for Intelligent Machines at (514) 392-5426.

May 11-15, 1987 - **Computer Vision, Image Processing and Pattern Recognition** at Purdue University. Contact School of Electrical Engineering at (317) 494-2756.

May 14-15, 1987 - **Robot Programming** at McGill University. Contact Research Centre for Intelligent Machines at (514) 392-5426.

May 18-22, 1987 - **Introduction to AI and Expert Systems** at Univ. of Calif. Los Angeles. Contact UCLA Extension at (213) 825-3344.

May 18-22, 1987 - **Lisp, Prolog and Rule-Based Programming** at Purdue University. Contact School of Electrical Engineering at (317) 494-2756.

June 8-12, 1987 - **Advanced Topics in AI** at Univ. of Calif. Los Angeles. Contact UCLA Extension at (213) 825-1047.

July 20-24, 1987 - **Computer Vision** at Univ. of Michigan. Contact Engineering Summer Conferences at (313) 764-8490.

July 26-August 9, 1987 - **Computational Neuroscience: Vision** at Cold Spring Harbor Laboratory. Contact Registrar at (516) 367-8343.

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# LETTERS TO THE EDITOR

## Sicherman - Mastermind

Dear Editor:

In connection with the intriguing article "Algorithms to Play Mastermind" by Rao, Kazin, and O'Brien (SIGART, January 1986), your readers may be interested in a Jotto program I wrote in the mid-70s for a CDC 6400.

Jotto resembles Mastermind, but uses English words rather than color patterns. Each player chooses a word of five different letters. The players alternately offer such words as guesses, and are told how many letters are correct, but not whether their positions are correct. (Thus an answer of "5" does not necessarily end the game!)

The program combined heuristic strategy with brute force. It maintained an "active" list of all valid words, discarding those eliminated by each guess. A potential guess word was evaluated by checking it against a large random sample from the active list, and computing the entropy of the distribution of responses. After evaluating as many randomly chosen guess words as time permitted, the program would use the one with the highest entropy. (To save time, the entropy function was implemented in assembly language, using the number of significant bits instead of the binary logarithm.)

I used the entropy of the distributions to minimize the expected number of guesses. It might have been better to use the maximum, to minimize the worst-case number of guesses. Even so, the program was very hard to beat, rarely needing more than eight guesses. Moreover, it maintained an auxiliary list of words that were valid for all but one response, so that it could recover from a single inaccurate response, and it often did! Of course, when it lost under such circumstances, it claimed a win anyway.

Very truly yours,

(s) G. L. Sicherman  
{rocksvax,decvax}!sunnybcs!colonel  
colonel@buffalo.CSNET

# ANNOUNCEMENTS

## THE 1987 COMPUTERS AND THOUGHT AWARD

It is my great pleasure to announce that the winner of the 1987 Computers and Thought Award is Johan de Kleer of Xerox Palo Alto Research Center. The Award is in recognition of his fundamental contributions to artificial intelligence research in the areas of: qualitative reasoning, truth maintenance, constraint propagation and explicit control of reasoning.

The Computers and Thought Lecture is given at each International Joint Conference on Artificial Intelligence by an outstanding young scientist in the field of artificial intelligence. The Award carries with it a certificate and the sum of \$2,000 plus travel and subsistence expenses for the IJCAI. The Lecture is one evening during the Conference, and the public is invited to attend. The Lecturer is invited to publish the Lecture in the conference proceedings. The Lectureship was established with royalties received from the book *Computers and Thought*, edited by Feigenbaum and Feldman; it is currently supported by income from IJCAI funds.

Nominations for The 1987 Computers and Thought Award were invited from all in the artificial intelligence international community. The award selection committee was the union of the Programme, Conference and Advisory Committees of IJCAI-87 and the Board of Trustees of IJCAII, with nominees excluded.

Past recipients of this honour have been Terry Winograd (1971), Patrick Winston (1973), Chuck Rieger (1975), Douglas Lenat (1977), David Marr (1979), Gerald Sussman (1981), Tom Mitchell (1983) and Hector Levesque (1985).

Alan Bundy  
IJCAI-87 Conference Chair

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## THE 1987 IJCAI AWARD FOR RESEARCH EXCELLENCE

I regret to announce that the IJCAI-87 Awards Committee, having considered all the candidates nominated for the Research Excellence Award, have decided not to make an award.

The Award is given in recognition of an Artificial Intelligence scientist who has carried out a program of research of consistently high quality yielding several substantial results. The first recipient of this award was John McCarthy in 1985. In the opinion of the Awards Committee none of the nominated candidates reached the high standard required. Several members of the Committee afterwards suggested candidates that, in their opinion, did reach the required standard, but who had not been nominated.

Nominations for the Award were invited from all in the artificial intelligence international community. The Award Committee was the union of the Programme, Conference and Advisory Committees of IJCAI-87 and the Board of Trustees of IJCAII, with nominees excluded.

It is the sincere hope of all the Committee that, in future years, a greater effort will be made by the artificial

intelligence community to nominate suitable candidates.

Alan Bundy  
IJCAI-87 Conference Chairman

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## PROPOSALS FOR SITES FOR IJCAI-91 SOLICITED

The site for IJCAI-91 will be selected at the IJCAI-87 in Milan this coming summer (23-28 August). Because of the size of the conferences, it is now necessary to plan four years in advance. The selection process has become more complicated for the same reason. As a result, it will be necessary for countries that would like to host IJCAI-91 to submit detailed proposals describing their plans for the meeting and to prepare thorough budget estimates in advance. It will be necessary for an officially recognized AI organization in the country selected to sign an agreement with IJCAII that establishes a formal commitment to hold the conference and that defines mutual responsibilities.

IJCAI conferences are organized every two years, usually in August, and they alternate between North America and other parts of the world. Since IJCAI-89 will be held in Detroit, Michigan, USA, IJCAI-91 will be held outside of North America.

Proposals will be evaluated in relation to a number of site selection criteria:

1. National, regional, and local AI community support.
2. National, regional, and local government and industry support.
3. Accessibility, attractiveness, and desirability of proposed site.
4. Appropriateness of proposed dates.
5. Adequacy of conference and exhibit facilities for anticipated number of registrants (currently 7500-10000 for North America; 2000-3000 or more elsewhere, depending on the location).
6. Adequacy of residence accommodations and food services in a range of price categories.
7. Adequacy of budget projections.

Prospective hosts should request a detailed list of site information required and a set of budget categories as soon as possible. Initial draft proposals should be submitted by 15 April 1987; final proposals must be distributed to the Executive Committee by 15 July 1987.

Direct requests for proposal information to the IJCAII Secretary-Treasurer:

Dr. Donald E. Walker (IJCAII)  
Bell Communications Research  
435 South Street, MRE 2A379  
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# THE CATALOGUE OF AI TECHNIQUES

Alan Bundy

The Catalogue of Artificial Intelligence Techniques is a kind of mail order catalogue. Its purpose is to promote interaction between members of the AI community. It does this by announcing the existence of AI techniques, and acting as a pointer into the literature. Thus the AI community will have access to a common, extensional definition of the field, which will: promote a common terminology, discourage the reinvention of wheels, and act as a clearing house for ideas and algorithms.

The catalogue is a reference work providing a quick guide to the AI techniques available for different jobs. It is not intended to be a textbook like the Artificial Intelligence Handbook. It, intentionally, only provides a brief description of each technique, with no extended discussion of its historical origin or how it has been used in particular AI programs.

The original version of the catalogue, was hastily built in 1983 as part of the UK SERC-DoI, IKBS, Architecture Study. It has now been adopted by the UK Alvey Programme and is both kept as an on-line document undergoing constant revision and refinement and published as a paperback by Springer Verlag. Springer Verlag have agreed to reprint the Catalogue at frequent intervals in order to keep it up to date.

The on-line and paperback versions of the catalogue meet different needs and differ in the entries they contain. In particular, the on-line version was designed to promote UK interaction and contains all the entries which we received that meet the criteria defined below. Details of how to access the on-line version are available from John Smith of the Rutherford-Appleton Laboratory, Chilton, Didcot, Oxon OX11 0QX. The paperback version was designed to serve as a reference book for the international community, and does not contain entries which are only of interest in a UK context.

By "AI techniques" we mean algorithms, data (knowledge) formalisms, architectures, and methodological techniques, which can be described in a precise, clean way. The catalogue entries are intended to be non-technical and brief, but with a literature reference. The reference might not be the "classic" one. It will often be to a textbook or survey article. The border between AI and non-AI techniques is fuzzy. Since the catalogue is to promote interaction some techniques are included because they are vital parts of many AI programs, even though they did not originate in AI.

We have not included in the catalogue separate entries for each slight variation of a technique, nor have we included descriptions of AI programs tied to a particular application, nor of descriptions of work in progress. The catalogue is not intended to be a dictionary of AI terminology, nor to include definitions of AI problems, nor to include descriptions of paradigm examples.

Entries are short (abstract length) descriptions of a technique. They include: a title, list of aliases, contributor's name, paragraph of description, and references. The contributor's name is that of the original author of the entry. Only occasionally is the contributor of the entry also the inventor of the technique. The reference is a better guide to the identity of the inventor. Some entries have been subsequently modified by the referees and/or editorial team, and these modifications have not always been checked with the original con-

tributor, so (s)he should not always be held morally responsible, and should never be held legally responsible.

The original version of the catalogue was called "The Catalogue of Artificial Intelligence Tools" and also contained descriptions of portable software, e.g. expert systems shells and knowledge representation systems. Unfortunately, we found it impossible to maintain a comprehensive coverage of either all or only the best such software. New systems were being introduced too frequently and it required a major editorial job to discover all of them, to evaluate them and to decide what to include. It would also have required a much more frequent reprinting of the catalogue than either the publishers, editors or readers could afford. Also expert systems shells threatened to swamp the other entries. We have, therefore, decided to omit software entries from future editions and rename the catalogue to reflect this. The only exception to this is programming languages, for which we will provide generic entries. Any software entries sent to us will be passed on to Graeme Pub. Co., who publish a directory of AI vendors and products.

If you would like to submit an entry for the catalogue then send it to:

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Tel: 44-31-225-7774 ext 242  
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## Computers and Philosophy

**CLEVELAND STATE UNIVERSITY**  
**Department of Philosophy**  
**Cleveland, Ohio 44115**  
**(216) 687-3900**

The American Association of Philosophy Teachers and the Department of Philosophy at Michigan State University announce the Second National Conference on Computers and Philosophy to be held in East Lansing, Michigan on June 18, 19, and 20, 1987. The call is for presentations on intellectual, ethical, and practical problems in the development of philosophical software as well as for papers on all other aspects of the relationships between philosophy and computers. Papers on Artificial Intelligence are particularly invited. The conference will also serve as a showcase for instructional software for use in Philosophy classes. Local and hardware arrangements will be handled by Professors Joseph Hanna and Herbert Hendry of the Philosophy Department at MSU (East Lansing, MI 48824-1036). Deadline for submissions is April 30, 1987. Conference particulars including the call for presenters is available from Professor Nelson Pole of the Philosophy Department at Cleveland State University (Cleveland, OH 44115).

