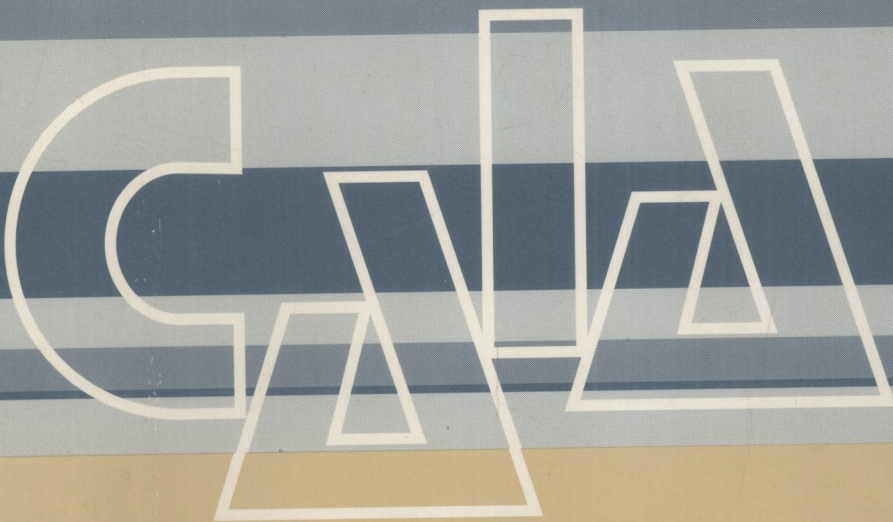


Proceedings The Seventh Conference on Artificial Intelligence Applications

**Sponsored by the IEEE Computer Society
Miami Beach, Florida February 24-28, 1991**



IEEE Computer Society Press

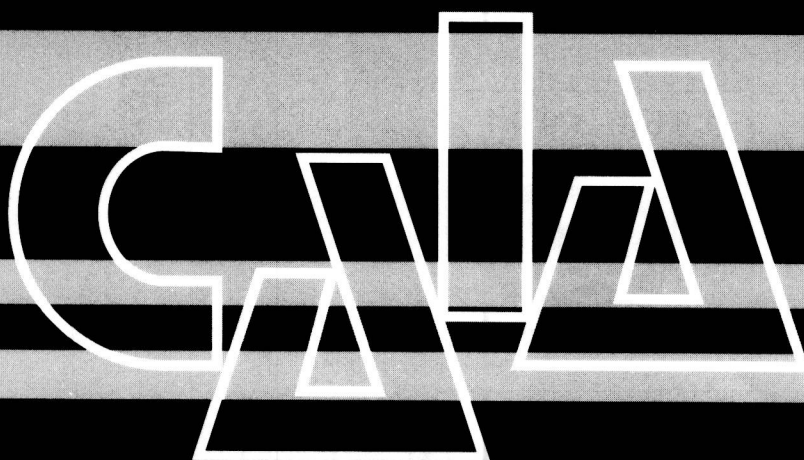


The Institute of Electrical and Electronics Engineers, Inc.

Volume II: Visuals

Proceedings The Seventh Conference on Artificial Intelligence Applications

**Sponsored by the IEEE Computer Society
Miami Beach, Florida February 24-28, 1991**



IEEE Computer Society Press



The Institute of Electrical and Electronics Engineers, Inc.

The papers in this book comprise the proceedings of the meeting mentioned on the cover and title page. They reflect the authors' opinions and, in the interests of timely dissemination, are published as presented and without change. Their inclusion in this publication does not necessarily constitute endorsement by the editors, the IEEE Computer Society Press, or the Institute of Electrical and Electronics Engineers, Inc.



Published by the
IEEE Computer Society Press
10662 Los Vaqueros Circle
PO Box 3014
Los Alamitos, CA 90720-1264

© 1991 by the Institute of Electrical and Electronics Engineers, Inc. All rights reserved.

