Fourteenth National Conference on Artificial Intelligence (AAAI-97)
Ninth Conference on Innovative Applications of Artificial Intelligence (IAAI-97)

July 27-31, 1997
Providence, Rhode Island

Sponsored by the American Association for Artificial Intelligence
Cosponsored by NASA Ames Research Center and Microsoft Corporation
In cooperation with Brown University

Program & Exhibit Guide
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Acknowledgments

The American Association for Artificial Intelligence wishes to acknowledge and thank the following individuals for their generous contributions of time and energy to the successful creation and planning of the Fourteenth National Conference on Artificial Intelligence and the Ninth Conference on Innovative Applications of Artificial Intelligence.

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  Matthew L. Ginsberg, CIRL / University of Oregon
- Robot Competition Chair
  Ronald C. Arkin, Georgia Institute of Technology
- Student Abstract Chair
  Polly K. Pook, Massachusetts Institute of Technology
- Tutorial Forum Co-chairs
  Bart Selman, AT&T Laboratories
  Brian C. Williams, NASA Ames Research Center
- Workshop Chair
  Raymond C. Mooney, University of Texas at Austin
- AAAI-97 / SIGART Doctoral Consortium Organizers
  Vibhu O. Mittal, University of Pittsburgh
  Loren G. Terveen, AT&T Research

A complete listing of the AAAI-97 and IAAI-97 Program Committee members appears in the AAAI-97 / IAAI-97 Proceedings.

Corporate Sponsorship

AAAI gratefully acknowledges the generous contributions of the following corporations and organizations to AAAI-97:

- Brown University
- Caelum Research
- Defense Advanced Research Projects Agency
- General Motors Corporation
- Microsoft Corporation
- NASA Ames Research Center
- National Science Foundation

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Special Events & Programs

1997 AAAI Fellows Recognition Dinner

Each year the American Association for Artificial Intelligence recognizes a small number of members who have made significant sustained contributions to the field of artificial intelligence, and who have attained unusual distinction in the profession. AAAI is pleased to announce the five newly elected Fellows for 1997:

- Henry A. Kautz, AT&T Laboratories — Research
- Pat Langley, Daimler-Benz Research and Technology Center and Institute for the Study of Learning and Expertise
- Robert M. MacGregor, USC / Information Sciences Institute
- David Allen McAllester, AT&T Laboratories — Research
- Stuart Russell, University of California at Berkeley

The 1997 Fellows Recognition Dinner will be held Monday, July 28, from 7:00 - 10:30 PM in the Narragansett Ballroom, ground floor, Westin Hotel. A reception will begin at 7:00 PM, followed by dinner at 7:30 PM. (By invitation only).

Fredkin Prize Presentation and Chess Panel

The presentation of the $100,000 Fredkin Prize to the members of the IBM Deep Blue team, in recognition of the computer’s victory over Kasparov earlier this year, will be held on Tuesday, July 29 at 4:30 PM in Ballroom A of the Rhode Island Convention Center. Feng H. Hsu, Murray Campbell, and A. Joseph Hoane, Jr. will split the prize. The Fredkin Prize was originally established at Carnegie Mellon University seventeen years ago by Massachusetts Institute of Technology Computer Science Professor Edward Fredkin to encourage continued research progress in computer chess. The prize is three-tiered. The first award of $5,000 was given to two scientists from Bell Laboratories who in 1981 developed the first chess machine to achieve master status. The intermediate prize of $10,000 for the first chess machine to reach international master status was awarded in 1988 to five Carnegie Mellon graduate students who built Deep Thought, the precursor to Deep Blue, at the university. The $100,000 third tier of the prize is being awarded to the first computer chess machine that beat the world chess champion.

The members of the Deep Blue team will also be honored for their achievement with the Allen Newell Research Excellence Medal, sponsored by Carnegie Mellon University. Allen Newell Medals will also be presented to each of the major researchers in the field whose earlier contributions ultimately led to the success of Deep Blue. These individuals include Richard Greenblatt (MacHack VI); David J. Slate and Lawrence R. Atkin (CHESS 4.7); Ken Thompson and Joe Conrad (Belle); Hans Berliner, Carl Ebeling, Gordon Goetsch and Murray Campbell (Hitech); and Feng H. Hsu, Murray Campbell, Thomas A. Natharaman, Andreas Novotny, and Mike Browne (Deep Thought).

A special Chess Panel will be held immediately following the awards ceremony from 5:00 - 6:00 PM. The panel members will consist of one member of each research team, and will concentrate on the following issues:

- What were the major contributions to progress that the team made?
- What was the motivation for doing this in the first place?
- What were the major milestones in computer chess and who achieved them?
- What, if anything, do they see left to do in computer chess?

AAAI-97 Opening Reception

The AAAI-97 Opening Reception will be held in Exhibit Hall C/D, Rhode Island Convention Center on Tuesday, July 29 from 6:00 - 7:00 PM. Attendees will have an opportunity to view the exhibits and perhaps challenge one of the computer players of a variety of classic games of strategy in the Hall of Champions. The AAAI-97 Student Abstract Poster Session will be held simultaneously, as will the poster session for the AAAI-97 / SIGART Doctoral Consortium. A variety of hors d’oeuvres, some served by robots from the Sixth Annual Mobile Robot Competition, and a no-host bar will be available. Admission to the reception is included in the AAAI-97 technical registration. A $20.00 per person fee will be charged for guests, spouses, and children. Guest tickets are available in onsite registration.
AAAI-97 Program Committee Dinner

AAAI-97 Program Committee Dinner will be held Wednesday, July 30, from 7:00 - 10:30 pm in the Narragansett A Ballroom, ground floor, Westin Hotel to honor the contributions of all the members of the AAAI-97 and IAAI-97 Program Committees. (By invitation only.)

AAAI-97 Student Abstract Poster Program

Students whose abstracts were chosen for inclusion in the AAAI-97 Conference Proceedings will display their work at the Student Abstract Poster Session in Exhibit Hall C / D, Rhode Island Convention Center on Tuesday, July 29 from 6:00 - 7:00 pm in conjunction with the AAAI-97 Opening Reception. In addition, participants in the AAAI / SIGART Doctoral Consortium will display their poster presentations during this session. All students will be available for questions.

AAAI / SIGART Doctoral Consortium (DC-97)

The AAAI / SIGART Doctoral Consortium program will be held Monday, July 28 from 8:30 am - 6:00 pm in Room 552A, Rhode Island Convention Center. This small, focused gathering will allow selected students to present their work to a faculty panel, who will provide feedback on participants’ current research and guidance on future research directions. All participants in the AAAI-97 Student Abstract and Poster Program are invited to attend these panel discussions. AAAI gratefully acknowledges a grant from the National Science Foundation for student travel to this event.

Special Meetings

AAAI Annual Business Meeting

The Annual Business Meeting will be held Thursday, July 31, from 11:45 am - 12:15 pm in the Providence Room I / II, Westin Hotel.
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Tutorial Forum

Tutorial forum registration includes admission to up to four tutorials and the corresponding four tutorial syllabi. A maximum of four consecutive tutorials may be taken due to parallel schedules. Tutorial attendees may redeem their tutorial syllabi tickets at the tutorial rooms. Attendees who wish to obtain syllabi from other tutorials may purchase them separately for $15.00 per syllabus in onsite registration.

Session I: Sunday, July 27

9:00 am - 1:00 pm

SA 1: Belief Networks and Decision-Theoretic Reasoning for Artificial Intelligence
Daphne Koller and Jack Breese
Room 555A, Rhode Island Convention Center

SA 2: Evolutionary Computation and Artificial Life
Melanie Mitchell and John Batali
Narragansett A, Westin Hotel

SA 3: Agent Development in Soar
John Laird, Clare Congdon, and Randolph Jones
(Please note: This is a full-day tutorial.)
Room 556B, Rhode Island Convention Center

SA 4: Data Mining
Usama Fayyad and Evangelos Simoudis
Narragansett B, Westin Hotel

Session II: Sunday, July 27

2:00 - 6:00 pm

SP 1: Reinforcement Learning
Leslie Pack Kaelbling and Richard S. Sutton
Room 555A, Rhode Island Convention Center

SP 2: Model-Based Autonomous Systems
Brian Williams and Pandurang Nayak
Narragansett A, Westin Hotel

SP 3: Modeling with Defaults: Causal and Temporal Reasoning
Hector Geffner
Narragansett C, Westin Hotel

SP 4: Principles of Ontological Engineering
Michael Gruninger and Mike Uschold
Narragansett B, Westin Hotel

Session III: Monday, July 28

9:00 am - 1:00 pm

MA 1: Topics in the Theory of the Practice of Machine Learning
Michael Kearns
Room 555A, Rhode Island Convention Center
MA2: Genetic Programming
Astro Teller and David Andre
Narragansett B, Westin Hotel

MA3: The Database Perspective on Knowledge Representation and Information Integration
Alon Levy and Jeffrey D. Ullman
Providence I-II, Westin Hotel

MA4: Physics-Based Modeling for Vision and Virtual Human Animation
Dimitris Metaxas and Norman Badler
Providence III-IV, Westin Hotel

Session IV: Monday, July 28

2:00 – 6:00 pm

MP1: Compute-Intensive Methods in Artificial Intelligence
Henry Kautz and Bart Selman
Room 555A, Rhode Island Convention Center

MP2: Computer Vision
Daniel Huttenlocher and Todd Cass
Narragansett B, Westin Hotel

MP3: Practical Planning
Steve Chien and Brian Drabble
Providence I-II, Westin Hotel