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# INTERNATIONAL CONFERENCE ON EXPERT SYSTEMS AND THE LEADING EDGE IN PRODUCTION PLANNING AND CONTROL

Charleston, South Carolina  
May 11-13, 1987

**SPONSORED BY:** Institute of Information Management, Technology and Policy and Management Science Department College of Business Administration University of South Carolina

**In Cooperation with:** Operations Management Association and American Association for Artificial Intelligence

**CONFERENCE OBJECTIVES** The conference theme is "Bridging the Gap between the Leading Edge in Production Planning and Control and Expert Systems Development." Significant advances in theory and practice have occurred in both fields, yet manufacturing competitiveness and technology transfer lag behind. The conference goal is to explore state-of-the-art production planning and control and expert systems development, and to encourage in transfer of ideas among what to date have been divergent

audiences. Participants will leave with answers to the following questions:

- \* Where is the leading edge in production planning and control?
- \* What are the primary challenges to future advances?
- \* How can expert systems and related information technologies contribute to these advances?

**CONFERENCE ORGANIZATION AND TOPICS** The conference is organized around a core of five major sessions and panel discussions. Each session includes invited papers that focus on recent advances in production planning and control and on topic-specific expert systems developments. Breakout sessions following each day's activities provide ideal opportunities for conference participants interested in further dialogue. Conference attendees will represent industries, universities, and research laboratories. Middle and upper management from the automotive, textile, aerospace, and computer industries will be among those attending.

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## BINDINGS

George Drastal  
Siemens Research & Technology Labs.  
Princeton Forrestal Center  
105 College Road East.  
Princeton, NJ 08540

# CALLS FOR PAPERS

## The 1987 INTERNATIONAL CONFERENCE ON COMPUTER-AIDED DESIGN

November 9-12, 1987  
Santa Clara, California

Sponsored by:  
Computer Society of the IEEE  
IEEE Circuits and Systems Society  
in cooperation with  
IEEE Electron Devices Society  
ACM-SIGDA<sup>+</sup>

The Conference is oriented towards Electrical Engineering CAD professionals, concentrating on CAD for Electronic Circuit Design. Papers on the following topics are invited:

- \* Simulation: Functional, Logic, Timing, Circuit, Device and Process Simulation, Modeling.
- \* Layout: Placement, Routing, Floor Planning, Interactive and Symbolic Layout, Circuit Extraction, Design Rule Checking.
- \* Test: Test Pattern Generation, Testability, Built-in Test, Fault Simulation.
- \* Systems: Design Synthesis, Silicon Compilers, Expert Systems, Tool Integration, Data Base Management, Hardware Acceleration, CAD Systems.

All papers should be suitable for a 25 minute presentation, and must not have been previously published.

Authors should submit 12 COPIES of both a 1-paragraph abstract and a more detailed description not to

<sup>+</sup>Pending approval of the ACM.

exceed 1500 words or six pages (double-spaced). Excessively long submissions may be returned to the authors.

The 1-paragraph abstract, typed on one separate page, should clearly and precisely state what is new and point out the significant results. Succinctness is required since this paragraph may be included in the Advance Program.

An author must somehow in the 1500 WORD DESCRIPTION objectively address the question why the proposed contribution is superior to prior work or what is the significance of the contribution if breaking new ground. Demonstration of superiority in algorithms and strategies with heuristics is required through a description of the programming implementation and application to "real" problems. Additional mathematical proofs are welcome. The contribution should address an area of current technical interest to the CAD professional. A clear description of the new contribution, status of the work and significant examples and results should be given. References, figures and tables are not counted as part of the 1500 words.

Submissions should include, on the first page: the title of the paper, full author names and their affiliations, complete return address and telephone number (with the individual to whom all communications should be addressed clearly identified). In giving your return address, please consider that the communications for paper acceptance and mailing of the author kit occur in the month of July.

Submissions should be received no later than May 1, 1987. Send to:

## WORKSHOP ON SPATIAL REASONING AND MULTI-SENSOR FUSION

October 5-7, 1987  
St. Charles, Illinois  
Sponsored by AAAI

Spatial reasoning is central to the interaction of an intelligent robot with its environment. Although the problems are somewhat different for mobile and stationary robots, the basic need for correlating perceived information -- which due to viewpoint limitations in most cases constitutes only partial evidence about scene entities -- with the stored world knowledge remains the same. Also common to both cases are the problems of integrating incoming information through various sensors, such as photometric, range, tactile and force/torque. Such issues will form the focus of this workshop. In particular, the topics that will be highlighted at the meeting include

- \* Reasoning about shape from partial evidence
- \* Fusion of photometric and range data for mobile robots
- \* Fusion of 2D, 3D, tactile and F/T sensing for assembly robots
- \* Evidential reasoning for verification vision
- \* Reasoning architectures for spatial data
- \* Programming paradigms for spatial reasoning
- \* Formal theories of spatial reasoning
- \* Spatial planning and problem solving

Papers on these topics are invited for consideration. Three copies of an extended abstract or a full-length paper should be sent to either of the following two addresses prior to March 15, 1987.

Su-Shing Chen Dept. of Comp. Science University of NC Charlotte, NC 28223	Avi Kak Robot Vision Lab EE Building, Box 121 Purdue University W. Lafayette, IN 47907
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This workshop will be held October 5-7, 1987 at the Pheasant Run Resort in St. Charles, IL, 25 miles from Chicago's O'Hare International Airport. The resort management will provide transportation between the airport and the workshop site. Pheasant Run encompasses 300 acres of the beautiful Fox River Valley. Resort facilities include championship golf courses, indoor and outdoor tennis and basketball courts, Fox River boat rides, etc. Pheasant Run Theatre features top name entertainment and critically acclaimed hit plays.

### PROGRAM COMMITTEE

Su-shing Chen (Co-Chair)	Tom Garvey
Avi Kak (Co-Chair)	Tom Henderson
Jake Aggarwal	Tod Levitt
Ruzenna Bajscy	Linda Shapiro

Is there a conflict between large-scale computing and AI? This will be the central question addressed during the International Conference on Frontiers in Computing. During this meeting various trends in parallel computing as well as in optical, molecular and bio-computing will be introduced. The impacts of these developments in the medium and long term will be assessed.

Trends such as these pose questions as to the usefulness of the increased processing power generated, e.g. "Who is producing the environments and software systems for making 100 Mips workstations and 100 GigaFlops supercomputers useful?" Discussions of such problems will be given appropriate priority at the conference.

The conference topics include:

- \* Non-conventional architectures: new processor architectures with parallelism, knowledge processing, unification mechanisms, expert systems, fifth generation, hyper-cubes, connection machines, reduction machines, dataflow machines, etc.
- \* Architectures for neuro- and supercomputing
- \* New architectures for large systems
- \* Computing needs of society and the impact on software
- \* Comparison of IT programs

### General Chairman

Reind P. van de Riet  
(Free Univ. Amsterdam)

### Co-Chairmen

Hideo Aiso (Keio Univ.)  
Frank Kuo (SRI)  
Bob Hertzberger (Univ Amster)

### Program Committee

Hideo Aiso (Keio Univ.)	Gen Matsumoto (ETL)
Makoto Amamiya (NTT)	Yoichi Muraoka (Waseda)
Jeffrey Fox (Caltech)	Loek Nijman (Philips Res.)
Gerhard Goos (GMD)	Reind P. van de Riet
John Gurd (Manchester)	Shigeki Shibayama (Toshiba)
Bob Hertzberger (Amsterdam)	Hidehiko Tanaka (Tokyo)
Horst Huenke (ESPRIT)	Sunichi Uchida (ICOT)
Robert M. Keller (Quintus)	Phil. Treleaven (London)
Frank Kuo (SRI)	B. B. Th. Veltman (TH)
H. T. Kung (CMU)	Friedrich Winkelhage (GMD)

**Submission of papers:** In order to make the conference attractive to those interested in specific topics, researchers are urged to submit papers. These will be selected and refereed by the Programme Committee, on the basis of originality, significance, relevancy and overall quality. Both selected and invited papers shall be published in a proceedings volume. A paper should not exceed approximately 5000 words (about 15 double-spaced pages). Submit six (6) copies of your paper, including abstract, to:

Secretary of Frontiers in Computing  
c/o CWI Centrum voor Wiskunde en Informatica  
Ms Elisabeth Both  
P.O. Box 4079  
1009 AB Amsterdam  
The Netherlands.

## 2<sup>nd</sup> International Conference on Genetic Algorithms and Their Applications

The 2<sup>nd</sup> International Conference on Genetic Algorithms and Their Applications, sponsored by AAAI and the U.S. Navy Center for Applied Research in AI (NCARAI), will be held on July 28-31, 1987 at MIT in Cambridge, Mass. Authors are invited to submit papers on all aspects of Genetic Algorithms, including: foundations of genetic algorithms, machine learning using genetic algorithms, classifier systems, apportionment of credit algorithms, relationships to other search and learning paradigms. Papers discussing specific applications (e.g., OR, engineering, science, etc.) are encouraged.

Authors are requested to send three copies (hard copy only) of a full paper by April 1, 1987 to the program chair:

Dr. John J. Grefenstette  
Navy Center for Applied Research in AI  
Code 5510  
Naval Research Laboratory  
Washington, DC 20375-5000  
gref@NRL-AIC.ARPA  
(202) 767-2685

For registration forms and information concerning local arrangements, contact:

Mrs. Gayle M. Fitzgerald  
Conference Services Office  
Room 7-111  
Massachusetts Institute of Technology  
77 Massachusetts Avenue  
Cambridge, MA 02139  
(617) 253-1703

### Conference Committee:

John H. Holland Univ. of Michigan (Conference Chair)  
Lashon B. Booker Navy Center for Applied Research in AI  
Dave Davis Bolt Beranek and Newman Inc.  
Kenneth A. De Jong George Mason Univ.  
David E. Goldberg Univ. of Alabama  
John J. Grefenstette Navy Center for Applied Res. in AI  
Stephen F. Smith Carnegie-Mellon Robotics Institute  
Stewart W. Wilson Rowland Institute for Science

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### Workshop on Blackboard Systems: Implementation Issues

In the past couple of years a wide variety of blackboard systems have been built to address a wide variety of problems. The goal of this workshop is to study the design and implementation issues in blackboard systems and to understand the diversity which exists in such systems. Specific issues that will be focused on are:

1. Control Issues: What is the approach taken to control the problem solving and rationale for choice?
2. Organization Issues: What are the mechanisms available for organizing knowledge in such systems? If the system is distributed what are the communication issues that play a critical role in the development of the system.
3. Parallelism and Concurrency Issues: What scope is present in the system to exploit parallelism at the application level, at the system level?

4. Performance issues: What benchmarks are available for evaluating the performance, and what are the bottlenecks affecting performance?
5. Development Environment: Does the system provide any help in developing the actual application?

To encourage vigorous interaction and exchange of ideas between those attending, the workshop will be limited to approximately 30 participants. The workshop is scheduled on July 13th, 1987, Monday, as a parallel activity during AAAI 1987, and will last for a day.

All submitted papers will be refereed with respect to how well they identify and discuss the factors affecting the design and implementation of blackboard systems. Authors should discuss their design decisions (why a particular approach was selected); what worked, what did not and why; the advantages, disadvantages and limitations of their approach; and what they would recommend to others developing such systems. Preference will be given to those papers that discuss approaches that have been demonstrated in real applications.