Copyright and Reprint Permissions: Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limits of US copyright law, for private use of patrons, those articles in this volume that carry a code at the bottom of the first page, provided that the per-copy fee indicated in the code is paid through the Copyright Clearance Center, 29 Congress Street, Salem, MA 01970. Instructors are permitted to photocopy, without fee, isolated articles for noncommercial classroom use. For other copying, reprint, or republication permission, write to the Director of Publishing Services, IEEE, 345 East 47th Street, New York, NY 10017.

IEEE Computer Society Press Order Number 2135
Library of Congress Number 90-85778
IEEE Catalog Number 91CH2967-8
ISBN 0-8186-2135-4 (paper)
ISBN 0-8186-6135-6 (microfiche)
ISBN 0-8186-9135-2 (case)

Additional copies can be ordered from

IEEE Computer Society Press
Customer Service Center
10662 Los Vaqueros Circle
PO Box 3014
Los Alamitos, CA 90720-1264

IEEE Service Center
445 Hoes Lane
PO Box 1331
Piscataway, NJ 08855-1331

IEEE Computer Society
13, avenue de l'Aquilon
B-1200 Brussels
BELGIUM

IEEE Computer Society
Ooshima Building
2-19-1 Minami-Aoyama
Minato-ku, Tokyo 107
JAPAN

Editorial production: Robert Werner
Printed in the United States of America by Technical Communication Services



THE INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INC.

SEVENTH IEEE CONFERENCE ON ARTIFICIAL INTELLIGENCE APPLICATIONS

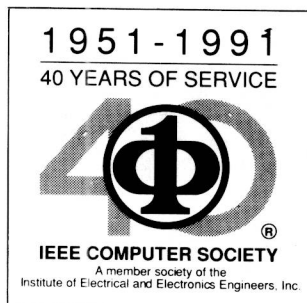


TABLE OF CONTENTS

PANEL SESSIONS

Chairman's Welcome	3
<i>S.J. Hong</i>	
Towards Intelligent Systems in the DoD	5
<i>S.E. Cross</i>	
Application Projects at ICOT	15
<i>K. Furukawa</i>	
European Strategic Programme in Information Technologies (ESPRIT)	39
<i>D.E. Talbot</i>	
"Applying Common Sense" – Necessity or Oxymoron?	45
<i>D. Lenat</i>	
AI in Engineering Design: The User's Perspective	60
<i>D. Sriram</i>	
Variational Geometry and Object/Rule-Based Tools for Mechanical Design	69
<i>K. Severler</i>	
Wisdom Systems Concept Modeller at Xerox Corporation	75
<i>W. Spear</i>	
Standards for Knowledge-Based Systems	85
<i>R. Ohlander</i>	
WIP: The Coordinated Generation of Multi-Modal Presentations from a Common Representation	109
<i>W. Wahlster</i>	
Multi-Media in Artificial Intelligence	115
<i>Y. Arens, E. Hovy, and M. Vossers</i>	
Media Coordination in COMET	119
<i>S.K. Fetner and K.R. McKeown</i>	
Knowledge Sharing and the Role of Common Ontology	123
<i>T. Gruber</i>	
When Does Truth Maintenance Pay Off?	140
<i>V. Dhar</i>	

PRESENTATIONS

A Platform for Applying Multiple Machine Learning Strategies to the Task of Understanding Gene Structure	155
<i>G.C. Overton and J.A. Pastor</i>	
Pattern-Matching Search of DNA Sequences Using Logic Grammars	162
<i>D.B. Searls and M.O. Noordewier</i>	
From Parsing to Database Generation: Applying Natural Language Systems	177
<i>P.S. Jacobs</i>	
Automatic Cluster Assignment for Documents	186
<i>J.S. Deogun, S.K. Bhatta, and V.V. Raghavan</i>	
Extracting Company Names from Text	189
<i>L.F. Rau</i>	
Text Classification in Fragmented Sublanguage Domains	195
<i>R.P. Frail and R.S. Freedman</i>	
IREF – An Interactive Theory-Driven Knowledge Refinement Tool	203
<i>C. Chen and H. Gelernter</i>	