MP4: Mobile Robot Control Architectures
R. James Firby and Reid G. Simmons
Providence III-IV, Westin Hotel

Robot Building Lab

The Robot Building Laboratory will be held Sunday and Monday, July 27 – 28, in Ballroom D-E of the Rhode Island Convention Center. Preregistration is required. Participants will spend the day learning about how AI can (and can't) be integrated into the world of mobile robots. Most of the day will be hands-on: building and programming small mobile robots to do a variety of tasks. Functional mechanical modules will be available from the start of the program. Participants will be able to spend their time designing and programming the robot, with only a bare minimum of LEGO-hacking to get their robots to move reliably. The lab will begin with a brief tutorial on sensors, effectors and robot capabilities to get everyone up to speed, followed by the actual robot building. Throughout the day there will be a series of short tutorials, both for individual teams and for the group as a whole, on particular aspects of robot building and programming. On Monday, July 28, all the robots will be displayed in the arena to show off their special capabilities and to compete head to head in a contest of speed and intelligence. This exhibition will be open to all of the conference attendees. The lab is being organized and taught by the KISS Institute for Practical Robotics (KIPR) for AAAI. Instructors and assistants are from KIPR's trained staff. David Miller is the lead instructor.
Workshop Program

Attendance at the workshops is limited, and participation is by invitation only. All workshop participants must register for the AAAI-97 technical program or pay a $150.00 fee per workshop. Registration onsite for a workshop is possible with the prior permission of the corresponding workshop organizer. All workshops will begin at 8:30 am and conclude at 6:00 pm, unless otherwise noted below.

Sunday, July 27

W2: AI and Knowledge Management
Organizer: Bradley Whitehall
Room 552A, Rhode Island Convention Center

W3: AI Approaches to Fraud Detection and Risk Management
Organizer: Tom Fawcett
8:30 am - 5:45 pm
Room 552B, Rhode Island Convention Center

W4: Building Resource-Bounded Reasoning Systems
Organizer: Shlomo Zilberstein
Room 555B, Rhode Island Convention Center

W5: Constraints and Agents
Organizer: Eugene C. Freuder
Room 556A, Rhode Island Convention Center

W7: Language and Space (two-day workshop)
Organizer: Patrick Olivier
Room 554, Rhode Island Convention Center

W13: Verification & Validation of Knowledge-Based Systems
Organizer: Robert Plant
8:45 am - 4:15 pm
Room 558, Rhode Island Convention Center

Monday, July 28

W1: Abstraction, Decisions, and Uncertainty
Organizer: Christopher Geib
Room 558, Rhode Island Convention Center

W6: Deep Blue Versus Kasparov: The Significance for Artificial Intelligence
Organizer: Robert Morris
Room 552B, Rhode Island Convention Center

W7: Language and Space (two-day workshop)
Organizer: Patrick Olivier
Room 554, Rhode Island Convention Center

W8: Multiagent Learning
Organizer: Sandip Sen
8:30 am - 5:50 pm
Room 555B, Rhode Island Convention Center

W9: On-Line Search
Organizer: Sven Koenig
Room 556A, Rhode Island Convention Center
W10: Robots, Softbots, Immobots: Theories of Action, Planning and Control
Organizer: Chitta Baral
Room 556B, Rhode Island Convention Center

W11: Spatial and Temporal Reasoning
Organizer: Frank D. Anger
Room State Suite A, Biltmore Hotel

W12: Using AI in Electronic Commerce, Virtual Organizations and Enterprise Knowledge Management to Reengineer the Corporation
Organizer: Daniel E. O'Leary
Room State Suite B, Biltmore Hotel

AAAI-97 / IAAI-97 Invited Talks

All AAAI-97 invited presentations will be held in Ballroom A, fifth level, Rhode Island Convention Center. IAAI-97 invited presentations will be held in Room Narragansett C, Westin Hotel. The presentations are listed chronologically below.

Monday, July 28

5:40 – 6:40 pm  Joint AAAI-97 / IAAI-97 Invited Talk: Recent Advances in Knowledge Discovery in Databases (KDD)
Padhraic Smyth, University of California, Irvine
Room Narragansett C, Westin Hotel

KDD is currently a “hot” topic for a very practical reason: performance improvements and reduced costs in data acquisition, transmission and storage have transformed how organizations and individuals collect and manage data. From the local grocery store to the NASA spacecraft monitoring the surface of Mars, collecting massive amounts of data is now routine. KDD consists of methods and algorithms for finding structure in such data, with a particular focus on “massive data sets.” Not surprisingly, much of the current interest in KDD is applications-driven. Smyth will provide a brief history of KDD, review the basic technical ideas in the field (largely from AI, statistics, and databases), discuss current and emerging applications, outline recent research advances, and identify future challenges. A key component of this talk will be a discussion of the current and potential future role of AI in this area. In particular, Smyth will argue that there are several open research challenges in KDD where AI can play a significant role.

Tuesday, July 29

9:00 – 10:00 am  Keynote Address: AI Growing Up: The Changes and Opportunities
James F. Allen, University of Rochester

If we draw an analogy between the development of AI and the stages of human development, Allen would argue that AI research so far has been a varied and exploratory childhood—with false starts, great leaps of faith, no clearly defined goals, and even some antisocial behavior. Yet, like most people, we have somehow survived and have learned some of the basic facts of life. But we are now moving onto adolescence, where we must learn much of our self-discipline and acquire a set of life-long habits. The reason that Allen thinks we are at this profound transition point is that it is now possible to build simple intelligent artifacts, from simple robots, to reasoning systems...
that analyze and predict phenomena, to simple natural language dialog systems. The presence of such artifacts will enable us, in fact require us, to develop a new paradigm of research that combines theoretical work with a significant empirical component. Allen will draw from his own and other's work in natural language, especially work aimed at defining conversationally proficient intelligent agents, to illustrate why we are at such a critical point. He'll then lay out some choices we have to make and explore what he believes are our excellent prospects for the future.

10:30 - 11:30 am Invited Talk: The A scent of Soar
Paul S. Rosenbloom, USC / Information Sciences Institute; John Laird, University of Michigan; and Jill Lehman, Carnegie Mellon University

For the past fifteen years, Soar has been evolving from its origins as a problem solving agent towards the grand challenge of a humanlike intelligent agent. In this talk, Rosenbloom reflects on this past history, describes Soar's present form, and speculates on the future path towards humanlike intelligent agents.

10:30 - 11:30 am IAAI-97 Invited Talk: Taming the Jabberwock
Alexa T. McCray, National Library of Medicine

Room Narragansett C, Westin Hotel

Making sense of language may be seen as the essential issue in information retrieval (IR). Mediating between the language of users and the language of the databases they attempt to access is a thorny problem and continues to be the principal research agenda for many IR researchers. McCray will outline some of the approaches taken in research at the National Library of Medicine. The work on the Unified Medical Language System (UMLS) project has resulted in very large knowledge sources that may be effectively used to test a number of hypotheses about the appropriate role of both linguistic and domain knowledge in information retrieval systems. The knowledge sources include the Metathesaurus, a structure that integrates more than thirty biomedical thesauri and which contains more than 300,000 concepts, a semantic network of some 130 high level semantic categories with over 50 relationships, a lexicon of 100,000 entries containing morphosyntactic information, and a set of morphological analysis programs and databases. McCray and colleagues are currently testing the UMLS knowledge sources in the context of a project that is developing and evaluating automated techniques for indexing the biomedical literature.

11:40 am - 12:40 pm Invited Talk: What Does KR Have to Say to AI?
David Etherington, CIRL / University of Oregon

In recent years, knowledge representation (KR) has become more and more of a discipline unto itself, focusing on artificial problems while other areas of AI have tended to develop their own representations and algorithms. Etherington will consider what traditional KR has to offer to AI.

2:00 - 3:00 pm Invited Talk: The AAAI-97 Mobile Robot Competition: Martians, Remotes, Hors d'Oeuvres, and Cleaning up the Mess Afterwards
Ronald C. Arkin, Georgia Institute of Technology and R. James Firby, University of Chicago

This year's competition, the sixth annual held at AAAI, continues to expand upon the legacy of those which preceded it. In this talk we first review the event's history and goals. This year, however, marks a significant departure from the past. Arkin and Firby survey the four different events which make up this year's competition (find life on Mars, find the remote
control, home vacuuming, and hors d’oeuvres anyone?). Their significance to the AI and robotics communities lies along several lines: addressing opportunities in the exploration of Mars that are inspired by NASA’s recent launch of the Pathfinder mission and its Sojourner robot, coupled with the teasing scientific possibility of life on that planet; developing assistive robotic technology for the disabled; mainstreaming service robot applications; and heightening human-robot interaction by having robots serve food to the AAAI conference attendees at this year’s conference reception. This talk aspires to provide the research and intellectual backdrop that highlights the various aspects of AI, robotics, and computer vision which are challenged by each event, and to describe which specific research approaches are being used by the various competitors, that you may have only read about but not actually seen in action.

3:10 – 4:10 pm Invited Talk: Machine Learning for Intelligent Systems
Pat Langley, Daimler-Benz Research and Technology Center and Institute for the Study of Learning and Expertise

Recent research in machine learning has focused on supervised induction for simple classification or prediction and, in the process, has become disconnected from AI’s original goal of creating complete intelligent agents. Langley reviews recent work on machine learning for planning, natural language, and related topics that runs counter to this trend and thus holds interest for the AI research community at large.