**Submission Details:** Five copies of an extended abstract, double spaced draft up to 4000 words, should be submitted to the workshop chairman before April 1, 1987. Acceptances will be mailed by May 1, 1987. Final copies of the extended abstract will be required by June 1, 1987 so that they may be informally bound together for distribution before the workshop.

### Workshop Chairman:

V. Jagannathan  
M/S 7L-64  
The Boeing Advanced Technology Center  
Boeing Computer Services  
P.O. Box 24346  
Seattle, WA 98124-0346  
(206)865-3240  
E-mail:juggy@boeing.com

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### Fourth International Workshop on Machine Learning

Recently, machine learning has emerged as a central area of research in artificial intelligence and cognitive science. In order to increase communication between researchers in this growing field, the Fourth International Workshop on Machine Learning will be held at the University of California, Irvine during June 22-25, 1987.

In an attempt to maximize interaction at the workshop, attendance will be limited and participation will be through invitation only. If you are active in machine learning and if you are interested in receiving an invitation, we encourage you to submit a one-page summary of your recent work in the area. If you would like to present a paper at the meeting, include a title and extended abstract. You may supplement this information with recent papers on machine learning.

Invitations will be based on an informal review of the research summaries by the organizing committee. Based on their abstracts, some attendees will be invited to speak at the workshop and to contribute a paper to the workshop proceedings. Each participant will receive a copy of the proceedings. The organizing committee consists of: J. G. Carbonell (C-MU), R. H. Granger (UCI), D. F. Kibler (UCI), P. Langley (UCI), T. M. Mitchell (C-MU), and

R. S. Michalski (Illinois).

The deadline for submission of research summaries is February 1, 1987. Please send summaries, along with abstracts and optional papers, to: Pat Langley, Program in Computation and Learning, Department of Information & Computer Science, University of California, Irvine, CA 92717 USA. Applicants will be informed of their status two weeks after submission.

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## Workshop on Coupling Symbolic and Numeric Computing in Knowledge-based Systems

The second workshop on coupling symbolic and numeric computing in knowledge-based systems will be held the 20-24 of July 1987 at the Boeing Advanced Technology Center, Bellevue, Washington. This workshop will be jointly sponsored by the American Association for Artificial Intelligence (AAAI) and Boeing Computer Services (BCS).

Many real-life problems encountered in science and industry require solution techniques that combine AI and conventional computation methods (coupled systems). Typically these problems have some major subproblems that are amenable to conventional techniques - such as numerical analysis, statistics, quantitative modeling - but others for which these techniques are not appropriate.

This workshop will attempt to build upon last year's workshop and improve our understanding of the issues involved in developing coupled systems. During the workshop the methodology of designing and developing coupled systems will be explored by assessing alternative approaches. The primary goals of the workshop will be to establish criteria and guidelines for those involved in the design and implementation of coupled systems and to define the state-of-the-art and the future research needs in this area.

To encourage a vigorous interaction and exchange of ideas between those attending, the workshop will be limited to approximately 35 participants. Ample time will be provided during the workshop for the presentation of technical papers and discussions of the material presented. Participation will be by invitation and will be based upon the referee of a submitted paper.

Submittals are invited for consideration on the following topics: software and hardware architectures that facilitate the development and use of coupled systems (or those that don't), approaches to designing and developing coupled systems, deep reasoning involving quantitative models or numeric algorithms, representation of knowledge within coupled systems, generic coupled system languages/shells, and novel or state-of-the-art applications.

All submitted papers will be refereed with respect to how well they identify and discuss the factors affecting the design and implementation of coupled systems. Authors should discuss their design decisions (why a particular approach or development environment was selected); what worked, what didn't and why; the advantages, disadvantages and limitations of their approach; and what they would recommend to others developing coupled systems. Preference will be given to those papers that discuss approaches that have been demonstrated in real applications.

Four copies of a full-length paper (or extended abstract), double spaced draft up to 5000 words, should be submitted to the workshop chairman before 1 March 1987 (please notify the chairman by 30 January 1987 of your intent to submit). Acceptances will be mailed by 1 May 1987. Final papers will be required by 1 July 1987 so they may be bound together for distribution before or at the workshop. Potential attendees should also indicate their interest in chairing or participating in special discussion sessions.

### Workshop Chairman:

C.T. Kitzmiller,

MS: 7J-63

Boeing Advanced Technology Center

Boeing Computer Services

PO Box 24346

Seattle, WA 98124-0346

(206) 865-3227

E-mail: tedk@boeing.com

or bcsaic1tedk@uw-june.arpa

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## AAAI-87 Workshops

The AAAI-87 Program Committee invites members to submit proposals for the Workshop Program--expected to be an important feature of this year's conference.

Gathering in an informal setting, workshop participants will have the opportunity to meet and discuss issues with a selected focus. This format will provide for active exchange among researchers and practitioners on topics of mutual interest. Members from all segments of the AI community are encouraged to submit proposals for review by the committee.

To encourage interaction and a broad exchange of ideas, the workshops will be kept small. Attendance will be limited to active participants only. Workshop sessions will consist of individual presentations, and ample time will be allotted for general discussion.

Please submit your workshop proposals to:

Joseph Katz

MITRE MS-D070

Burlington Road

Bedford, Massachusetts 01730

Katz@mitre-bedford.arpa

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## Fourth Annual Workshop on Theoretical Issues in Conceptual Information Processing

Washington, D.C.

June 4-5, 1987

Sponsored by

American Association for Artificial Intelligence

and

University of Maryland Institute for

Advanced Computer Studies

**Objectives** The goal of the investigations under the title "conceptual information processing" has been understanding intelligence and cognition computationally, rather than merely the construction of performance programs or

formalization per se. Thus, this workshop will focus on an exploration of issues common to representation and organization of knowledge and memory for natural language understanding, planning, problem solving, explanation, learning and other cognitive tasks. The approaches to be covered are united by a concern with representation, organization and processing of conceptual knowledge with an emphasis on empirical investigation of these phenomena by experimentation and implementation of computer programs.

**Format** The TICIP workshop will be comprised of a combination of panels, invited paper presentations, and "debates" designed to encourage lively and active discussion. Not all participants will be invited to present, but all will be expected to interact.

**Attendance** In order to maximize the interactive nature of this workshop, attendance will be limited. Those interested in participating, either as speakers or audience, are asked to submit a one-page summary of work in this area. A small number of invitations will be extended to those who are interested in the area but have not yet contributed. Those interested in such an invitation should contact the Program Chair. A limited amount of financial assistance will be available to graduate students invited to participate.

**Review Process** Invitation will be based on an informal review of submissions by the Program Committee.

**Workshop Information** The conference chair is Prof. B. Chandrasekaran (Ohio State University). The program committee consists of Prof.s R. Alterman (Brandeis), J. Carbonell (CMU), M. Dyer (UCLA), and J. Hendler (U of Maryland, Chair).

**Submission** A one page abstract of recent work in the area should be submitted to the Program Chair. The deadline for these submissions is April 15, 1987. Applicants will be informed of their status soon thereafter. Send abstracts (but please, no papers) to:

James Hendler  
Computer Science Department  
University of Maryland  
College Park, Md. 20742.  
hendler@brillig.umd.edu  
hendler@maryland

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## EUROPEAN CONFERENCE ON AI IN MEDICINE

Marseilles (France)  
August 31st - September 3rd 1987

Following proposals at the International Conference on Artificial Intelligence in Medicine, Pavia, November 1985 the European Society for Artificial Intelligence in Medicine (AIME) has been established to foster fundamental and applied research in artificial intelligence and symbolic information processing techniques for medical care and medical research. AIME also wishes to assist industry in identifying high quality medical products which exploit these techniques. A major AIME activity will be a biannual series of international conferences, the next of which will be in Marseilles, France, following the International Conference on Artificial Intelligence in Milan, August 1987.

Papers are invited on any aspect of the theory, design or application of medical AI systems. Submissions will be refereed by an international panel on the basis of complete but succinct papers. These should be in English, length 2000 - 4000 words. Criteria for acceptance will include originality, practical significance, contribution to theory of methodology and clarity of presentation. Submissions for a poster session are also invited; these should be a maximum of 500 words or one A4 page. The conference proceedings of papers and poster summaries will be available at the conference.

### DEADLINES

- \* April 1st, 1987 Final date for receipt of full short paper camera ready.
- \* May 15th, 1987 Notifications of acceptance of papers distribution of the Preliminary Program.
- \* July 1st, 1987 Register for reduced registration fee until now.

### ADDRESS

Viviane Bernadac - AIME 87  
IRIAM  
2 rue Henri Barbusse  
13241 Marseille Cedex 1  
FRANCE

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## Cognitive Science Society

Seattle, WA  
July 16-18, 1987

The Ninth Annual Conference of the Cognitive Science Society will be held on July 16-18, 1987 at the University of Washington. The dates have been chosen to allow people to attend this conference and the conference of the American Association for Artificial Intelligence, which meets in Seattle earlier in the week. The conference will feature symposia and invited speakers on the topics of mental models, educational and industrial applications of cognitive science, discourse comprehension, the relation between cognitive and neural sciences, and the use of connectionist models in the cognitive sciences. The conference schedule will include paper sessions and a poster session, covering the full range of the cognitive sciences. The proceedings of the conference will be published by L Erlbaum Associates.

Submitted papers are invited. These should cover original, unreported work, research or analysis related to cognition. All submissions for paper and poster sessions will be refereed.

All submitted papers and posters must include the following:

- \* Author's name, address, and telephone number.
- \* Set of four or fewer topic area keywords.
- \* Four copies of the full paper (4000 words maximum) or poster (2000 words maximum). Each copy should include a 100-250 word abstract.
- \* Indication of preference for paper or poster session.

All papers MUST adhere to the following rules for prepara-

tion of camera-ready copy. NOTE: Papers will NOT be sent back after acceptance for modification. The accepted paper will be sent directly to the publisher.

- \* 1 inch margins on both sides, top, and bottom. Single spaced text. Figures centered on type page at top or bottom.
- \* Titles and author's names and institutions centered at top of first page.
- \* One line between title heading and text.
- \* Use American Psychological Association publication format.
- \* Authors are responsible for obtaining permission to reprint published material.

Send submissions to Earl Hunt, Department of Psychology, University of Washington, Seattle, Wa 98195

Submissions are due by MARCH 16, 1987.

All members of the Cognitive Science society will receive a further mailing discussing registration, accommodation, and travel.

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## 12<sup>th</sup> IMACS WORLD CONGRESS 88 SECOND GENERATION EXPERT SYSTEMS Reasoning with Heuristic and Deep Knowledge

PARIS  
July 18 - 22, 1988

A one-day session of the Congress will be devoted to SECOND GENERATION EXPERT SYSTEMS. Authors are invited to submit papers describing Expert Systems reasoning with Deep Knowledge, or any aspect of deep reasoning; the covered topics include:

- \* Model-Based Reasoning
- \* Qualitative Physics
- \* Multi-Level / Multi-Model Reasoning
- \* Reasoning from Structure, Behavior and Function
- \* Causal Reasoning

Papers can deal with both theoretical aspects of deep reasoning and applications (diagnosis, process control, simulation ...). Emphasis will be put on work describing cooperation between Heuristic and Deep Reasoning.