Model-Based Acquisition of Inference Structures	210
<i>X. Tong</i>	
Specialized Knowledge Acquisition Tool Support Compared to Manual Development – A Case Study	217
<i>H. Eriksson</i>	
ALEX: Automatic Learning in Expert Systems	223
<i>L. Winkelbauer and K. Fedra</i>	
TWIN: A Parallel Scheme for a Production System Featuring Both Control and Data Parallelism	227
<i>T. Yukawa</i>	
Use of Procedural Programming Languages for Controlling Production Systems . . .	233
<i>T. Ishida, Y. Sasaki, and Y. Fukuhara</i>	
Proving Properties of Rule-Based Systems	240
<i>R.J. Waldinger and M.E. Stickel</i>	
Automating the Presentation of Information	245
<i>S.F. Roth and J. Mattis</i>	
Molecular Scene Analysis	254
<i>J.I. Glasgow, S. Fortier, and F.H. Allen</i>	
InterBALANCE: Cooperative Load-Balancing System	259
<i>M. Kudo and Y. Tozawa</i>	
Fault Diagnosis of a Sewage Plant	261
<i>J. Schönwälder, M. Hofmann, and H. Langendörfer</i>	
A Knowledge Representation for Model-Based High-Level Specification	263
<i>H. Mizutani, Y. Nakayama, K. Sadashige, and T. Matsudaira</i>	
KRS – A Hybrid System for Representing Knowledge in Knowledge-Based Help Systems	268
<i>R. Adams</i>	
Knowledge Representation Support for a Software Information System	271
<i>P.G. Selfridge</i>	
Using a Description Classifier to Enhance Deductive Inference	292
<i>R.M. MacGregor</i>	
Rapid Prototyping Based on Common Substrate of Knowledge	303
<i>Y. Jang and C. Apté</i>	
AirLand Battle Management Program Decision Aids for Battle Management Planning	310
<i>W.E. Wedlake and M.A. Hirschberg</i>	
An Assumption-Based Scene Interpretation System that Solves Multiplicity of Scene Description	316
<i>M. Etoh and F. Kishino</i>	
A Multi-Level Pattern Matching Method for Text Image Parsing	326
<i>M. Prussak and J.J. Hull</i>	
Multi-Sensor Image Interpretation Using Laser Radar and Thermal Images	332
<i>C.-C. Chu and J.K. Aggarwal</i>	
Shape Feature Abstraction in Knowledge-Based Analysis of Manufactured Products	339
<i>R. Gadh and F.B. Prinz</i>	
Task Dependency Modelling to Support Assembly Plant Design	345
<i>K.E. Fayyad and R. Kass</i>	
Case-Based Reasoning in Engineering Design	354
<i>D. Navtrichandra, K.P. Sycara, S. Narasimhan, R. Guttal, and J.L. Koning</i>	
Application of Machine Learning to the Recognition of Texture Concepts	359
<i>J.W. Bala and P.W. Pachowicz</i>	