4:30 – 5:00 pm Fredkin Prize and Allen Newell Research Excellence Medals Presentation: Deep Blue Team and Chess Pioneers
(Please see description under Special Events on page 3.)

5:00 – 6:00 pm Chess Panel: Deep Blue Team and Chess Pioneers
Organizers: Raj Reddy and Hans Berliner, Carnegie Mellon University

Wednesday, July 30

9:00 – 10:00 am AAAI-97 / IAAI-97 Joint Invited Talk: The Emergence of Spacecraft Autonomy
Richard J. Doyle, Jet Propulsion Laboratory

The challenge of space flight in NASA’s future is to enable more frequent and more intensive space exploration missions at lower cost. Nowhere is this challenge more acute than among the planetary exploration missions which JPL conducts for NASA. The launching of a new era of solar system exploration — beyond reconnaissance — is being designed for the first time around the concept of sustained intelligent presence on the space platforms themselves. Artificial intelligence, spacecraft engineering, mission design, software engineering and systems engineering all have a role to play in this vision, and all are being integrated in new work on spacecraft autonomy.

10:30 – 11:30 am Invited Talk: Resource-Bounded Language Processing
Fernando Pereira, AT&T Bell Labs

Much of natural-language processing research in the past thirty years assumed a ready supply of general and linguistic knowledge, and limitless computational resources to use it in understanding and producing language. However, in practice accurate knowledge is hard to acquire and computational power is limited. Trying to keep within that resource budget, approximate, often statistical, knowledge sources and less profligate,
often finite-state, processing models have been developed and applied with remarkable success to problems such as speech recognition, parsing and translation. Furthermore, the new approaches have close connections with recent developments elsewhere in AI.

11:40 a.m - 12:40 p.m Invited Panel: Computer Game Players: What They Mean for Society and for Science
Organizer: Matthew L. Ginsberg, CIRL / University of Oregon

Computer game players have come of age, exhibiting world class performance in many — if not yet quite all — games of strategy. Panelists will focus on the lessons to be drawn from these successes: How can the rest of AI duplicate the successes of the game players? Is the fact that humans are being displaced as the world's best game players an anomaly, or a harbinger of things to come? The panelists will be drawn from the participants in the Hall of Champions, and will include both program authors and human champions.

2:00 – 3:00 pm Invited Talk: Embodied Intelligent Agents: Issues and Trends in Robotics
George Bekey, University of Southern California

Bekey surveys some of the changes in robotics during the past 20 years, from simple industrial manipulators to autonomous intelligent agents, with an emphasis on the role of AI. Included are developments in robot control, learning, locomotion and group behavior, and current trends such as miniaturization, humanoids, robot colonies and human-robot interaction.

3:10 – 4:10 pm Invited Talk: Performance Models for Dialogue Agents
Marilyn Walker, ATT Laboratories

Recent advances in dialogue modeling and spoken language processing have made it possible to build spoken dialogue agents for many tasks. However, one obstacle to progress in spoken dialogue is the lack of a general performance model for comparing agent strategies. Walker discusses recent empirical studies whose goal is to develop and test such a performance model.

3:10 – 4:10 pm IAAI-97 Invited Talk: Artificial Intelligence and Education
Jack Mostow, Carnegie Mellon University
Room Narragansett C, Westin Hotel

Attempts to apply artificial intelligence to education date back at least three decades. Mostow considers: What AI techniques are applicable to education? What breakthroughs have happened recently to make AI applications feasible in education? What educational applications of AI are starting to appear? What are some remaining technical and institutional roadblocks to widespread use of AI in education? What can and should the AI community do to overcome these barriers?

4:30 – 6:00 pm Invited Talk: Advances in Uncertain Reasoning
Eric Horvitz, Microsoft Research

For thirteen years, the Conference on Uncertainty and Artificial Intelligence (UAI) has been a central meeting for researchers from computer science, decision science, operations research, statistics, and psychology with interest in developing computational methods for grappling effectively with inescapable uncertainties in the real world. Horvitz discusses recent advances in uncertain reasoning, highlighting key developments in representation, inference, and learning.
Ever since a series of Fortune magazine articles on the value of intellectual capital, the issue of managing knowledge as a corporate asset has become a hot topic within business circles. Today's business proponents of knowledge management believe that they are on the cutting edge of something new. Meanwhile, AI researchers have been addressing issues of managing knowledge for some time. Today, these two groups are largely unaware of each other, and each is working separately on how to address issues in knowledge management. This panel will bring the two communities together for the first time and address ways that ideas derived from AI can contribute to the field of knowledge management.

Thursday, July 31

9:00 – 10:00 am Invited Talk: James Bond and Mike Ovitz: The Secret Life of Agents
Katia P. Sycara, Carnegie Mellon University

As agents populate cyberspace in their many guises and roles, they coordinate and interact in different ways, spanning self-interested, as well as collaborative interactions. Agent coordination should be supported by an agent's internal architecture and agent societal frameworks. Sycara takes a micro-economic view of coordination, and reports on work on adaptive agent architecture and the primitive agent behaviors it supports, agent organizations, contracting protocols among agents and presence of middle agents.

10:30 – 11:30 am Invited Talk: Market-Oriented Programming
Mike Wellman, University of Michigan

Market-oriented programming is the construction of computational economies, where agents interact through a price system. Markets can provide effective allocation of resources for a variety of distributed environments, and economic analysis a powerful design tool for interaction mechanisms. The spread of electronic commerce puts a premium on market-aware agents, and presents a case for market awareness on the part of agent developers and AI researchers as well.

1:00 – 2:00 pm Invited Talk: Preaching What We Practice: How AI is Changing the Concept of Computation
Lynn Andrea Stein, Massachusetts Institute of Technology

AI is transforming computer science, replacing notions of computation as calculation with computation as interaction, shifting focus from algorithmic I/O to sustained behavior patterns. Yet the pedagogy remains virtually unchanged. Stein will describe a radical introduction to computer science that teaches students this model from the outset.

2:10 – 3:10 pm Invited Panel: Prospects, Trends and Issues in Government Support of AI: Views of the Funding Agencies
Organizer: Mel Montemerlo, NASA
Innovative Applications of Artificial Intelligence (IAAI-97)

All IAAI-97 sessions will be held in the Narragansett Ballroom B or C of the Westin Hotel. Monday's schedule of award-winning deployed papers is listed below. The emerging applications papers will be presented in parallel with the A A A I-97 technical program on Tuesday, July 29 and Wednesday, July 30. Please refer to the daily schedule on the following pages for times.

Monday, July 28

(IAAI-97 Award-Winners: Narragansett Ballroom C)

9:00 - 10:00 am  **Session 1: IAAI-97: Introduction / Scheduling I**

- Opening Remarks
  - Ted Senator, IAAI-97 Conference Chair
- CREWS_NS: Scheduling Train Crew in The Netherlands
  - Ernesto M. Morgado and João P. Martins

10:00 - 10:30 am  **Coffee Break**

10:30 - 11:30 am  **Session 2: IAAI-97: Scheduling II**

- The Scheduling of Rail at Union Pacific Railroad
  - Kathleen Murphy, Elizabeth Ralston, David Friedlander, Rodney Swab and Paul Steege
- SunRay V — An Intelligent Container Trucking Operations Management and Control System
  - Ina Ng, Andrew Gill, Ian Chia, Mei-Leng Koh, Christopher Yeung and Lih-Wee Chew

11:40 am - 12:40 pm  **Session 3: IAAI-97: Planning / Layout**

- Case and Constraint Based Apartment Construction Project Planning System: FASTrak-APT
  - Kyoung Jun Lee, Hyun Woo Kim, Jae Kyu Lee, Tae Hwan Kim, Chang G on Kim, M young K yun Yoon, Eui Jun H wang and H yun Jeong Park
- STHANA: Profitability Forecast and Situation Analysis for Automated Teller Machines
  - Cyril Way

12:40 - 2:00 pm  **Lunch Break**

2:00 - 3:00 pm  **Session 4: IAAI-97: Regulatory Compliance / Eligibility Determination I**

- ChemReg: Using Case-Based Reasoning to Support Health and Safety Compliance in the Chemical Industry
  - Kirk D. Wilson
- DISXPERT: A Social Security Disability Screening Expert System
  - James R. Nolan
3:10 – 4:10 pm  
**Session 5: IAAI-97: Regulatory Compliance / Eligibility Determination II**

Desktop Underwriter: Fannie Mae’s Automated Mortgage Underwriting ExpertSystem  
David W. McDonald, Charles O. Pepe, Henry M. Bowers and Edward J. Dombroski

PST: The Provider Selection Tool  
Howard Marmorstein, Jayesh Ghia, Sandeep Sathaye, Akshay Gupta and Eva Baron-Vartian

4:10 – 4:30 pm  
Coffee Break

4:30 – 5:30 pm  
**Session 6: IAAI-97: Computer Diagnosis**

PIMTOOL, An Expert System to Troubleshoot Computer Hardware Failures  
Narendra Dev and Bart Anderson

Design of High Performance Help Desk Application and Its Implementation Results  
Charles S. Moon, Thomas A. Shore, Gary Brophy and Dennis Koski

5:40 – 6:40 pm  
**AAAI-97 / IAAI-97 Joint Invited Talk**  
Recent Advances in Knowledge Discovery in Databases (KDD)  
Padhraic Smyth, University of California, Irvine
Welcome, Opening Remarks, and AAAI-97 Best Paper Awards
Benjamin J. Kuipers and Bonnie Webber, AAAI-97 Program Cochair