Submission Information : Submit three copies of a 1000 words abstract by August 1, 1987 to the Session Chairman. Papers will be accepted on the basis of submitted abstracts. Notifications of acceptance will be mailed by December 1, 1987. Accepted papers will be either original contributions or important survey papers.

Timetable :

- \* abstracts submission: August 1, 1987
- \* notifications of acceptance: December 1, 1987
- \* full papers submission: February 15, 1988

Submissions and inquiries about the Second Generation Expert System Session should be sent to the Session Chairman:

Jean-Marc DAVID  
IMACS '88  
Laboratoires de Marcoussis  
Computer Science Division  
Route de Nozay  
91460 - Marcoussis  
FRANCE

Other inquiries should be directed to the Congress

Secretariat :

Secretariat IMACS WORLD CONGRESS '88  
I.D.N. BP 48  
59651 - Villeneuve d'Ascq Cedex  
FRANCE

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## 21ST ANNUAL HAWAII INTERNATIONAL CONFERENCE ON SYSTEM SCIENCES (HICSS-21)

Papers are invited for the session(s) on Use of AI Techniques in Software Design and Implementation in the software track of the 21st annual Hawaii International Conference on System Sciences (HICSS-21), to be held in Kona, Hawaii next January 5-8, 1988.

Topics of interest include, but are not limited to, the following artificial intelligence areas as they apply to software design and implementation, particularly for large-scale software systems. Techniques may apply to any or all phases of the software development process: project management, requirements, functional specification, design specification, modular decomposition, coding, integration, testing, maintenance, documentation, delivery, etc. Example applications are given in parentheses.

- \* Automatic deduction (detecting inconsistencies among programmers' assumptions, automatic programming)
- \* Knowledge representation (semantic nets, frames, etc. for representing programming information)
- \* Learning (self-tuning of software tools to specific programs, generalization of program fragments to support reusability)
- \* Natural language (matching functionality of program parts with the corresponding program documentation, explaining program components and their interactions to new project member)
- \* Planning (detecting interactions among planned changes)
- \* Rule-based systems (program transformation, performance tuning)
- \* Search (retrieval of reusable program fragments)

Six copies of the full paper (maximum 20 double-spaced pages) should be sent to the session chairman at the address given below. Papers must arrive by July 1, 1987. Authors will be notified of acceptance by September 7, 1987. Camera-ready copies will be due by October 19, 1987.

Session chairman: Prof. Gail E. Kaiser, Columbia University, Department of Computer Science, New York, NY 10027. Phone: 212-280-3856. Electronic mail: kaiser@cs.columbia.edu, ...!columbia!cs!kaiser

Software track chairman: Dr. Bruce D. Shriver, IBM T.J. Watson Research Center, P.O. Box 704, Yorktown Heights, NY 10598. Phone: 914-789-7626. Electronic mail: shriver@ibm.com

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## 1987 International Conference on Research and Development in Information Retrieval

ACM SIGIR  
June 3-5, 1987

**Monteleone Hotel (in the French Quarter)  
New Orleans, Louisiana**

Papers were invited on theory, methodology, and applications of information retrieval. Emerging areas related to information retrieval, such as office automation, computer hardware technology, and artificial intelligence and natural language processing are welcome.

Topics include, but are not limited to:

- \* retrieval system modeling
- \* user interfaces retrieval in office environments
- \* system development and evaluation
- \* natural language processing
- \* mathematical models
- \* knowledge representation
- \* linguistic models
- \* hardware development
- \* multimedia retrieval
- \* storage and search techniques
- \* complexity problems
- \* cognitive and semantic models
- \* retrieval system performance
- \* information retrieval and database management

Conference Chairman  
Donald H. Kraft  
Dept. of Computer Science  
Louisiana State University  
Baton Rouge, LA 70803  
(504) 388-1495  
Publicity Chairman  
Vijay Raghavan  
Center for Advanced Studies  
Univ. of Southwestern LA  
P.O. Box 44330  
Lafayette, LA 70504  
Technical Program Co-Chair  
Clement T. Yu  
Dept. of Elec. Engineering  
and Computer Science  
University of IL, Chicago  
Chicago, IL 60680  
(312) 996-2318

Treasurer  
Bert R. Boyce  
School of Lib. & Info. Sci.  
Louisiana State University  
Baton Rouge, LA 70803  
(504) 388-3158  
Arrangements Chairman  
Michael C. Stinson  
Dept. of Computer Science  
Louisiana State University  
Baton Rouge, LA 70803  
(504) 388-1495  
Technical Program Co-Chair  
C. J. "Keith" van Rijsbergen  
Dept. of Computer Science  
University of Glasgow  
Lilybank Gardens  
Glasgow G12 8QQ  
Scotland  
(041) 339-8855

**Technical Program Committee Members**

Abraham Bookstein (USA)	W. S. Luk (Canada)
Nick Cercone (Canada)	Michael McGill (USA)
Stavros Christodoulakis (Canada)	Esen Ozkarahan (USA)
Yves Chiaramella (France)	Fausto Rabitti (Italy)
Martha Evens (USA)	Gerard Salton (USA)
Aviezri Fraenkel (Israel)	Peter Scheuermann (USA)
Jochum Friedbert (Germany)	C. J. "Keith" van Rijsbergen (Scotland)
Richard Frost (Scotland)	Michael Wong (Canada)
Tetsuro Ito (Japan)	Clement T. Yu (USA)

**PRELIMINARY PROGRAM**

Preregistration for the meeting is strongly encouraged. Preregistration will cost considerably less and will facilitate planning, especially for the excellent social programs we have planned. Preregistration has May 1, 1987 as its deadline.

Please do not send cash; send a check, only in U.S. dollars, along with the registration form to: Professor Bert R. Boyce, School of Library and Information Science, Louisiana State University, Baton Rouge, LA 70803, USA. Make your check payable to SIGIR 86. A full refund can be made only if a cancellation notice is received before May 15, 1987.

The registration desk will be located on the Mezzanine Floor of the Monteleone Hotel. While visiting the registration area, do not forget to visit the exhibits.

Note: All attendees, including speakers and session chairs, must register and pay the appropriate registration fee.

**Accommodations** The conference will be held in its entirety in the Monteleone Hotel. This fine old hotel is located at 214 Rue Royal (Royale Street) in New Orleans, near Iberville Street; the Zip Code is 70140 and the telephone number is (504) 523-3341. The hotel is one of the largest, and one of the grandest, in the fabulous French Quarter. The magnificent Monteleone is an institution in New Orleans; more than just a big building with rooms to rent, it's a way of life!

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**2<sup>ND</sup> KNOWLEDGE ACQUISITION FOR  
KNOWLEDGE-BASED SYSTEMS  
WORKSHOP**

**Sponsored by the AAAI  
Banff, Canada  
October 19-23, 1987**

A problem in the process of building knowledge-based systems is acquiring appropriate problem solving knowledge. The objective of this workshop is to assemble theoreticians and practitioners of AI who recognize the need for developing systems that assist the knowledge acquisition process.

To encourage vigorous interaction and exchange of ideas the workshop will be kept small - about 40 participants. There will be individual presentations and ample time for technical discussions. An attempt will be made to define the state-of-the-art and the future research needs. Attendance will be limited to those presenting their work, one author per paper.

Papers are invited for consideration in all aspects of knowledge acquisition for knowledge-based systems, including (but not restricted to)

- \* Transfer of expertise - systems that obtain and model knowledge from experts.
- \* Transfer of expertise - manual knowledge acquisition methods and techniques.
- \* Apprenticeship learning systems.
- \* Issues in cognition and expertise that affect the knowledge acquisition process.
- \* Induction of knowledge from examples.
- \* Knowledge acquisition methodology and training.

Five copies of an abstract (up to 8 pages) or a full-length paper (up to 20 pages) should be sent to John Boose before April 15, 1987. Acceptance notices will be mailed by June 15. Full papers (20 pages) should be returned to the chairman by September 15, 1987, so that they may be bound together for distribution at the workshop.

Ideal abstracts and papers will make pragmatic or theoretical contributions supported by a computer implementation, and explain them clearly in the context of existing knowledge acquisition literature. Variations will be considered if they make a clear contribution to the field (for example, comparative analyses, major implementations or extensions, or other analyses of existing techniques).

## Workshop Co-chairmen:

Send papers via US mail to:

John Boose  
Advanced Technology Ctr  
Boeing Computer Services  
PO Box 24346  
Seattle, WA, USA 98124  
Express mail address:  
Advanced Technology Center  
Boeing Computer Services  
Bldg. 33.07  
2760 160th Ave. SE  
Bellevue, WA, USA 98008

Brian Gaines  
Dept. of Computer Science  
University of Calgary  
2500 University Dr. NW  
Calgary, Alberta  
Canada T2N 1N4

### Program and Local Arrangements Committee:

Jeffrey Bradshaw, Boeing Computer Services  
B. Chandrasekaran, Ohio State University  
Catherine Kitto, Boeing Computer Services  
Sandra Marcus, Boeing Computer Services  
John McDermott, Carnegie-Mellon University  
Ryszard Michalski, University of Illinois  
Mildred Shaw, University of Calgary

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## Workshop on COMPUTER VISION

IEEE Computer Society  
Fontainebleau Hilton, Miami Beach, Florida  
November 30-December 2, 1987

### General Chair:

Keith Price  
Institute for Robotics and  
Intelligent Systems, MC 0273  
Electrical Engineering - Systems  
University of Southern California  
Los Angeles, CA 90089  
price@ganelon.usc.edu  
Tel: (213) 743-5526

### Program Chairs:

Narendra Ahuja  
Thomas Huang  
Coordinated Science Laboratory  
University of Illinois  
1101 W. Springfield Ave  
Urbana, IL 61801  
ahuja@uicsl.csl.uiuc.edu  
Tel: (217) 333-1837

Papers are solicited on the following topics:

- \* Image structure (edges, regions, texture, ...)
- \* Segmentation and 2-D description
- \* 3-D from 2-D (motion, stereo, texture, ...)
- \* Shape and 3-D description
- \* Range imaging
- \* Model based vision
- \* High level vision
- \* Vision guided manipulation, navigation
- \* Vision systems
- \* Industrial vision
- \* Human visual perception

### REVIEW OF PAPERS

In order to maintain quality of papers and consistency in the reviewing standards, all papers will be reviewed by two members of the program committee (membership yet to be announced). The program committee will then make the final selections. Papers will be accepted either for

regular presentations (6 proceedings pages) or poster presentations (3 proceedings pages). It is important that regular papers report on new and interesting research ideas; research proposals and minor changes to old ideas are discouraged. Poster presentations could be less complete or present novel results of established techniques.

### SUBMISSION OF PAPERS

Each paper should be complete and have a cover sheet with the title, authors' names, primary address, index terms including at least one of the above topics, and the type of paper (regular or poster). The cover page will not be sent to the reviewers. The body of the paper must contain the title of the paper and an abstract of about 250 words, followed by the text of the paper. The authors' names and organization should not be on the body of the paper. The length of the paper should not exceed: 25 double spaced typed pages for regular papers (including about 6000 words of text and illustrations), or 12 double spaced typed pages for poster papers (including about 3000 words of text and illustrations).