Seismic Event Identification Using Artificial Neural Networks	369
<i>J.L. Perry and D.R. Baumgardt</i>	
Learning Multiple Fault Diagnosis	375
<i>Y. El Fattah and P. O'Rorke</i>	
Example-Guided Optimization of Recursive Domain Theories	378
<i>D. Subramanian and R. Feldman</i>	
Automobile Transmission Design as a Constraint Satisfaction Problem: First Results	380
<i>B.A. Nadel and J. Lin</i>	
A Resource-Based Paradigm for the Configuring of Technical Systems from Modular Components	384
<i>M. Heinrich and E.W. Jüngst</i>	
Applying Qualitative Reasoning Techniques for Analysis and Evaluation in Structural Design	393
<i>G. Biswas, K. Krishnamurthy, and P.K. Basu</i>	
Combining Rules and State Space Objects in a Configuration Expert System	398
<i>R. König and C. Rathke</i>	
Combining Decision Theory and Hierarchical Planning for a Time-Dependent Robotic Application	402
<i>P.J. Gmytrasiewicz, E.H. Durfee, and D.K. Wehe</i>	
Interactive Diagnosis and Repair of Decision-Theoretic Models	405
<i>D.A. Klein and E.H. Shortliffe</i>	
MEXSES: An Expert System for Environmental Screening	408
<i>K. Fedra and L. Winkelbauer</i>	
A Constraint Logic Programming Language for Combinatorial Optimization and Linear Programming	411
<i>P. Lim, M.L. Epstein, and E.H. Freeman</i>	
Representation, Organization, and Use of Topographic Models of Physical Spaces for Route Planning	416
<i>A.K. Goel, T.J. Callantine, M. Shankar, and B. Chandrasekaran</i>	
FMS Scheduling Using Goal-Directed Conceptual Aggregation	419
<i>A.R. Chaturvedi, G.K. Hutchinson, and D.L. Nazareth</i>	
GIDEON: A Genetic Algorithm System for Vehicle Routing with Time Windows . .	422
<i>S.R. Thangiah, K.E. Nygard, and P.L. Juell</i>	
A Partitioned ATMS	426
<i>B. D'Ambrosio and J. Edwards</i>	
A Cyclic Pattern Resulting from a Constraint Satisfaction Search	429
<i>H.G. Ziegeler and H. Kaindl</i>	
Solving N-ary Constraint Labeling Problems Using Incremental Subnetwork Consistency	435
<i>H.S. Lee</i>	
Influence Networks: A Reactive Planning Architecture	439
<i>L. Tychonievich, T.C. Smith, and R. Evans</i>	
PEX: A Reactive Procedure Based Decision Maker	444
<i>J.C. Chautard and C. Honnorat</i>	
Strategic Planning System	447
<i>M. Smith</i>	
TEXSYS: A Large Scale Demonstration of Real-Time Control	455
<i>B.J. Glass, W.K. Erickson, and K.J. Swanson</i>	
Execution Monitoring and Recovery Planning with Time	465
<i>D.J. Musltnr, E.H. Durfee, and K.G. Shin</i>	

OASIX: A Real-Time Knowledge-Based System for UNIX Operations and Administration	470
<i>S.Y. Park, H.K. Kang, M.K. Kim, H.G. Lim, K.T. Chong, and Y.H. Lim</i>	
LIMA: A Logistics Inventory Management Assistant	477
<i>M. Lipshutz, R. McEntire, and D.P. McKay</i>	
Uncertainty Reasoning in Prolog with Layered Meta-Interpreters	481
<i>L.Ü. Yalçınalp and L. Sterling</i>	
Advice-Giving Using REASON: An Intelligent Assistant for Interactive Computing	485
<i>D.M. Lamberti and J.M. Prager</i>	
SPOKESMAN: Data-Driven, Object-Oriented Natural Language Generation	491
<i>M.W. Meteer</i>	
Exploiting Text Generation Techniques in the Provision of Help	498
<i>C. Tattersall</i>	
AUTHOR INDEX	503

PANEL SESSIONS

CHAIRMAN'S WELCOME
Se June Hong
IBM T. J. Watson Research Center

Over 250 papers submitted:

1/7 —> short papers
1/7 —> long papers

Thanks to:	Program Committee	- Tim Finin
	Tutorial	- Dan O'Leary
	Publicity	- Jeff Pepper
	Local arrangement	- Alex Pelin
	IEEE-Computer Soc.	- Mansur Kabuka
	Steering Committee	- Nancy Wise
	Best Student Paper Award	- Mark Fox
		- IBM

SJ0220
02/20/91

Best Student Paper Award

"Multi-Sensor Image Interpretation Using Laser Radar
and Thermal Images"

Chen-Chau Chu and J. K. Aggarwal
Computer and Vision Research Center
The University of Texas at Austin

Honorable Mention

"An Intelligent Assistant for Financial Hedging"

Michel Benaroch and Vasant Dhar
Information Systems Department
New York University

A N D

"A Multi-level Pattern Matching Method for Text
Image Parsing"

Michal Prussuk and Jonathan J. Hull
Department of Computer Science
State University of New York at Buffalo

What will you do with

1000 mips

200 Mb main memory

10 Gb disc

Remote Communication at today's
disc access rate

on your desk ?