Keynote Address
AI Growing Up: The Changes and Opportunities
James F. A llen, University of Rochester

Session 7
Planning Under Uncertainty
Chair: Nevin Lianwen Zhang
A Heuristic Variable Grid Solution Method for POMDPs by Ronen I. Brafman
Incremental Methods for Computing Bounds in Partially Observable Markov Decision Processes by Milos Hauskrecht

Session 8
Qualitative Reasoning
Chair: Gautam Biswas
Model Decomposition and Simulation: A Component Based Qualitative Simulation Algorithm by Daniel J. Clancy and Benjamin Kuipers
Static and Dynamic Abstraction Solves the Problem of Chatter in Qualitative Simulation by Daniel J. Clancy and Benjamin Kuipers

Session 9
Description Logics
Chair: Mark Johnson
Representing Sequences in Description Logics by Haym Hirsh and Daniel Kudenko
P-CLASSIC: A Tractable Probabilistic Description Logic by Daphne Koller, Alon Levy and Avi Pfeffer

Session 10
Constraint Satisfaction Problems: Symmetry
Chair: Tom Ellman
Exploiting Symmetry in Lifted CSPs by David E. Joslin and A misha Ray
Interchangeability Supports Abstraction and Reformulation for Multi-Dimensional Constraint Satisfaction by Eugene C. Freuder and Daniel Sabino

Session 11
IAAI-97 Invited Talk
Taming the Jabberwock
Alexa T. McCray, National Library of Medicine

Session 12
Classification
Symbolic Nearest Mean Classifiers by Piew Datta and Dennis Kibler
Classification and Reductio-ad-Absurdum Optimality Proofs by Haim Schweitzer

Session 13
Automated Reasoning/Diagnosis
Chair: Jeff Ricket
Fast Context Switching in Real-Time Propositional Reasoning by P. Pandurang Nayak and Brian C. Williams
Representing Actions and State Constraints in Model-Based Diagnosis by Sheila A. McIlraith

Session 14
Multi-Agent Systems
Chair: Jack J. Gelfand
Using Communication to Reduce Locality in Multi-Robot Learning by Maja J. Mataric
Interference as a Tool for Designing and Evaluating Multi-Robot Controllers by Dani Goldberg and Maja J. Mataric

Session 15
IAAI-97: Information Extraction I
Information Extraction Based Multiple-Category Document Classification for the Global Library Information Network by Richard D. Donald and Dennis Kibler
Smooky: Automatic Recognition of Hostile Messages by Ellen Spertus

Session 16
IAAI-97: Complex Systems Design I
An Intelligent Control Architecture for Accelerator Beamline Tuning by William B. Klein, Carl R. Stern, George F. Luger and Erik T. Olson
MultiADD: A Multisensor Active Design Document Model to Support Group Design by Adriana Santarosa Vlaicu and Ana Cristina Bicharra Garcia

Welcome, Opening Remarks, and AAAI-97 Best Paper Awards
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Smooky: Automatic Recognition of Hostile Messages by Ellen Spertus
### Tuesday, July 29

#### 2:00 - 3:00 PM
**Invited Talk**
The AAI-97 Mobile Robot Competition: Martians, Remotes, Hors d’Oeuvres, and Cleaning up the Mess Afterwards
Ronald C. Akin, Georgia Institute of Technology and R. James Firby, University of Chicago

#### 3:10 - 4:10 PM
**Invited Talk**
Machine Learning for Intelligent Systems
Pat Langley, Daimler-Benz Research and Technology Center and Institute for the Study of Learning and Expertise

#### 4:30 - 6:00 PM
**Session 20**
IAAI-97: Military I
Intelligent Agents for the Synthetic Battlefield: A Company of rotaryWing Aircraft by Randall W. Hill, Jr., Johnny Chen, Jonathan Gratch, Paul Rosenbloom and Mihild Tambe
A Hybrid Architecture for Real-Time Mixed-Initiative Planning and Control by Steven W. M Ischell

**Session 26**
IAAI-97: Design II
Intelligent Command Control for VLSI CAD Systems by M. otsuhide Usubo, Satoru Fujita and Toru Yamanouchi
Blackboard Agents for Mixed-Initiative Management of Integrated Process-Planning/Production-Scheduling Solutions across the Supply Chain by David W. Hilden, Norman M. Sadah, Thomas J. Laiberty, John M. C. Nulty, Stephen F. Smith, and Doug Kienastad

#### Session 19
Text Retrieval and Learning
Chair: Robert Holte
Transferring and Retraining Learned Information Filters by William W. Cohen and Daniel Kudenko
A Clive Learning with Committees for Text Categorization by Ray Liere and Prasad Tadepalli

#### Session 23
Agent Architecture
Chair: James Lester
Modeling Emotions and Other Motivations in Synthetic Agents by Juan D. Velasquez
If at First You Don’t Succeed... by Kentaro Toyama and Gregory D. Hage

#### Session 24
Knowledge Representation: Ontologies
Chair: Nancy Lehrer
Efficient Management of Very Large Ontologies by Kilian Stoffel, M erwyn Taylor and Jim Hendler
Tools for Assembling Modular Ontologies in Ontolingua by Richard Fikes, Adam Farquhar, and Jim Hendler

#### Session 25
IAAI-97: Military II
Multimodal Interaction for Distributed Interactive Simulation by Philip H. Cohen, M. Ichael Johnson, David M. Coope, Sharon Oviatt, Jay Pittmann, Ira Smith, Liang Chen and Josh Low
Rationale-Supported Mixed-Initiative Case-Based Planning by M. arueela M. Veleso, A lice M., M. ulvehil and M. Ichael T. C ox

#### Session 27
Spatial Uncertainty
Noise, Non-Determinism and Spatial Uncertainty by M uray P. Shanahan
Integrating a Spatial Reasoner with a Computational Model, Application, and Psychological Evaluation by Constanze Vorwerk, G udeman Socher, Thomas Fa hur, Gerhard Sagerer and Gert Richrhein

#### Session 29
Model Selection and O verfitting
Chair: Wayne Iba
An Empirical Evaluation of Bagging and Boosting by Richard M. acin and David O. ptz
A New Metric-Based Approach to Model Selection by Dale E. Schuurmans
Lessons in Neural Network Training: Overfitting May Be Harder Than Expected by Steve Lawrence, C. Lee Giles and Ah Chung Tsoi

### Tuesday, July 29

#### 4:10 - 4:30 Coffee Break

#### 4:30 - 6:00 PM
**Session 28**
Plan Generation
Chair: Karen L. Myers
Planning by Rewriting: Efficiently Generating High-Quality Plans by José Luis A. mbite and C raj A. K nooklock
Planning with Concurrent Interacting Actions by Craig Boutilier and Ronen T. Braffman
A Robust and Fast Automatic Selection Mechanism for Planning by Biai Bonet, G abor Lovrics, and Hector G effiner

**Session 30**
Structure of Constraint Satisfaction Problems
Chair: Bart Selman
Clustering at the Phase Transition by Andrew J. Parkes
Exploiting the Deep Structure of Constraint Satisfaction Problems with Quantum Computers by Tad Hoff
Summarizing CSP Hardness... by Daniel Frost, Irina Rish, and Lluís Vi a
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<th>Ballroom A</th>
<th>Narragansett B</th>
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<tr>
<td>9:00 – 10:00 AM</td>
<td><strong>AAAI-97 / IAAI-97 Joint Invited Talk</strong>&lt;br&gt;The Emergence of Spacecraft Autonomy&lt;br&gt;Richard J. Doyle, Jet Propulsion Laboratory</td>
<td><strong>Session 31</strong>&lt;br&gt;Problem Solving &amp; Computational Resources&lt;br&gt;Chair: Stephen F. Smith&lt;br&gt;Complex Goal Criteria and Its Application in Design-to-Criteria Scheduling by Thomas Wagner, Alan Garvey and Victor Lesser&lt;br&gt;Models of Continual Computation by Eric J. Horvitz</td>
<td><strong>Session 32</strong>&lt;br&gt;Belief and Decision&lt;br&gt;Chair: Adam Grove&lt;br&gt;Possibilistic and Standard Probabilistic Semantics of Conditional Knowledge by Salem Benferhat, Dider Dubois and Henri Prade&lt;br&gt;On the Axiomatization of Qualitative Decision Criteria by Ronen I. Brafman and Moshe Tennenholtz</td>
<td><strong>Session 33</strong> Information Retrieval&lt;br&gt;Chair: Jon Levy&lt;br&gt;Query Optimization Using Local Completeness by Omer I. M. Dusza and Rasit</td>
<td><strong>Session 34</strong> Computational Systems for Education&lt;br&gt;Chair: Michelle Kim&lt;br&gt;The Sounds of Silence ... by Jack Mostow and Gregory S. A. S.</td>
<td><strong>Session 35</strong> Information Retrieval&lt;br&gt;Chair: Jonathan Schaeffer&lt;br&gt;Generating C.4.5 Production Rules in Parallel by Richard Kuffin&lt;br&gt;Maximizing the Benefits of Parallel Search&lt;br&gt;Using Machine Learning by Diana J. Cook and R. Craig Varnell</td>
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<td>Time</td>
<td>Session 48: Modeling for Decision Processes</td>
<td>Session 50: Negotiation</td>
<td>Session 56: Constraint Satisfaction Techniques</td>
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<td>Structured Solution Methods for Non-Markovian Decision Processes</td>
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<td>by Fahiem Bacchus, Craig Boutilier and Adam Grove</td>
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<td>Model Minimization in Markov Decision Processes by Thomas Dean and Robert Givan</td>
<td>Negotiation on Data Allocation in Multi-Agent Environments by Rina Schwartz and Sarit Kraus</td>
<td>Detecting Unsatisfiable CSPs by Coloring the Micro-Structure by Daya Ram Gaur, W. K. en Jackson and William S. Haveres</td>
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<td>A Trainable Message Understanding System by Amit Bagga, Joyce Yue Chai and Alan W. Biermann</td>
<td>A Color Interest Operator … by Zachary Dodds and Gregory D. Hager</td>
<td>Using Branch-and-Bound with Constraint Satisfaction in Optimization Problems by Stephen Barel</td>
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**Session 49: IAAI-97: Information Extraction II**