Four copies of papers should be sent to:

Narendra Ahuja  
Coordinated Science Laboratory  
University of Illinois  
1101 W. Springfield Avenue  
Urbana, Illinois 61801

The deadline for submission of papers is July 14, 1987. Authors will be notified of acceptance by late August 1987. Final camera ready copies of the papers will be due at IEEE early in October 1987.

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## COLING-88

12<sup>th</sup> International Conference on  
Computational Linguistics  
22-27 August 1988, Budapest, Hungary

Papers are invited on all aspects of computational linguistics in a broad sense, including but not limited to:

- \* theoretical issues of CL in its relations to linguistics, mathematics, computer science and cognitive science
- \* computational models of (sub)systems of natural language and of human communication (phonemics, morphemic, syntax, semantics, pragmatics, parsing and generation, discourse, speech acts and planning)
- \* linguistic contributions to
  - natural language dialog systems, intelligent and cooperative question answering
  - machine (aided) translation
  - speech understanding and voice output procedures
  - systems for text generation
  - systems for use and preparation of dictionaries for humans and machines
  - intelligent text editors
- \* knowledge representation and inferencing
  - language comprehension
  - automatic creation of knowledge bases from texts
- \* hardware and software support for language data processing
- \* computational tools for language learning and teaching

Papers should report on substantial, original and unpublished research and should indicate clearly the position of the work described within the context of the research in the given domain and emphasize what new results have been achieved.

Authors should submit four (4) copies of an extended abstract not exceeding seven (7) double-spaced pages plus a title page including the name(s) of the author(s), complete address, a short (five-line) summary, and a specification of the topic area.

Abstracts must be received not later than 10 December 1987 by the Chairperson of the Program Committee:

Dr. Eva Hajicova (COLING-88)  
Charles University  
Faculty of Mathematics, Linguistics  
Malostranske n. 25  
CS-118 00 Praha 1, Czechoslovakia

Authors will be notified of acceptance by 28 February 1988. Camera-ready copies of final papers must be received by 30 April 1988.

Inquiries about the conference, exhibitions, and demonstrations (live and video) should be directed to:

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COLING-88 is sponsored by the International Committee on Computational Linguistics. It is organized by the John von Neumann Society for Computing Sciences in cooperation with the Computer and Automation Institute and the Institute for Linguistics, both of the Hungarian Academy of Sciences.

COLING-88 will be preceded by tutorials and workshops, and immediately followed by the 3rd EURALEX Congress on all aspects of lexicography, also to be held in Budapest.

James Mathias  
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Sho Yoshida  
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A new international journal, *Computers and Translation (CAT)* deals with all facets of computerization in the translation field, and with their theoretical, social and practical implications.

Computerized translation, now recognized as a field in its own right, is developing fast. Machine aids for human translation are used in many countries. Even automatic translation of whole texts is now in practical use in a range of language services, including the European Commission. The growing need for up-to-date information among the increasing number of researchers in translation or related fields (AI, computational linguistics, etc.) requires a central medium of communication. The same need exists among practical translators and those responsible for translation in industry, government and commerce.

*Computers and Translation* meets this need, covering "translating and the computer" in all its variety:

- \* software in translating and language processing
- \* hardware to process language
- \* relevant research in linguistics, AI, database construction, information science and terminology
- \* the social consequences of computerized translation for society in general and for the translating profession

In the absence of such a journal, researchers and translators have worked largely in isolation since computerized translation was established in the 1950s. They had no influence on computer or software design or on linguistic research, but were left to make use of equipment designed for numerical analysis and software developed for business or the physical sciences. The most influential linguistic movement rejected any relationship with computational linguistics, let alone computerized translation. This, then, was the background to the US Government's decision in 1966 to stop supporting research in the field.

Twenty years later, conditions have changed. Many linguists are directing their attention to real language rather than an ideal version of it. Software once disregarded, such as LISP, has been refined to manipulate language. Hardware has been designed to handle language rather than merely numbers. Automatic translation has advanced and indeed has made a major contribution to the field of AI.

Meanwhile the "translation explosion" has continued. Translators, faced with overwhelming demands for their services, have turned in increasing numbers to computers, for example in the European Community. Computer companies have responded with a variety of products, and the status of the field is now secure. Until now, however, it has lacked a central journal in which to influence its own destiny, explain theory and practice, and chart new developments.

*Computers and Translation* fills this gap as a vehicle for the exchange of ideas and information between the business, governmental and academic communities, and keeps non-specialists and administrators informed of progress in the field.

Articles should be submitted to either:

Prof. W. P. Lehmann	Veronica Lawson
Linguistics Research Center	30 Half Moon Lane
P.O. Box 7247	Herne Hill
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# BOOK REVIEWS

## Universal Subgoalng and Chunking

**The automatic generation and  
learning of goal hierarchies**  
John Laird, Paul Rosenbloom, Alan Newell

Reviewed By: Art Murphy, V. Jagannathan and J. Bradshaw  
of Boeing Advanced Technology Center  
Bellevue, Washington

This book is two Ph.D theses bound together in one volume. The first thesis is by John Laird and is on "Universal Subgoalng" and the second thesis is on "The chunking of goal hierarchies" by Paul Rosenbloom. Alan Newell, their Ph.D advisor has an interesting preface, explaining how the respective thesis topics came into being. The first part (thesis) of the book is on developing a generalized problem solving architecture. The second part

format can be obtained from any rule under the form: "IF <fact trigger-part> THEN <sequence of actions>"). Then the building of the triangular table is correct.

In other respects, propositions and first implementations have used the triangular table in a hierarchy of macro-operators [PIC.85]. Our work follows the propositions of Nilsson [NIL.85]. According to these modifications ARGOS-II is able to generate a plan PL of which operators can be macro-operators. So it is creating a hierarchy of macros. And when ARGOS-II built the table of PL we have several levels of tables: several levels of error retrieval are allowed during a session of execution.

Concurrently with this work, we have used the triangular table for producing explanations [PIC.86]. The table is used as a data base where two types of data are stored: the operators and the facts. The location of facts in the table gives their relations with operators (precondition or effect), and inversely, the position of operators give the facts which are related to them (remember that operators are on the diagonal line, effects are in the column headed by the act concerned, preconditions are on the line of this act). So the human operator can ask the system questions as:

?{fact} (<<is {fact} an effect or a precondition of the plan ?, and of which operator?>>)

?{operator} (<<why {operator} is in the plan ?>>).

Self explanation is a strong characteristic of rule-based systems; and on the other hand we have realized that any rule can be modeled as an action with a (P,A,D) triplet. So by coupling this two facts, we have used all the existing procedures to build triangular tables of sequences of rules. So that ARGOS-II is able to produce explanations about the rule chaining (which creates a plan), as well as about the plan.

## PERSPECTIVES

The triangular tables have improved both monitoring and explaining capabilities of ARGOS-II. But it seems to us that all the properties of those triangular tables are not developed. We presently are studying the means of treating them more rigorously. Particularly we are trying to define some formal operations on these tables.

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# REPORTS

## SECOND ANNUAL SUNY BUFFALO GRADUATE CONFERENCE ON COMPUTER SCIENCE

William J. Rapaport  
Department of Computer Science  
SUNY Buffalo  
Buffalo, NY 14260  
rapaport@buffalo.csnet

On 10 March 1987, the graduate students in the Department of Computer Science at SUNY Buffalo held their second annual Graduate Conference on Computer Science. (For a report on the first one, see SIGART No. 99, pp. 22-24.) This time, the conference took on an international flavor, with talks by graduate students from the University of Toronto and the University of Rochester, in addition to talks by our own students. Once again, the conference was flawlessly mounted. The conference was sponsored by the SUNY Buffalo Department of Computer Science, the SUNY Buffalo Computer Science Graduate Student Association, the SUNY Buffalo Graduate Student Association, and the Niagara Frontier Chapter of the ACM. Approximately 150 people from area colleges and industry attended.

A SUNY Buffalo Department of Computer Science Technical Report with extended abstracts of the talks (James Geller & Keith Bettinger (eds.), UBGCSS-87: Proceedings of the Second Annual UB Graduate Conference on Computer Science, Technical Report 87-04, March 1987) is available by contacting the chair of the organizing committee, Scott Campbell, Department of Computer Science, SUNY Buffalo, Buffalo, NY 14260, campbl@buffalo.csnet. Following are the abstracts of the talks.

Ted F. Pawlicki  
SUNY Buffalo  
"The Representation of Visual Knowledge"

This paper reports on preliminary research into the representation of knowledge necessary for visual recognition. The problem is broken down into three parts: the actual knowledge that needs to be represented, the form that the representation should take, and how the knowledge itself and its representation should combine to facilitate the visual recognition task. The knowledge chosen to represent is a formalization of the theory of Recognition by Component. The representation chosen is a semantic network.

**John M. Mellor-Crummey**  
**University of Rochester**

**"Parallel Program Debugging with Partial Orders"**

Parallel programs are considerably more difficult to debug than sequential programs, because successive executions of a parallel program often do not exhibit the same behavior. Instant Replay is a new technique for reproducing parallel-program executions. Partial orders of significant events are recorded during program execution and used to enforce equivalence of execution replays. This technique (1) requires less time and space to save information for program replay than other methods, (2) is independent of the form of interprocess communication, (3) provides for replay of an entire program, rather than individual processes, (4) introduces no centralized bottlenecks, and (5) does not require synchronized clocks or globally-consistent logical time. Some performance results of a prototype on the BBN Butterfly [TM] Parallel Processor will be presented, and it will be shown how Instant Replay can be used in the debugging cycle for parallel programs.

**Timothy D. Thomas and Susan J. Wroblewski**  
**SUNY Buffalo**

**"Efficient Trouble Shooting  
in an Industrial Environment"**

Our work involves designing and implementing a real-time system for trouble shooting in an industrial environment. The system emulates the kind of problem-solving knowledge and behavior typical of a human expert after years of on-the-job experience. Our system, PASTE (Process Analysis for Solving Trouble Efficiently), is to be used in a real-time environment. It is because of this constraint that the design of an efficient system was of great importance. PASTE has a number of efficiency techniques that eliminate redundancy in remedy suggestion and that decrease response time.

**Ching-Huei Wang**  
**SUNY Buffalo**

**"ABLS: An Object Recognition System for  
Locating Address Blocks on Mail Pieces"**

ABLS (Address Block Location System), a system for locating address blocks on mail pieces, represents both a specific solution to postal automation and a general framework for coordinating a collection of specialized image-processing tools to opportunistically detect objects in images. Images that ABLs deals with range from those having a high degree of global spatial structure (e.g., carefully prepared letter mail envelopes which conform to specifications) to those with no structure (e.g., magazines with randomly pasted address labels). Its problem-solving

architecture is based on the blackboard model and utilizes a dependency graph, knowledge rules, and a blackboard.

**Diane Horton and Graeme Hirst**  
**University of Toronto**

**"Presuppositions as Beliefs: A New Approach"**

Most existing theories of presupposition implicitly assume that presuppositions are facts and that all agents involved in a discourse share belief in the presuppositions that it generates. We argue that these assumptions are unrealistic and can be eliminated by treating each presupposition as the belief of an agent. We describe a new model, including an improved definition of presupposition, that takes this approach. The new model is more realistic and can handle cases of presupposition projection that could not be handled otherwise.