- ☒ n to (n + few) in exponential processes
- ☒ Play hyper-Mario
- ☒ Utility information/transaction services
- ☒ Significantly more user interface services
- ☒ Connection to Huge Data/Knowledge/Program Base

SH40220-6

SH1105

11/08/90

"Knowledge is Power"

- Expert Systems, Knowledge Based Systems
- Inclusion shells, Knowledge Primed Shells
- Knowledge Substrates, Common Sense KB
- Intelligent User Interfaces

SI-0220-3
03/20/91

Challenges

- ☒ Characterize AI Algorithms
 - * Complexity, Does it scale up?
 - * When is it effective?
 - * How do we detect when it is effective?
- ☐ Characterize Tasks of Applications
 - * What kind of Search?
 - * What kind of Planning?
 - * What kind of Classification?
 - * What kind of Designing?
 - * Etc.
- ☒ Sensible Knowledge Representation
 - * To support large, complex application
 - * To be shared and re-used
- ☒ Do these with rigor
 - * Prove theoretically
 - * Prove in a real system

SI-0220-4
03/20/91



Towards Intelligent Systems in the DoD

**Lt Col Stephen E. Cross, USAF
DARPA/ISTO**



OVERVIEW

- **21st Century Challenges**
- **A Crucial Role for Intelligent Systems**
- **Some Visionary Potential Applications**
- **Assessment of AI Technology**
- **DARPA's Emphasis on Intelligent Systems Engineering**
- **Finally! – Concluding Remarks**



21st Century Challenges

- First, What is the Department of Defense?
- What Factors Shape Military Strategy?
- What are the Implications?
- What is the Role for Technology?

Implication: Greater role for intelligent systems



A Crucial Role for Intelligent Systems

- First, what are they?
- How do they differ from expert systems?
- What are the critical system needs?



Engineering Intelligent Systems

Cognitive Levels

Models

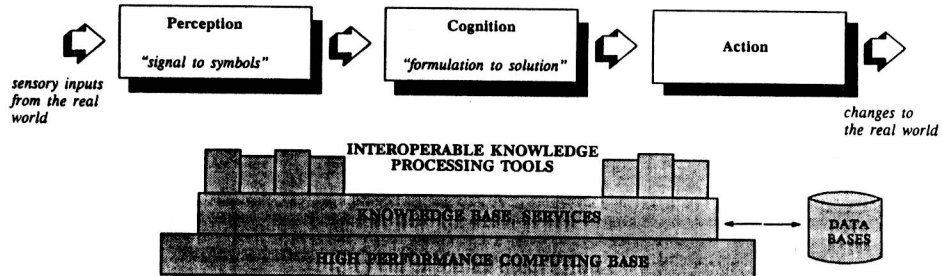
Assessment → Derive Goals → Form, Project, Execute, & Monitor Plans → Learn

Knowledge

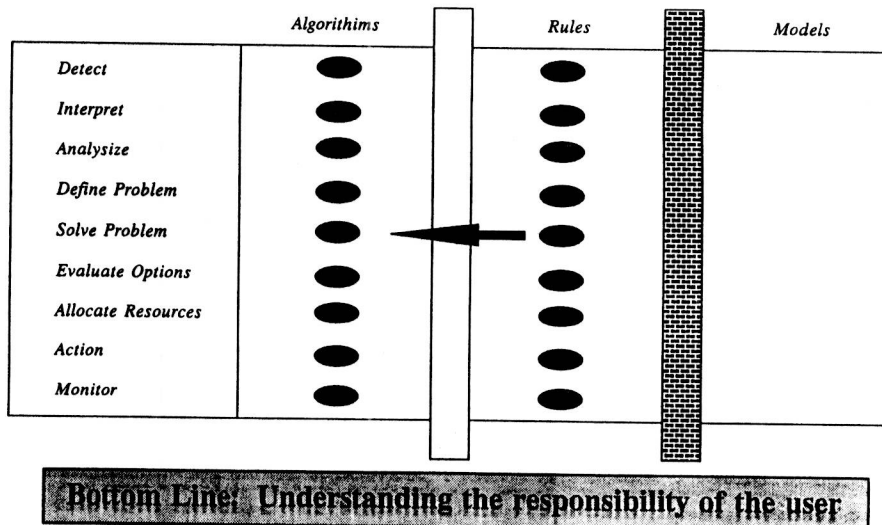
Detection → Association State/Task → Evaluate Options → Perform Task