**MITTA: An Information Extraction Approach to A nalysis of Free-Form Text in Life Insurance Applications** by Barry Gilpin, Alan M. Fannell, Dan Binney, Lila G. Gherzi and David Fisher

**The Role of Words in the Creation of a Trainable Message Understanding System** by Amit Bagga, Joyce Yue Chai and Alan W. Biermann

**Session 54: IAAI-97 Invited Talk**

**Artificial Intelligence and Education** by Jack M. Ostow, Carnegie Mellon University

**Session 55: Navigation & Perception**

**Spatial Navigation With Uncertainty** by Michael E. B. Stojanov and Christoph Schlieder

**A Color Interest Operator … by Zachary Dodds and Gregory D. Hager**

**Session 57: Language and Learning**

**Statistical Parsing with a Context-Free Grammar and Word Statistics** by Eugene Charniak

**A New Supervised Learning Algorithm for Word Sense Disambiguation** by Ted D. Pedersen and Rebecca F. Bruce

**Session 59: IAAI-97: Knowledge Management/Invited Panel**

**A Genetic Knowledge-Based Browser and Editor** by Suzanne M. Paley, John D. Lowrance and Peter D. Karp

**IAAI-97 Invited Panel**

**Knowledge Management: How Can AI Contribute to this Field?**

**Moderator:** Neena Buck, Common Knowledge
9:00 AM – 10:00 AM

**Invited Talk**

*James Bond and Mike Ovitz: The Secret Life of Agents*
Katia P. Sycara, Carnegie Mellon University

**Session 60**

*Machine Learning (Probabilistic)*
Chair: Daphne Koller

*Intelligent Methods for File System Optimization*
by Leonid Kuvayev, C. L. Giles, James F. Philbin and Henry Cetin

*Learning Bayesian Networks from Incomplete Data*
by Moninder Singh

**Session 61**

*Optimal Planning*
Chair: Dana Nau

*A Linear Programming Heuristic for Optimal Planning*
by Tom Bylander

*Finding Optimal Solutions to Rubik’s Cube Using Pattern Databases*
by Richard E. Korf

**Session 62**

*Knowledge Representation: Theorem Proving*
Chair: James Crawford

*Extending the Regular Restriction of Resolution to Non-Linear Subdeductions*
by Bruce Spencer and J. D. Horten

*Ordered Semantic Hyper Linking*
by David A. Plaisted and Yunshan Zhu

10:30 AM – 11:30 AM

**Invited Talk**

*Market-Oriented Programming*
Mike Wellman, University of Michigan

**Session 64**

*Scheduling*
Chair: Nicola Muscettola

*Stochastic Procedures for Generating Feasible Schedules*
by Angelo Oddi and Stephen F. Smith

*Effective Redundant Constraints for Online Scheduling*
by Lise Getoor, Greger Ottosson, Markus Fromherz and Björn Carlson

**Session 65**

*Reasoning about Physical Systems*
Chair: Richard Doyle

*The “Inverse Hollywood Problem:” From Video to Scripts and Storyboards via Causal Analysis*
by Matthew E. Brand

*Qualitative Rigid Body Mechanics*
by Thomas F. Stahovich, Randall Davis and Howard Shrobe

**Session 66**

*Building and Modifying Knowledge Bases*
Chair: Peter Clark

*Building Concept Representations from Reusable Components*
by Peter Clark and Bruce Porter

*A Script-Based Approach to Modifying Knowledge Bases*
by Yolanda Gil and Marcelo Tallis

**Session 67**

*Natural Language*
Chair: Candy Sidner

*Comparatives in Context*
by Steffen Staab and Udo Hahn

*A Pragmatic Treatment of Quantification in Natural Language*
by Wafid S. Saba and Jean-Pierre Corriveau
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<td>A Reflective Proof System for Reasoning in Contexts</td>
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<td>Obvious Properties of Computer Programs</td>
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<td>by Robert L. Ovian</td>
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<td>by Raul E. Valdes-Perez and Vladimir Pericliev</td>
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<td>Sparse Representations for Fast One-Shot Learning</td>
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<td>by Kenneth Yip and Gerald Jay Sussman</td>
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<td>Analogical Replay for Efficient Conditional Planning</td>
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<td>by Jim S. Blythe and Manuela M. Veloso</td>
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<td>Case-Based Similarity Assessment: Estimating Adaptability from Experience</td>
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<td>Local Search Techniques</td>
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<td>Tabu Search for SAT</td>
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<td>by Bertrand M. Azure, Lakhdar Sais and Eric G. Régnier</td>
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<td>Variable-Selection Heuristics in Local Search for SAT</td>
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<td>Knowledge Representation: Reasoning about Action II</td>
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<td>Causal Theories of Action and Change</td>
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<td>Beyond Minimizing Change</td>
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<td>Experimental Methodology</td>
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<td>C: Gerald Tesauro</td>
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<td>Presenting and Analyzing the Results of AI Experiments: Data Averaging and Data Snooping</td>
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<td>by C. Lee Giles and Steve Lawrence</td>
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<td>Techniques for Temporal Reasoning</td>
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<td>A New Unification Method for Temporal Reasoning with Constraints</td>
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<td>Connection Based Strategies for Deciding Propositional Temporal Logic</td>
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<td>by Subash Shankar and James K. Slagle</td>
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<td>by Bertrand M. Azure, Lakhdar Sais and Eric G. Régnier</td>
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<td>Variable-Selection Heuristics in Local Search for SAT</td>
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<th>Time</th>
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<td>Knowledge Representation: Reasoning about Action II</td>
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<td>Causal Theories of Action and Change</td>
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<td>Beyond Minimizing Change</td>
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<td>by Tom Costello</td>
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Exhibition

The Exhibition will be held in Exhibit Hall C/D, Rhode Island Convention Center, Tuesday, July 29 through Thursday, July 31. Admission is restricted to badged conference attendees. Vendor-issued guest passes must be redeemed at the Exhibitor Registration Counter, outside Hall D, third level, Rhode Island Convention Center. Further information regarding access to the Exhibition can be obtained from the Exhibitor Registration Desk.

Exhibit Hours

Tuesday, July 29  10:00 am – 7:00 pm
Wednesday, July 30  9:00 am – 5:00 pm
Thursday, July 31  10:00 am – 3:00 pm

Exhibitors

- AAAI Press
- AK Peters, Ltd.
- Applied Science Laboratories
- Brightware, Inc.
- Franz Inc.
- Harlequin Inc.
- Kluwer Academic Publishers
- The MIT Press
- Morgan Kaufmann Publishers
- Nomadic Technology
- PC AI Magazine
- Prentice Hall
- Real World Interface, Inc.
- Springer-Verlag
- US Department of Energy / Office of Science and Technology

Booth #11

AK Peters, Ltd.
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AK Peters continues to build upon its tradition of excellence in sci-tech publishing, rapidly expanding into the realm of robotics and artificial intelligence. Come see the antics of “Rug Warrior” created from our Expanded Mobile Robot Kit which was designed to complement the best-selling book Mobile Robots: Inspiration to Implementation by Jones and Flynn. Also featured will be the critically acclaimed Sensors for Mobile Robots by H. R. Everett, Navigating Mobile Robots by Borenstein et al., and the new Algorithms for Robotic Motion and Manipulation by Laumond and Overmars (eds).

Booth #801

Applied Science Laboratories
175 Middlesex Turnpike
Bedford, MA 01730-1428
Tel: (617) 275-4000
Fax: (617) 275-3388
Email: asl@a-s-l.com

Applied Science Laboratories (ASL) manufactures a complete line of computer-based eye movement measurement devices. Eye movement, point of gaze and pupil diameter are routinely monitored by ASL equipment. Systems can be used to analyze visual tasks by determining fixation positions, fixation durations and other scan pattern parameters. Reading studies, computer usability, and visual search strategies are some of the many uses of ASL eye tracking systems. In addition, real time point of gaze data from ASL systems can be used to enable human interaction with computer controlled devices, such as those used in the fields of robotics and virtual reality.

Booth #803

Brightware, Inc.
350 Ignacio Boulevard
Novato, CA 94949
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Fax: (415) 884-4740
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Web: www.brightware.com

Brightware technology has been used in 44

IAAI Applications. Brightware offers customer-direct application products that use AI technology to establish the two-way communication required to make the Internet a viable marketing and sales channel. Brightware application products offer the key benefit of turning “hits” into qualified leads, low-cost sales and satisfied customers. They include BrightResponse™ — an inbound telemarketing rep for the Net — (in beta) and BrightAdvisor™ — a consultative telesales rep for the Web — (in development). Brightware offers ART*Enterprise / Web for building custom applications on the Net, and ART*Enterprise® for building custom client / server solutions.