**Norman D. Wahl and Susan E. Miller**  
**SUNY Buffalo**

**"Hypercube Algorithms to Determine Geometric  
Properties of Digitized Pictures"**

This research focuses on implementing algorithms to solve geometric problems of digitized pictures on hypercube multiprocessors. Specifically, in this paper, we present algorithms and paradigms for solving the connected component labeling problem. Work is ongoing to complete implementations of these algorithms and obtain running times on the Intel iPSC and Ncube hypercubes. The goal of this study is to determine under what circumstances (if any) each of the various algorithms is most appropriate.

**Deborah Walters and Ganapathy Krishnan**  
**SUNY Buffalo**

**"Bottom-up Image Analysis for Color Separation"**

A system for automatic color separation for use in the printing industry is described. The goal of this research was to automate the labor-intensive preprocessing required before a graphics system can process the image. This system makes no assumptions about the semantic content of the image. The processing is entirely bottom-up and is based on image features used by the human visual system during the early stages of processing. The image is convolved with oriented edge operators, and the responses are stored in the Rho-Space representation. A number of parallel operations are performed in Rho-Space, and the image is segmented into perceptually significant parts, which can then be colored using an interactive graphics system.

**Bart Selman**  
**University of Toronto**

**"Vivid Representations and Analogues"**

Levesque introduced the notion of a vivid knowledge representation. A vivid scheme contains complete knowledge in a tractable form. A closely related concept is that of an analogical representation or analogue. Sloman characterizes analogues as representations that are in some sense direct models of the domain, as opposed to representations consisting of a description in some general language. The prototypical example of an

analogical representation is a pictorial representation, which is also an important source of vivid knowledge. We are studying these types of representations for their possible application in computationally tractable knowledge-representation systems. In particular, we are studying how information in a non-analogical (or non-vivid) form can be translated into an analogical (or vivid) form, using for example defaults and prototypes. This talk will cover the properties of vivid and analogical representations, a description of their relationship to each other, and some initial ideas on the translation process.

**Soteria Svorou**  
**SUNY Buffalo**

**"The Semantics of Spatial Extension  
Terms in Modern Greek"**

In recent years, there have been increasing efforts to uncover the nature of the human mind by studying the structure of its building blocks: concepts. Partaking in this enterprise, this study explores the domain of spatial extension categories by looking at the way language treats them. It shows that lexical contrasts of Modern Greek in the domain of spatial extension reflect the perceptual strategies of "orientation" and "Gestalt" and their interaction with the concept of "boundedness", which speakers employ in the description of everyday objects.

**Yong Ho Jang and Hing Kai Hung**  
**SUNY Buffalo**

**"Semantics of a Recursive Procedure  
with Parameters and Aliasing"**

We consider a subset of an Algol-like programming language that includes blocks and recursive procedures, with value and location parameter passing. We develop the operational and denotational semantics for both static and dynamic scope, with their different aliasing mechanisms. The main advantage of our approach is that the denotational semantics is compositional and can systematically handle the various scope and aliasing features.

**Josh D. Tenenbergs and Leo B. Hartman**  
**University of Rochester**

**"Naive Physics and the Control of Inference"**

Hayes proposed the naive physics program in order eventually to address problems involving the control of inference. At the time of the proposal, progress toward solutions of these problems seemed impeded by the lack of a well-defined body of knowledge of challenging size. The building of a formally interpretable encoding of the common-sense knowledge that people use to deal with the physical world seemed to fill this need. It was argued that the knowledge be expressed in first-order logic or an equivalent language in order to separate declarative information from control information. We argue here that no finite encoding of a formal theory can be completely separated from control choices by virtue of there being well-defined measures of the depth of a theorem in the deductive closure of a theory. In addition, any control choice is a commitment to a particular set of statistical properties of the problems an agent faces, and the measurement of such properties is required to evaluate these choices.

**Zhigang Xiang**  
**SUNY Buffalo**

**"Multi-Level Model-Based Diagnostic Reasoning"**

Diagnostic systems capable of reasoning from functional and structural knowledge are model-based systems. The uniqueness of our work is that problems of diagnosis that need not only functional and logical structural knowledge but also spatial structural knowledge are to be the focus. Towards this goal, we propose a framework for organizing, representing, and reasoning with an integrated knowledge base that includes multiple levels of abstraction of the physical system. More specifically, a physical system is decomposed into physical and logical components. Analogical (geometrical) and propositional (topological) spatial structural information are associated with physical components. The latter is mutually related to logical components. Functional relationships are established between logical components. Logical reasoning infers the functional status of logical components, whereas spatial reasoning performs fault localization. The framework is carried out using semantic-network representations. The implementation is independent of any given domain of application. The system, when given a description of a physical system's spatial structure, logical structure, and functional relationships between logical components, performs logical as well as spatial reasoning to locate faulty components, lesions, etc., from symptoms and findings. Domain-specific examples include circuitry fault localization and neuroanatomic localization.

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## FUNCTIONS IN CONTEXT DATA BASE

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## A REPRESENTATION OF ACTION AND BELIEF FOR AUTOMATIC PLANNING SYSTEMS

Mark E. Drummond

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A plan representation is presented which can describe sensory and iterative behaviours. The representation builds on previous research in parallel plans, action teleology, reason maintenance, iterative plans, action disjunction and action-ordering plan structures. The new representation is motivated by demonstrating that current methods of operator description cannot easily describe the sensory effects of actions, and by arguing that existing action-ordering plan representations cannot easily describe iterative behaviour. A new representation is defined which overcomes these two difficulties and sample plans are given. Comments are made regarding the relationship between this new representation and what has come before.

## GOAL STRUCTURE, HOLDING AND "CLOUDS"

Austin Tate

AIAl-TR-17, #1.00 UK/surface mail; #2.00 airmail

This paper briefly describes the representation of plans as used in the Edinburgh O-Plan knowledge-based planning system. The representation allows for the modeling of relative and metric time and metric resource constraints. The O-Plan system structure is mentioned.

The main body of the paper describes the representation of effects and conditions in a plan. It lists the Support Operations often required in an AI planner. The use of a "cloud" as an abstraction of a potentially large set of effects (and effects caused by events external to the plan) and how this structure is used within the planner to replace earlier "Goal Structure" maintenance packages in planners is described.

## COMPUTERS WHICH PLAN

Austin Tate

AIAl-TR-18, #1.50 UK/surface mail; #2.00 airmail

This paper describes knowledge-based computer systems which can plan a civil engineering project, control a factory or sequence the operations of a space probe. These systems may offer greater flexibility and more reliability than previous manual methods.

## AI: COMING OUT OF ITS "SHELL"

Austin Tate

AIAl-TR-19, #1.50 UK/surface mail; #2.00 airmail

The application of AI techniques to difficult tasks is having the beneficial effect of drawing AI out of the laboratory and away from simple demonstration tasks. The utility of the rule based system "shell" has fuelled the use of other AI techniques of greater power and potential. Realistic applications tackled by innovative companies and in national and international R&D programmes use AI techniques as one part of a new enlarged repertoire of tools and methodologies available to the system builder.

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The following paper is available from:

Kurt Ammon  
Department of Computer Science  
University of Hamburg  
Schluterstr. 70  
D-2000 Hamburg 13  
West Germany

## AN ARCHITECTURE FOR MATHEMATICAL COGNITION

Ammon, Kurt

May 1986

This paper presents the architecture of the discovery system SHUNYATA which models studies and research in higher mathematics. SHUNYATA analyzes mathematical proofs and produces concepts and proof strategies which form the basis for the discovery of more difficult proofs in other mathematical theories. Its architecture avoids combinatorial explosions and does not require search strategies. The proof strategies contain two categories of predicates. A predicate of the first category selects a small set of proof steps and the predicates of the second category evaluate partial proofs and decide which predicate of the first category should be applied next. Thus, the proof strategies include feedback loops. A detailed example is given. It contains a simple proof in group theory, the analysis of this proof, and the discovery of a

proof in lattice theory whose degree of difficulty represents the state-of-the-art in automated theorem proving. The most important result of this work is the discovery of a holistic logic based on the concept that cognitive structures arise from simple perceptions, evolve by reflection and finally contain their own evolution mechanisms.

---

The following report is available from:

Department of Computer Science  
Attn: Professor John R. Fisher  
California State Polytechnic University  
Pomona, California 91768

## EXPERIMENTS USING RANKED REFUTATION REASONING

John R. Fisher

August, 1986, 85 pages, \$5.00

This technical report explores a method of formal logical reasoning that relaxes the global consistency requirement for logical databases, using ranked (or weighted) information. The theory develops the notion of a ranked tentative answer to a query, and establishes a criterion for accepting or rejecting a tentative answer depending upon the highest ranking consistent arguments supporting or refuting the tentative answer. This answer characterization provides an interesting approach to default-type reasoning. Also proposed is a technique for updating a ranked database using a test based upon subsumption and the ranks of previous and current assertions; this feature makes the reasoning system non-monotonic. The theory is implemented in a Lisp program. The deductive answer-extraction apparatus uses a form of linear, set-of-support, ranked (binary) resolution. This experimental program seems to satisfy the general goal of concise reasoning, within limits, even in the presence of inconsistencies in the current database. As expected, various kinds of computational or logical incompleteness are inevitable, and are discussed in the report. Open questions regarding the theory and its implementation are also posed.

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The following reports may be obtained from:

Scarlet Noekel  
Universitat Kaiserslautern  
Postfach 3049  
6750 Kaiserslautern  
West Germany

## ASSOCIATIVE DIAGNOSTIC PROBLEM SOLVING WITH THE EXPERT SYSTEM SHELL MED 2

F. Puppe

SEKI-REPORT SR-86-12

Available \$6.00 (DM 10)

The motivation, the structure, the use and also the restrictions of the expert system shell for classification problem solving are described. Its architecture is based on the integration of typical classification strategies including hypothetico-deductive reasoning being complemented by standardized preplanning of diagnostic tests, differential diagnosis, separation of database and diagnostic reasoning, and the combination of several criteria for hypothesis evaluation.

The efficient implementation of these mechanisms is based on the concentration of a small set of suspected hypotheses in the working-memory and the aggregation of related symptoms to question-sets providing an adequate

abstraction level for hypothetico-deductive reasoning. Criteria for evaluating hypotheses include categorial and probabilistic rules, a predisposition score and an indicator in the value of a diagnosis for explaining symptoms. All rules can be qualified by exceptions. For retracting premature conclusions, an efficient belief revision algorithm is used. Its correctness depends on blocking circular conclusions at run-time which is implemented in MED2. It is also used for evaluating follow-up sessions in which the change of symptoms with time yields additional diagnostic evidence.

Developing, changing and testing of a knowledge base are supported by the knowledge-acquisition component, the use of which requires no knowledge in programming languages, and by the explanation component, which separates between a user and a knowledge-engineer mode. Currently two major knowledge bases exist in a medical and a technical domain. MED2 runs on various LISP-dialects including COMMONLISP on the IBM-AT and has a size of about 600 K byte.

---

### CONSTRUCTION OF EQUALITY GRAPHS

K.-H. Blaesius

*SEKI-REPORT SR-86-01*

The theoretical and practical problems of equality reasoning in Automated Deduction are notorious. A new method is presented to cope with the enormous search space that usually arises when equational axioms are present. Starting from an empty graph a production system constructs graphs which represent solutions for simpler problems defined by abstraction. These graphs contain global information and are plans for guiding the search for a proof of the original problem, represented in the final graph. The construction of equality graphs is based on the idea to search for the differences between two terms by separating top level symbol and subterms of a functional term. The impact of the explicit representation of information contained in the inference system on the control of inferences is discussed. Finally the method is compared to other equality reasoning methods.