Skill

Feature Formation → Automated Sensori-Motor Patterns

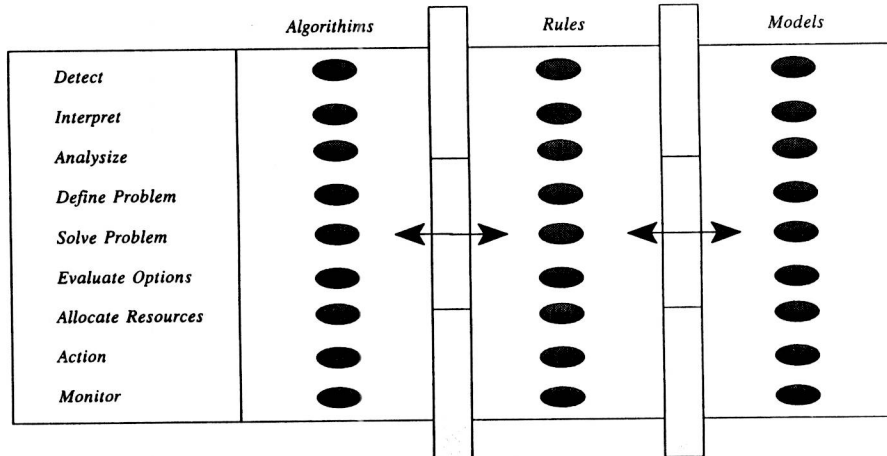


Engineering Intelligent Assistant Systems





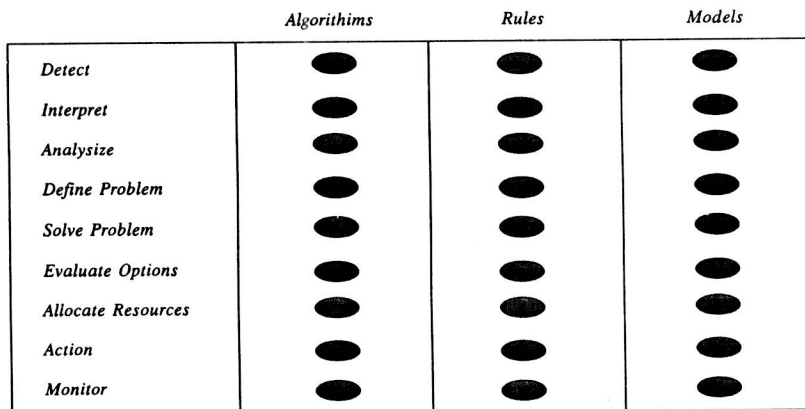
Engineering Intelligent Associate Systems



Bottom Line: Computer Understands the User's Problem Solving Requirements and Abilities



Engineering Autonomous Systems





Critical System Needs

- Ability for user tailoring or modification
- Adaptive, experience-based modification
- Cooperative distributed problem solving
- Real time (i.e., just in time) performance
- Intelligent, interactive documentation
- Integration into conventional software environments
- Effective VV&T/quality assurance methods



Some Visionary Potential Applications

- **Crisis Action Planning Systems**
 - *Dynamic Analysis and Replanning Tool*
- **Advanced Simulation and Training**
 - *Magic Carpet*
- **Manufacturing and Design Engineering**
 - *Engineer's Associate*
- **Autonomous Systems**
 - *Unmanned Vehicles*