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Franz Inc. offers the most powerful dynamic object-oriented programming system available for enterprise-wide, complex application development on UNIX and Windows platforms.

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A llegro CL has been used by Fortune 500 companies and software developers worldwide for over ten years. It is a mature, robust product with proven commercial applications including high-end mechanical and electrical CAD, scheduling and process control, knowledge-based and expert systems, sophisticated telephone switching, workflow, video games and complex Web applications.

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Cambridge, MA 02142
Tel: (617) 374-2400
Fax: (617) 252-6505
Email: web@harlequin.com
Harlequin is a leading global supplier of advanced software development environments. At AAAI we will be demonstrating the latest Windows ’95™ version of our leading LispWorks™ Lisp application development environment — to our knowledge the only commercial Windows Lisp development environ-

ment that does not incur runtime royalty fees for deployed applications. Also on display will be our acclaimed Watson™ graphical database visualization product — one of the many widespread examples of successful commercial applications developed using Harlequin’s unique Lisp technology.

Booth #04
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101 Philip Drive
Norwell, MA 02061
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Check out Machine Learning Online, the electronic version of the paper journal Machine Learning! It’s available for review at mlis.wkap.nl.

Booth #101
The MIT Press
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Web: mitpress.mit.edu
Publisher of academic books and journals in artificial intelligence and computer science. Stop by our booth for information on two new series: the Adaptive Computation and Machine Learning Series edited by Tom Dietterich, and the Intelligent Robotics and Autonomous Agents Series edited by Ronald C. Arkin.

Booth #10
Morgan Kaufmann Publishers
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Web: www.mkp.com
Morgan Kaufmann has published revolutionary artificial intelligence titles since our founding in 1984. Featuring Applying Case

Booth #02

PC AI Magazine
Post Office Box 30130
Phoenix, AZ 85046
Tel: (602) 971-1869
Fax: (602) 971-2321
Email: info@pcai.com
Web: www.pcai.com/pcai/

PC AI Magazine provides the information necessary to help managers, programmers, executives, and other professionals understand the quickly unfolding realm of artificial intelligence (AI) and intelligent applications (IA). PC AI addresses the entire range of personal computers including the Mac, IBM PC, NeXT, a pollo, and more. PC AI is an application-oriented magazine designed to give readers useful "hands-on" information. PC AI features developments in expert systems, neural networks, object oriented development, and all other areas of artificial intelligence. Feature articles, product reviews, real-world application stories, and a Buyer's Guide present a wide range of topics in each issue.

Booth #00

Prentice Hall
One Lake Street
Upper Saddle River, NJ 07458
Tel: (201) 236-7283
Fax: (201) 236-7210

Prentice Hall is proud to offer an array of innovative AI titles. In particular, we will be featuring the worldwide best-seller Artificial Intelligence: A Modern Approach, by Stuart Russell and Peter Norvig. Come find out about the long-awaited revision of this market leading text.

Booth #09

Real World Interface, Inc.
32 Fitzgerald Drive
Jaffrey, NH 03452
Tel: (603) 532-6900
Fax: (603) 532-6901

Robots for the Real World! — Come see our new BeeSoft robotics applications development environment and take home a free
BeeSoft CD! BeeSoft lets you get a robot up and running in minutes with autonomous navigation, map building, features recognition, collision avoidance, sensor fusion and a simulator. Also new RWI and ActivMedia: the Pioneer gripper and Pioneer Applications Interface (PAI) software. PAI makes our low-priced robot easier to program than ever in C or Lisp subset on Linux, UNIX or Windows machines. And register to win one of fifty exceptionally cool Pioneer T-shirts we’ll be giving away at the show!

Booth #108

Springer-Verlag
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Email: custserv@springer-ny.com
Web: www.springer-ny.com

Take advantage of the exclusive 20% AAAI discount at the Springer-Verlag booth. Springer is an international publisher of cutting-edge computer science books, journals, and lecture notes. Whenever there’s an important new breakthrough in the field of computer science, chances are, Springer will publish it. Come by the booth for a selection of Springer’s latest books, including Kingdon’s Intelligent Systems and Financial Forecasting, Newborn’s Kasparov Versus Deep Blue, Yang’s Intelligent Planning, the new fourth edition of Bundy’s Artificial Intelligence Techniques, Michalewicz’s Genetic Algorithms + Data Structures = Evolution Programs, Muller’s The Design of Intelligent Agents, and Denning and Metcalfe’s Beyond Calculation: The Next Fifty Years of Computing.

Exhibition

Booth #200

U S Department of Energy / Office of Science and Technology
DOE Headquarters in Washington, DC
Tel: (202) 586-5000
Contact: Robin Stone
191 Waukegan Road, Suite 201
Northfield, Illinois 60093
Tel: (847) 784-8000
Fax: (847) 784-8010

For over 40 years, the US Department of Energy (DOE) designed, manufactured and tested nuclear weapons at its facilities across the country. Now DOE is faced with the enormous challenge of cleaning up the extensive hazardous and radioactive waste that has been left behind. Since 1989, DOE’s Office of Science and Technology (OST) has been developing new technologies to process, destroy, store, recycle, and/or reuse radioactive and hazardous waste. Safety, efficiency and cost-effectiveness are central to these efforts. Our CD-ROM presentation highlights several DOE sites and technologies.
Hall of Champions

The AAAI Hall of Champions is an exhibition of game-playing programs, focusing (though not exclusively) on those that compete at or near the human world-champion level.

The fundamental goal of the Hall of Champions is to educate the public about AI problems, methods, and successes. We want to convey the following points:

• Successful game-playing programs are a success of AI.
• Chess is only one among many successful game-playing programs.
• Some games are solved mathematically; some are not solved, but programs are better than any human; some programs are competing at the world champion level; some are approaching that level; and in some cases we are not even close.
• There are concepts from AI that help people understand why some problems are easy and some are hard: game tree, branching factor, search, evaluation, etc.

The Hall of Champions will be open during exhibit hours (see the schedule in the box below).

AAAI-97 attendees will be able to interact with these programs in a variety of ways. First, all of the programs themselves will be available during the conference and attendees will be able to compete against them. Second, many of the programs’ authors will be available to discuss both the technical issues involved in creating the programs and the social issues involved in introducing world-class computer players into tournament play. And finally, human experts will be on hand to play a series of challenge matches against the programs themselves.

The Hall of Champions includes a spectators’ area where AAAI attendees can view these matches as they progress. Admission to the Hall of Champions is included in the technical program registration fee or the on-site exhibits-only registration fee. High-school students are welcome and will be admitted without fee upon presentation of a valid high-school student ID. Children under 12 will also be admitted without fee, but must be accompanied by an adult conference registrant.

Disclaimer
This is an educational exhibition, not a competition. The programs and humans participating in the Hall of Champions are all outstanding; each participant may or may not be the human or computer champion of the game. The persons or programs currently holding championships are determined by the governing organizations of the various games. Participation in the AAAI Hall of Champions has been determined primarily by excellence of play, but also by suitability for our educational mission and by the scheduling constraints of the event.

Expert Players Schedule

Tuesday, July 29
10:00 am Backgammon—Malcolm Davis
12:30 pm Bridge—Jeff Meckstroth & Eric Rodwell
2:30 pm Checkers—Ron King

Wednesday, July 30
9:00 am Chess—Gabriel Schwartzman
11:40 am Games Panel—Organized by Matthew L. Ginsberg
Ballroom A, Rhode Island Convention Center
1:00 pm Scrabble—Adam Logan
3:00 pm Go—Janice Kim

Thursday, July 31
10:00 am Othello—Tetsuya Nakajima and David Parsons
Sixth Annual AAAI Mobile Robot Competition & Exhibition

The Robot Competition and Exhibition will be held in Exhibit Halls C & D of the Rhode Island Convention Center, and will be open to registered conference attendees during exhibit hours.

Following in a long tradition of popular mobile robot competitions, this year’s event will provide conference attendees with a first hand look at the progress in the fields of artificial intelligence and robotics. The competition will consist of four events which will focus on detecting signs of past and current life on Mars, the robot's ability to perform “fetch-it” tasks, to show the value of a robot completing a rudimentary service task, and testing the robots ability to safely serve refreshments and interact with guests.

Event 1: Find Life on Mars

Mission Objectives
This task is inspired by the Pathfinder Mission to Mars, as well as the tantalizing (albeit limited) possibility of life on Mars as depicted by a recent meteorite analysis. The robot's mission is to explore a large area of Mars, looking for signs of past and current life, and return the life-forms, and only those life-forms, to the lander for further analysis. From satellite imagery, we have some clues as to where life may exist, but it is up to the robot to make a thorough exploration before its batteries run dead.

Event Specifics
The robot will be placed in a large physically bounded area. The arena will be approximately 1000 square feet in area (either rectangular or hexagonal), with lexan walls delimiting the boundaries (assume the robot landed in a crater). The floor of the arena will be littered with a variety of small objects. The “past life-forms” will be stationary spheres and cubes, about the size and weight of tennis balls. Currently, we anticipate having three or four different colors for each shape. The “current life-forms” will be squiggle balls (they will all be the same color). The rocks will all be larger than the other objects — at this time, we expect they will be real rocks.

In about the center of the arena will be a small enclosed pen with two openings (the “lander”). The pen will be a square 1 – 2 meters in length and width, will have lexan or cardboard walls, and the openings will be about 0.5 meters wide. The openings of the pen will have small lips (~ 5 cm) to prevent the squiggle balls from escaping. The doors will be hinged at the top. One will be colored blue and the other will be red.