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### SPECIFICATION, HORIZONTAL COMPOSITION AND PARAMETERIZATION OF ALGEBRAIC IMPLEMENTATIONS

Ch. Beierle, A. Voss

*SEKI-REPORT SR-86-02*

Loose specifications of abstract data types (ADTs) have many nonisomorphic algebras as models. An implementation between two loose specifications should therefore consider; many abstraction functions together with their source and target algebras. Just like specifications are stepwise refined to restrict their class of models, implementations should be stepwise refinable to restrict the class of abstraction functions. In this scenario specifications and implementations can be developed interwovenly.

We suggest to have implementation specifications analogously to loose ADT specifications: Implementations have signatures, models, axioms and sentences thus constituting an institution. Implementation specifications are the theories of this institution and refinements between implementation specifications are the theories of this institution and refinements between implementation specifications are its theory morphisms.

In this framework, implementations between

parameterized specifications and horizontal composition of implementations turn out to be special cases of the more powerful concept of parameterized implementations, which allow to instantiate an implementation by substituting a subimplementation by another implementation.

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### KAPRI: A RULE BASED NON-MONOTONIC INFERENCE ENGINE WITH AN INTEGRATED REASON MAINTENANCE SYSTEM

M. Reinfrank, M. Beetz, H. Freitag, J. Klug

*SEKI-REPORT SR-86-03*

KAPRI (Kaiserslautern Augmented Production Rule Interpreter) uses rules of the form if ... unless ... then ... . For such a rule to be fired, its monotonic if-antecedents are required to match the current database, while none of its non-monotonic unless-antecedents does. The current state of a KAPRI-system is represented by a dependency network composed of assertions and corresponding justifications for believing in them in terms of belief respectively disbelief in other assertions. This network is maintained by a reason maintenance system, KL-DNMS (Kaiserslautern Dependency Network Management System), that revises the current belief status with respect to every modification due to the firing of a rule or to the addition/retraction of a basic fact.

In the present paper, we described a very simple first version of KAPRI, and discuss some key issues that arise from augmenting production rules by an UNLESS-part, and from integrating a production rule-based inference engine with a reason-maintenance system.

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### A RELATIONAL FUNCTIONAL INTEGRATION WITH VALUED CLAUSES

H. Boley

*SEKI-REPORT SR-86-04*

The RELFUN programming language is introduced as an attempt to integrate the capabilities of the relational and functional styles. Definitions of functions and relations are specified uniformly by valued Horn clauses, where rules return the value of their rightmost premise. Functional nestings are flattened to relational conjunctions, using a purified version of PROLOG's is-primitive, RELFUN functions may have non-ground arguments, like relations, and/or return non-ground values; their input and output arguments can be inverted like those of relations. Higher-order functions are definable as (function-) valued clauses, with funarg problems being avoided by the standard renaming of clause variables, RELFUN's operational semantics is specified as an abstract machine, which also yields its first (e-mailable) FRANZ LISP implementation.

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### SOME RELATIONSHIPS BETWEEN UNIFICATION, RESTRICTED UNIFICATION AND MATCHING

H.-J. Burchert

*SEKI-REPORT SR-86-05*

We present restricted T-unification that is unification of terms under a given equated theory T with the restriction that not all variables are allowed to be substituted. Some relationships between restricted T-unification, unrestricted T-unification and T-matching (one-sided T-unification) are established. Our main result is that, in the case of an almost collapse free equational theory the most general restricted unifiers and for certain term-pairs

the most general matches are also most general unrestricted unifiers; this does not hold for more general theories. Almost collapse free theories are theories, where only terms starting with projection symbols may collapse (i.e. to be T -equal) to variables.

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### **COMPLETION OF GLOBALLY FINITE TERM REWRITING SYSTEMS FOR INDUCTIVE PROOFS**

R. Gobel

SEKI-REPORT SR-86-06

The Knuth-Bendix Algorithm (KBA) is not able to complete term rewriting systems with cyclic rules such as the commutativity. These kind of rules cause cycles in a reduction chain. This problem may be solved by an extension of the KBA for globally finite term rewriting systems. For a globally finite term rewriting system, cycles may occur in a reduction chain, but for each term there is only a finite set of reductions. A confluent and globally finite term rewriting system R provides a decision procedure for equality induced by R.

Two terms are equal iff there is a common term in their reduction sets. This extension requires new methods for testing the global finiteness and a new confluence test, because local confluence does not imply global confluence for globally finite relations. In this paper we give a theoretical framework for this extension. We will show how this theory can be applied to term rewriting systems, if we are mainly interested in the initial algebra which is induced by the set of rules.

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The following papers may be obtained from:

Projektgruppe KIT

Technische Universitaet Berlin

Institut fuer Angewandte Informatik, CIS

Sekr. FR 5-8

Franklinstr. 28/29

D-1000 Berlin 10

Fed. Rep. of Germany

<ciskit@db0tui11.bitnet>

### **Category Cooccurrence Restrictions and the Elimination of Metarules**

James Kilbury

KIT-REPORT 33

This paper builds upon and extends certain ideas developed within the framework of Generalized Phrase Structure Grammar (GPSG). A new descriptive device, the Category Cooccurrence Restriction (CCR), is introduced in analogy to existing devices of GPSG in order to express constraints on the cooccurrence of categories within local trees (i.e. trees of depth one) which at present are stated with Immediate Dominance rules and metarules. In addition to providing a uniform format for the statement of such constraints, CCRs permit generalizations to be expressed which presently cannot be captured in GPSG. The paper shows how the use of CCRs allows metarules to be eliminated from the present GPSG formalism.

### **Generierung struktureller Konzepte im Version-Space**

Thomas Hoppe

KIT-REPORT 34 (in German)

In opposite to other strategies (Depth-first, Breath-first) the Version-Space strategy has some advantages. The major advantage lies in the fact, that generated generalisations must not be matched against the postive

and negative examples, because two concept sets summarize the information contained in the examples. Because the strategy is independent of the used representation formalism, the question arises, what would be happen if one would apply it on structural descriptions.

### **Semantic Networks with Number Restricted Roles (or Another Story about Clyde)**

Kai von Luck

KIT-REPORT 35

The Number Restriction of Roles, first proposed in KL-ONE, gives a Semantic Network formalism great expressive power. On the other hand, hybrid systems having such features as part of their terminological knowledge representation formalism have great difficulties in using these Number Restrictions for inferences and consistency checking in their assertional component. Some of these difficulties are discussed in this paper and a solution, worked out as part of the BACK system, is presented.

### **NIGEL Gets To Know Logic - An Experiment in Natural Language Generation Taking a Logical, Knowledge-Based View**

Bernhard Nebel and Norman K. Sondheimer

KIT-REPORT 36

This paper argues for using logic as the internal meaning representation language for natural language generators. We present our efforts in realizing such an interface for the natural language generator NIGEL. The language is a restricted first-order logic enhanced by some non-standard quantifiers. A network knowledge base organizes the concepts of the application domain appearing as predicates in the logical expressions into categories known by the generator. The logical expressions are interpreted by NIGEL using the hybrid knowledge representation system KL-TWO.

### **Language Variation, Parsing, and the Modelling of Users' Language Varieties**

James Kilbury

KIT-REPORT 37

Most natural language computer systems either do not deal with the problem of language variation at all or else simply treat it as a matter of robustness like ill-formed input. The features of input that mark it as belonging to a particular language variety are regarded as noise. Since this information is lost during analysis, it cannot be used to generate system answers tailored in form and content to particular users, or more importantly, to help in the analysis of further input. This paper proposes a solution to these problems based on the linguistic variation theory of C.-J. Bailey and on formal devices of Generalized Phrase Structure Grammar.

### **Big Flood in the Blocks World (or Non-cumulative Learning)**

Werner Emde

KIT-REPORT 38

The knowledge acquisition process of many Machine Learning approaches is idealized, e.g., with respect to the exclusion of noisy data. The consequence of abandoning the idealization is: the system may be led to a dead end. In this paper the reasons for this assertion are given and some heuristics of METAXA.3 are described. METAXA.3 is able to leave such dead ends by replacing old theories by new, differently structured theories with an exchange of

parts of the factual knowledge. It is argued that the development of a "paradigm" is advantageous and possibly necessary in learning processes.

#### **Bitter Pills - A Case Study in Knowledge Representation**

Albrecht Schmiedel, Christof Peltason, Bernhard Nebel and Kai von Luck  
KIT-REPORT 39

This report describes an effort to represent knowledge about the effects of drugs within a KL-ONE like knowledge representation formalism. The main purpose was to gather experience with the kind of problems one encounters when trying to represent a real-world domain. The domain knowledge is based on a book called "Bitter Pills," which is a guide to the use and risks of drugs available on the Austrian and West German market. Using KL-ONE, which is mainly concerned with representing terminology, the main part of the report describes the choice of primitive concepts and relations, the definition of more complex concepts in terms of these, and their interrelations within a taxonomic hierarchy. Examples for making assertions with this terminology are given, and some of the general problems associated with domain modeling are discussed.

#### **Anything you can do - I can do meta**

Katharina Morik  
KIT-REPORT 40

In this paper it is argued that there should be no upper boundary for the levels of meta-knowledge set by the form, but by the need for representation alone. Moreover, it is claimed that meta-knowledge should be at the meta-level, regardless of the representation of that knowledge. The Berlin Learning by Induction Program (BLIP) is presented and it is shown how meta-knowledge is represented and used there.

#### **The Anatomy of the BACK System**

Kai von Luck, Bernhard Nebel, Christof Peltason and Albrecht Schmiedel  
KIT-REPORT 41

The Berlin Advanced Computational Knowledge Representation (BACK) System is an integrated hybrid knowledge representation system based on the ideas of KL-ONE with well-defined and operationalized semantics. The major topics in developing the BACK system were the close integration of two different knowledge representation formalisms and the careful selection of representation constructs with respect to tractable interpretation algorithms. The close integration approach arises from the experiences taken from loosely coupled system like KL-TWO or NISRL. Thus BACK is motivated as an integrated hybrid system with balanced expressiveness of the different knowledge representation formalisms. Arguments will be made to motivate the specific selection of language constructs done for the BACK system especially under considerations of the tractability of interpreter algorithms. Additional efforts were undertaken in developing user-friendly interfaces for inspecting, modifying and maintaining models of a selected domain.

#### **The User's Guide to the Back System**

Christof Peltason, Kai von Luck, Bernhard Nebel and Albrecht Schmiedel  
KIT-REPORT 42

The report serves as a manual for the hybrid knowledge representation system BACK which was developed at the TU Berlin. The general characteristics of the system are sketched, all functions are specified, and practical examples are given. The system also contains an additional graphics package which provides an elaborate knowledge editing environment. For a detailed discussion of the system's design see KIT Report 41. The BACK system is implemented in PROLOG and runs under a number of various systems. The graphics package runs on SYMBOLICS 36xx Lispmachines.

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For copies, send requests to:  
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University of Wisconsin  
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Madison, WI 53706

#### **A Structured Memory Access Architecture for LISP**

Matthew T. Thazhuthaveetil  
August 1986  
TR658 (supplies limited)

Lisp has been a popular programming language for well over 20 years. The power and popularity of Lisp are derived from its extensibility and flexibility. These two features also contribute to the large semantic gap that separates Lisp from the conventional von Neumann machine, typically leading to the inefficient execution of Lisp programs. This dissertation investigates how the semantic gap can be bridged.

We identify function calling, environment maintenance, list access, and heap maintenance as the four key run-time demands of Lisp programs, and survey the techniques that have been developed to meet them in current Lisp machines. Previous studies have revealed that Lisp list access streams show spatial locality as well as temporal locality of access. While the presence of temporal locality suggests the use of fast buffer memories, the spatial locality displayed by a Lisp program is implementation dependent and hence difficult for a computer architect to exploit. We introduce the concept of structural locality as a generalization of spatial locality, and describe techniques that were used to analyze the structural locality shown by the list access streams generated from a suite of benchmark Lisp programs. This analysis suggests architectural features for improved Lisp execution.

The SMALL Lisp machine architecture incorporates these features. It partitions functionality across two specialized processing elements whose overlapped execution leads to efficient Lisp program evaluation. Trace-driven simulations of the SMALL architecture reveal the advantages of this partition. In addition, SMALL appears to be a suitable basis for the development of a multi-processing Lisp system.

#### **Pyramid Vision Using Key Features to Integrate Image-Driven Bottom-Up and Model-Driven Top-Down Processes**

Ze-Nian Li and Leonard Uhr  
December 1986  
TR678

Pyramid-like parallel hierarchical structures have been

shown to be suitable for many computer vision tasks, and to have the potential for achieving the speeds needed for the real-time processing of real-world images. We are developing algorithms to explore the pyramid's massively parallel and shallowly serial-hierarchical computing ability in an integrated system that combines both low level and higher level vision tasks.

Micro-modular transforms are used to embody the program's knowledge of the different objects it must recognize. This paper describes pyramid vision programs that, starting with the image, use transforms that assess key features to dynamically imply other feature-detecting and characterizing transforms, and additional top-down, model-driven processes to apply. Program performance is presented for four real-world images of buildings.

The use of key features in pyramid vision programs and the related search and control issues are discussed. To expedite the detection of various key features, feature-adaptable windows are developed. In addition to image-driven bottom-up and model-driven top-down processing, lateral search is used, and is shown to be helpful, efficient, and feasible. The results indicate that, with the use of key features and the combination of a variety of powerful search patterns, the pyramid-like structure is effective and efficient for supporting parallel and hierarchical object recognition algorithms.

### **Multiscale Image Understanding**

Charles R. Dyer  
December 1986  
TR679

This paper reviews methods for understanding multiscale (also called multiresolution) image descriptions. We include work related to the construction and analysis of image representations which make explicit properties of edges, shape and texture at multiple scales. In addition we present two applications of multiscale techniques for model-based object recognition and texture segmentation.

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The following is a list of the latest USC/ISI Research Reports. If you would like any of these reports, contact:

Diane Speekman  
USC/Information Sciences Institute  
4676 Admiralty Way, Suite 1001  
Marina del Rey, CA 90292

### **Recent Developments in NIKL**

Thomas Kaczmarek, Raymond Bates and Gabriel Robins  
ISI/RS-86-167  
November 1986

NIKL (a New Implementation of KL-ONE) is one of the members of the KL-ONE family of knowledge representation languages. NIKL has been in use for several years and our experiences have led us to define and implement various extensions to the language, its support environment and the implementation. Our experiences are particular to the use of NIKL. However, the requirements that we have discovered are relevant to any intelligent system that must reason about terminology. This article reports on the extensions that we have found necessary based on experiences in several different testbeds. The motivations for the extensions and future plans are also presented.

### **A Logical-Form and Knowledge-Base Design for Natural Language Generation**

Norman Sondheimer and Bernhard Nebel  
ISI/RS-86-169

November 1986

This paper presents a technique for interpreting output demands by a natural language sentence generator in a formally transparent and efficient way. These demands are stated in a logical language. A network knowledge base organizes the concepts of the application domain into categories known to the generator. The logical expressions are interpreted by the generator using the knowledge base and a restricted, but efficient, hybrid knowledge representation system. The success of this experiment has led to plans for the inclusion of this design in both the evolving Penman natural language generator and the Janus natural language interface.

### **Rhetorical Structure Theory:**

#### **Description and Construction of Text**

William C. Mann and Sandra Thompson  
ISI/RS-86-174  
October 1986

Rhetorical Structure Theory (RST) is a theory of text structure that is being extended to serve as a theoretical basis for computational text planning. Text structure in RST are hierarchic, built on small patterns called schemas. The schemas which compose the structural hierarchy of a text describe the functions of the parts rather than their form characteristics. Relations between text parts, comparable to conjunctive relations, are a prominent part of RST's definitional machinery.

Recent work on RST has put it onto a new definitional basis. This paper describes the current status of descriptive RST, along with efforts to create a constructive version for use as a basis for programming a text planner.

### **Towards Explicit Integration of Knowledge in Expert Systems**

Jack Mostow and Bill Swartout  
ISI/RS-86-176  
November 1986

The knowledge integration problem arises in rule-based expert systems when two or more recommendations made by right-hand sides of rules must be combined. Current expert systems address this problem either by engineering the rule set to avoid it, or by using a single integration technique built into the interpreter, e.g., certainty factor combination. We argue that multiple techniques are needed and that their use -- and underlying assumptions -- should be made explicit. We identify some of the techniques used in MYCIN's therapy selection algorithm to integrate the diverse goals it attempts to satisfy, and suggest how knowledge of such techniques could be used to support construction, explanation, and maintenance of expert systems.

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The following technical reports may be obtained from

Information Services  
The Robotics Institute  
Carnegie Mellon University  
Pittsburgh, PA 15213  
(Nancy.Serviou@h.cs.cmu.edu)

### **A Variational Principle for Quasistatic Mechanics**

M. A. Peshkin and A. C. Sanderson  
CMU-RI-TR-86-16, December 1986

Quasistatic mechanical systems are those in which mass or acceleration are sufficiently small that the inertial term  $ma$  in  $F = ma$  is negligible compared to dissipative

forces. In robotics, quasistatic mechanics may be used for systems with friction when motions are sufficiently slow. Here we consider a general quasistatic system with constraints and both dissipative and conservative forces. Under some conditions it is possible to replace Newton's law with the simple and intuitive variational principle that the system moves within the space of unconstrained motions in such a way as to minimize power. For quasistatic systems we find that this *principle of minimum power* is correct if all the *velocity-dependent* forces are parallel to the velocity and have a magnitude independent of velocity, i.e., are essentially equivalent to Coulomb friction. No restriction need be imposed on velocity-independent forces or forces of constraint. (14 pages)

#### **On Learning Boolean Functions**

B. K. Natarajan

CMU-RI-TR-86-17, December 1986

This paper deals with the learnability of boolean functions. An intuitively appealing notion of dimensionality of boolean functions is developed and used to identify the most general class of boolean function families that are learnable from polynomially many positive examples with one-sided error. It is then argued that although bounded DNF expressions lie outside this class, they must have efficient learning algorithms as they are well suited for expressing many human concepts. A framework that enables efficient learning of bounded DNF functions is then identified. (13 pages)

#### **On Detecting the Orientation of Polygons and Polyhedra**

B. K. Natarajan

CMU-RI-TR-86-18, December 1986

This paper concerns the use of ray sensors to detect the orientation of polygonal and polyhedral objects moving on a belt or slide. The problem is abstracted to the computational domain and the following results obtained. For polygons of  $n$  vertices,  $n$  sensors are sufficient and  $(n/2)$  necessary. For convex polyhedra of  $n$  vertices,  $(6n)$  sensors are sufficient and  $(n/4)$  necessary. Non-convex polyhedra cannot be effectively handled with such sensors. (9 pages)

#### **Inspecting Money: How to Avoid Negative Bucks**

Robert Thibadeau

CMU-RI-TR-87-1, January 1987

The focus of the activity of the Inspection Laboratory in the past several years has been high-speed inspection of patterned surfaces. The Bureau of Engraving prints money on a high-speed "web," which means that large sheets of money are being produced very fast. The question is raised of how to inspect for the print quality at those speeds. People will see either a blur or only a sample of the print. In this report, we use our past experiences to attempt to detail the inspection methods, hardware, etcetera, which would be needed to construct a hypothetical "inspect-a-buck" system, and the problems that might be encountered along the way. (12 pages)

#### **Problems of Automatic Vectorization of Artwork**

Robert Thibadeau

CMU-RI-TR-87-2, January 1987

A number of attempts have been made to scan printed wiring artwork, or drawings of circuit layouts, for automatic entry into computer aided design systems.

Several commercial machines are available which accomplish forms of artwork vectorization. The Inspection Laboratory, under the sponsorship of Visual Understanding Systems, Inc., has worked on the problem of vectorization. Most recently this work is based on a small, relatively inexpensive, vectorization system composed of an IBM/XT, custom electronics hardware, and 300 DPI scanner. This report will summarize our findings to date and indicate the capability of current "vectorization" technology. (13 pages)

#### **Prototype Software for Automatic Generation of On-Line Control Programs For Discrete Manufacturing Processes**

Gregg Ekberg and Bruce H. Krogh

CMU-RI-TR-87-3, February 1987

This report describes prototype software for automatically generating control programs for discrete manufacturing processes from a high-level description of the system control logic. The control logic is synthesized from a specification of the physical resource states required for each operation in the process. The software described in this report allows the user to specify interactively the operation sequencing logic and the actuators and sensors for each stage of the process. This information is then used to automatically generate code for on-line control computers. The current implementation supports binary sensor and actuator signals. The methodology is illustrated for the automatic generation of instruction list (IL) code to control a conveyor system in an existing robotic assembly plant. (32 pages)

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**Schedule of Activities**



Wednesday, May 27

8:30 a.m. - 12:30 p.m. Tutorials

2:00 p.m. - 6:00 p.m. Research Presentations

7:00 p.m. - 10:00 p.m. Welcoming reception - NU Faculty Center

Thursday and Friday, May 28-29

8:30 a.m. - 6:00 p.m. Research Presentations and Panels

Thursday evening, May 28 - 7:00 p.m. Gala Banquet, at the Colonnade Hotel

**Tutorials**

- A. "Introduction to Artificial Intelligence (For Lawyers)." Edwina L. Rissland, Associate Professor of Computer and Information Sciences, University of Massachusetts at Amherst, and Lecturer in Law, Harvard Law School, will present the fundamentals of AI from the perspective of a legal expert.
- B. "Applying Artificial Intelligence to Law: Opportunities and Challenges." Donald H. Berman, Richardson Professor of Law, and Carole D. Hafner, Associate Professor of Computer Science, Northeastern University, will survey the past accomplishments and current goals of research in AI and Law.

**Panels**

"The Impact of Artificial Intelligence on the Legal System." Moderated by Cary G. deBessonnet, Director of the Law and Artificial Intelligence Project, Louisiana State Law Institute.

"Modeling the Legal Reasoning Process: Formal and Computational Approaches." Moderated by L. Thorne McCarty, Professor of Computer Science and Law, Rutgers University.

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