The robots will start adjacent to the pen. The objective is for them to collect as many of the colored objects and squiggle balls in the given time (5 – 10 minutes), and deposit them in the pen, sorted by mobility (that is, the opening of the pen with the blue door is for squiggle balls, the red door is for all the different colored objects). Penalties are given for mixing mobile and nonmobile objects in the pen, and for putting any of the rocks in the pen. Penalties are also given for colliding with any of the rocks (the Mars rover is fragile!)

Before the contest begins, hand-drawn maps will be provided showing where certain colored objects and large rocklike objects *may* be located. These maps, which are not guaranteed to be totally accurate, may be used by the robots to help them decide where to explore. Teams can enter the map information into the robots in whatever way they want.

In addition, certain areas of the arena will be “danger zones”, where travel within the zone will add penalty points. The danger zones will be marked by laying colored paper on the floor and also by marking the location within the map. If possible, we will choose a color that will enable robots with only black-and-white vision to distinguish danger zones from the exhibition hall floor.

Scoring
There will be several categories of robot entries. There will be separate categories (with separate awards) for single robot and multi-robot teams (depending on the number of entries, we may further subdivide multi-robot teams into 2 – 3 robot teams and teams of 4 or more robots). An overall winner from the single and multi-robot entries will be determined by dividing a team’s total score by the number of robots in the team.

There is also a separate category for robots without manipulators. Such entries will have to get within 6 inches of an object, indicate somehow that they have spotted the object, and indicate its classification (e.g., using speech). The robot must then pause for at least five seconds (to give humans a chance to remove the object from the arena). In addi-
tion, in the nonmanipulator category robots do not actually have to return the objects to the lander.

There will be multiple trials, with each trial running for a predetermined length (5 - 10 minutes). The intention is to structure the event so that it would be difficult for an entry to explore the whole arena in the time allotted (for example, each trial may decrease the length of the event). Points and penalties will be given as described below.

In all trials, points will be awarded for the *first* object of a given shape / color, and then a different (typically smaller, but it may be the same) number of points will be awarded for each subsequent object of that particular shape / color. This is to encourage robots to find a diversity of “life-forms”. A nd, obviously, no additional points will be given for picking up the same object more than once in the same trial.

No modifications to the “Martian” environment will be allowed (rocklike objects, “life-forms”, danger zones, surrounding walls), although modifications to the “lander” itself will be allowed for penalty points (see below).

Several trials will be held, of increasing difficulty. The task itself will not change between trials, only the complexity of the environment (and one aspect of scoring). The parameters of the environment that may be changed are: number of different colored objects (some trials may have fewer different colors); density of rocks; density of “life-forms”; accuracy of the a priori map; placement of objects (e.g., certain objects may be surrounded on three sides by rocks and / or danger zones to make it harder to get at them). A nother parameter that may be altered is the ratio between the number of points awarded for the first object of a given type, and the subsequent ones. Probably, the points will be equal for the first trial, but for other trials the first object will be worth significantly more points.

**Event 2: Where’s the Remote Control**

This event is inspired by the need for robot assistants to perform “fetch-it” tasks in partially known environments. Imagine a robot assistant helping a handicapped person around the home. The person might ask the robot to fetch an orange, the TV remote, a cup of coffee, and so on. While the robot may not know where all of these items are initially, over time it will learn roughly where they are kept. The event will take place in an arena that contains tables, chairs, and shelves at varying heights. Scattered throughout the area, on the floor, the shelves, and the tables, will be 12 different objects. The robot will start the event near a human sitting in a chair (i.e., judge) who will ask the robot to fetch three items. Once these items have been returned, the human will ask for three more items. The winner will be the robot that can find and return the most items in the allotted time.

**The Environment:**

The environment will be divided into a kitchenlike area and a living-roomlike area with a partial divider between them. The lexan walls from last year’s contest will be used for the perimeter and the divider. The living-room area will include a TV and a sofa with coffee table between them. The kitchen area will include a sink, cutting board, and kitchen table. Either or both areas may include other distractor items, such as chairs and trash cans, but the area will be mostly free space, so as to allow easy mobility. The planned layout is shown as the “LIVING ROOM” and “KITCHEN” areas of the combined venue for the Home Vacuum event and Find the Remote Event.

**The Objects**

There will be twelve objects in all. Although their precise locations will not be known in advance, most objects will be constrained to lie on one of a few possible pieces of furniture. Teams are encouraged to use this context information to intelligently search the area.

**Scoring**

The robot will be started in a randomly chosen location in the rink. This location will be its “home” location to which it must return the objects. The objects will be randomly placed, but will match the location constraints given above.

Each team will rank the objects by perceived difficulty for their system. A random ordering of the objects will be chosen for each team using an algorithm biased to choose easier objects first. The robot will then be given 18 minutes in which to fetch the objects in the specified order. Teams will be awarded one point for each fetched object.
Event 3: Home Vacuum

The point of this contest is to explore the usefulness of intelligence in a task that appears to only require essentially unskilled labor — simple household vacuuming. We believe that unlike vacuuming in the service industry (factories, warehouses, etc.) home vacuuming will require sensor intelligence to deal with the humans in an everyday environment. For the AAAI contest, vacuuming robots ought to be short on vacuum mechanisms and long on intelligence. That is to say, simple suction, storage, and disposal devices are sufficient for these tasks, but the robots will probably have to make reasoned trade-offs among subtasks in real time to achieve a high score.

Objectives

• To show the value of intelligent robotics in a rudimentary service task.
• To let competitors measure the usefulness of their approach to robot intelligence.
• To have fun.

Scenario

We have a three room house (bedroom, family room, den) with a short hallway connecting the rooms. A smart vacuuming robot sits at a charging/disposal station in the hallway where it can see humans going in and out of the rooms (in the contest, charging a waning battery should not be required, but depositing trash will). Periodically, because of the activities of the human family living there, messes appear in the rooms, and sometimes in the hallway. The robot's task is to keep the floors vacuumed with minimum interruption of the activities of the human family living there. A such it is to vacuum on demand, when it knows a room might possibly be messy and on a periodic basis.

Periodically humans will come and go in the rooms. As they do, they may or may not leave "messes". The "messes" will consist of circular piles of paper confetti between 12" and 18" in diameter. Sometimes a human (possibly a teenager) may leave a mess in the hallway. There may be more than one mess in a room.

The vacuuming robots will be restricted to carry no more than two messes worth of trash before they must "deposit" the trash at the deposit site. Simply releasing the confetti at the deposit coordinates is sufficient to constitute a deposit.

The Tasks

Phase 1. "Once a Week" Vacuuming. (First day trials). All the rooms are to be cleaned once a week. In this phase, the robots will start at the disposal station, clean the each room by vacuuming the entire area of the room, and return to the disposal point. If messes are present (there may be from zero to two messes in each room), the robot must return to deposit the trash after every two messes. No humans will be present for this phase. There will be no messes in the hallway for this phase.

Phase 2: "Tidy Up" (Second Day Trials). The robot starts at the disposal station. Humans will periodically enter and leave the rooms (possibly leaving messes). It's the robot's job to keep the rooms clean of messes. Robots must not enter a room when a human is present (during this phase, humans will not enter a room while a robot is cleaning). During a given 15 minute run, humans will be present in each room for 1 minute out of every 5, except for the family room which will be occupied 3 minutes out of every 5. Robots may clean messes in the hallway while humans are present there.

Phase 3: "Clean My Room" (Third Day Trials). The robot starts at the disposal station. A human will come into the hallway and indicate to the robot that a room needs to be cleaned. The robot will then move to the room, clean any messes there and return to base to deposit the trash. While the robot is cleaning the room, one or more humans will enter. The robot must not clean while a human is in the room, but must move to the nearest wall and wait until the human leaves.

Event 4: (Special Event) Hors d’Oeuvres Anyone?

This event will occur at the AAAI main reception where there will be heavy interaction with the attendees. Judging will be conducted by the attendees. The goal is to provide solid refreshments to people in close quarters. Safety and self-protection are paramount. A human escort (only one allowed per team within the area) will always be nearby for safety and control of the robot (i.e., if it moves out of the designated area), but will be limited in their interaction with the attendees. The robots must be fully autonomous. The escort will also replenish the hors d’oeuvres on an as needed basis.

Attendees will be milling about taking hors d’oeuvres from off the robotic servers. All robots must be capable of carrying a standard
human interaction is the key to success. The robots must move about autonomously within the reception area and can interact by speech, vision, tactile, infrared, or whatever with potential servers. Personality counts here: the job is to have the robots engage the attendees as much as possible, convincing them that they are able servers.

Scoring
Scoring will be based on a combination of audience appreciation (60%) and technical judging (40%).

Audience appreciation: attendees entering the area will receive one token that they can drop in a box corresponding to their favorite server at the exit of the reception. We are really looking for robots with maximum “cute” appeal, so the scoring is biased towards audience participation. The technical points are there so that robots stay within reasonable guidelines.

Robot Event Judges & Chairs

Robot Competition Cochairs
Ronald C. Arkin, Georgia Institute of Technology and Jim Firby, University of Chicago

Robot Exhibition Chair
Holly Yanco, Massachusetts Institute of Technology

Fundraising Chair
Robin Murphy, Colorado School of Mines

Robot Competition Judges
Find Life on Mars: Reid Simmons, Carnegie Mellon University; Jim Hendler, University of Maryland; and Sridhar Mahadevan, University of South Florida
Where's the Remote? Ian Horswill, Northwestern University; Daniela Rus, Dartmouth; and Robin Murphy, Colorado School of Mines
Home Vacuum: Pete Bonasso, Texas Robotics & Automation Center Labs (TRA CLabs); Randy Sargent, Newton Research Labs; and Karen Myers, SRI International
Hors d’Oeuvres Anyone? Kurt Konolige, SRI International

Robot Competition & Exhibition Schedule

Invited Talk on Competition
Ron Arkin, Georgia Institute of Technology and James Firby, University of Chicago
Tuesday, July 29, 2:00 – 3:00 pm

Event One: Find Life on Mars
Preliminaries: Tuesday, July 29, 10:00 am – 2:00 pm and 4:00 – 5:30 pm
Finals: Thursday, July 31, 10:00 am – 1:00 pm

Event Two: Where's the Remote?
Preliminary / Qualifying — Wednesday, July 30, 11:00 am – 1:00 pm
Finals: Thursday, July 31, 9:00 am – 12:00 pm

Event Three: Home Vacuum
Phase 1: Tuesday, July 29, 9:00 – 11:00 am and 3:00 – 5:00 pm
Phase 2: Wednesday, July 30, 1:00 – 5:00 PM
Phase 3: Thursday, July 31, 9:00 am – 1:00 pm

Event Four: Hors d'Oeuvres Anyone?
Preliminaries: Tuesday, July 29, 12:00 – 2:00 PM
During the reception: Tuesday, July 29, 6:00 – 7:00 PM

Awards Ceremony
Thursday, July 31, 1:30 PM

Exhibition
The intent of the Robot Exhibition is to showcase current research in robotics that does not fit into the competition tasks. (Schedule posted daily)
Tuesday 10:00 am – 5:30 pm
Wednesday 9:00 am – 5:00 pm
Thursday 10:00 am – 1:00 pm
Robot Competition and Exhibition Teams

Many robot teams submitted abstracts for inclusion in the AAAI – 97 Proceedings. Additional abstracts are included below.

Exhibitor
A ctivMed i a / Real World Interface, Inc.
Team Members: Grinnell More (RWI), Tyson Sawyer (RWI), William Kennedy (ActivMedia), Jeanne Dietsch (ActivMedia), Laura Woodbury (RWI), and Travis Woodbury (RWI)

Thanks to RWI, the Pioneer 1 robot now sports a new gripper. Gripper paddles's two break beams sense when an object is placed for pick up. Aiso, take a look at ActivMedia's new RobotEyes accessories and software that lay a remote camera image side-by-side with a Saphira sonar map of the robot's space. And try out our new PAI and Logo software libraries by Barry Werger. These simple-to-use C libraries, with the inexpensive, reliable Pioneer, can jumpstart research projects in an afternoon.

Please see page 24 for Real World Interface, Inc.'s description.

Exhibitor and Competitor
Brandeis U niversity
Robots: Beni and Mae—The Interaction Lab RWI Pioneers
Interaction Laboratory
Team Advisor: Maja J. Mataric
Team Leader: Barry Werger
Team Members: Dani Goldberg and Greg Hornby

Competitor
Brown U niversity
Robot: Ramona
Team Advisor: Leslie Pack Kaelbling
Team Leader: Bill Smart
Team Members: Chris Cantor, Tony Cassandra, Andrew Duchon, Sarah Finney, Hagit Shatkay, and Nathan Sprague

This work will demonstrate the use of optical flow for obstacle avoidance and a simple game of tag. For obstacle avoidance, a few simple control laws based on optical flow allow the robot to wander around at speeds up to 50 cm / second in complex, cluttered environments. In the last five years, a number of groups around the world have used these purely reactive strategies which are based on work with insects. With Ramona, however, a number of factors need to be taken into consideration, most importantly the height of the camera (about 4 feet). Therefore, control laws for the tilt of the camera and robot speed have also been devised. For tag, the robot fixates moving targets and chases them if they move away and runs away if they move toward it. The robot can also be made to follow someone around, again using only optical flow. If time permits, some simple goal-directed navigation using optical flow (previously worked out in simulation) will also be demonstrated.

Competitor
Colorado School of Mines
Robot: Silver Bullet, CRISbot
Advisor: Robin R. Murphy
Team Leaders: Matt Long (Hors d’Oeuvres) and Travis Flowers (Find Life)
Team Members: Anne Brigante, Damian Diaz, Cathy Braun, and Chris Nye

Competitor
D artmouth
Robot: SK
Advisor: Daniela Rus and Keith Kotay
Team Members: Greg Friedland, Will Garner, Artym Lifshits, Jon Howel

Competitor
Georgia Institute of Technology
Robots: Shannon, Sally & Locorobos
Advisor: Tucker R. Balch and Tom Collins
Team Members: Darrin Bentivigna, Sheree Collins, Lester Davis, Mike Holloway, David Huggins, Lisa Huggins, Erwin Oei, and Juan Carlos Santa Maria

Exhibitor and Competitor
Iowa State U niversity
Robot: Cybot
Advisor: Dr. Patterson
Team Leader: Boone Oshel
Team Members: Ben Amey, Josh Bertram, Troy Polito, and Kelly Rowles

Project Cybot was started six years ago as an ambassador for the Electrical and Computer Engineering Departments at Iowa State University. As ambassador, Cybot has displayed the abilities of many different students that have worked on it throughout the years. Within the past few years Cybot has become more autonomous. Its systems are based on an IBM Pentium Pro running Windows 3.1. Its frame and circuitry have been designed and built by electrical and computer engineering students at Iowa State University. With this years students Cybot now has the ability to move and talk simultaneously. Also a high level compiler has been created to make programming its movements easier. These are just a few of the advancements Project Cybot has had in the past year and there are more to come.
Competitor

**Kansas State University**

Robot: Slick Willie  
Advisor: David Gustafson  
Team Members: Karen Gustafson (photographer), Steve Gustafson, Mike Novak, Todd Prater, Brian Rectanus

Exhibitor and Competitor

**KISS Institute for Practical Robotics**

Robot: Captain Peacock and Mr. Humphries  
Team Members: David P. Miller, Randy Sargent, Cathryne Stein and Anne Wright

Exhibitor

**Massachusetts Institute of Technology, Artificial Intelligence Laboratory**

Robot: Pebbles Mars Rover  
Advisor: Rodney Brooks  
Team Leader: Chandana Paul  
Team Members: Yokky Matsuoka and Milyn Moy

The Pebbles rover is being designed for Mars exploration. Its high level task is to behave as an “automated geologist” engaging in exploratory navigation and sample rock retrieval. The rover continuously drives around avoiding obstacles and searching for a target. When it locates the target it attempts to approach it. This target may be a rock or a visual marker indicating the location of the base. The rover also continuously searches for objects of interest in an attention window directly in front of it. If such an object is detected, the high-level goal directed navigation is temporarily interrupted. The four degree-of-freedom manipulator reaches for the object and the handlike gripper grasps it. The rock is dropped into the robot’s back-pack and the high-level navigation is resumed. The target selection habituates to familiar objects so that only new kinds of rocks are collected.

Exhibitor

**Massachusetts Institute of Technology, Artificial Intelligence Laboratory**

Robot: Cog  
Advisor: Rodney Brooks  
Team Members: Cynthia Ferrell, Robert Irie, Charles Kemp, Matt Marjanovic, Jonah Peskin, Brian Scassellati, Matt Williamson

Exhibitor

**Massachusetts Institute of Technology, Leg Lab**

Robot: Self-Stabilizing Hopper  
Advisor: Robert Ringrose  
Team: David Robinson

Properly designed legged robots can sustain stable dynamic locomotion without sensors or feedback. The self-stabilizing hopper is a robot which is inherently stable and automatically rejects minor perturbations as it hops. It has neither computer nor sensors. In contrast, most previous attempts to make robots run have used active, high bandwidth feedback control systems. Simulations indicate that self-stabilizing running extends to quadrupedal trotting, pacing, bounding, and galloping.

Exhibitor and Competitor

**Massachusetts Institute of Technology, Artificial Intelligence Laboratory / Boston College**

Robot: Wheelesley  
Advisor: Holly Yanco  
Team Members: Jim Gips (Boston College), Jonathan Gips, and Oded Maron

Wheelesley, a robotic wheelchair system, shares control with the user of the wheelchair to navigate indoor and outdoor environments. The user gives high level directional commands to the robot through a user interface on a Macintosh® Powerbook. The robot then carries out the navigational task using common sense constraints such as collision avoidance. Since the system automatically avoids obstacles and makes motor corrections, less effort is required by the user to drive the system. This system can be used by people who are unable to use a traditional electric wheelchair.

Recent work has resulted in the addition of EagleEyes, an eye tracking device for input to the user interface. EagleEyes is a technology that allows a person to control the computer through five electrodes placed on the head. This allows people to control the wheelchair using head and eye movements. We have also developed a head switch interface for the robot. Both EagleEyes and the head switch interface will be demonstrated during the robot exhibition.
Competitor  
**McGill University**  
Robot: Invader  
Advisor: Greg Dudek  
Team Members: Eric Bourque, Marc Boldoc, François Bélair, Deepthman Jugessor, Nicholas Roy, Rob Sim

Competitor  
**Miamisburgh High School**  
Team Name: Miamisburg Electronics Club  
Advisor: Wayne C. King  
Team: Wayne Cox, Jon Angel, and Eric Williams

Exhibitor  
**Michigan State University**  
Robot: SHOSLIF  
Advisor: John J. Weng  
Team Members: Shaoyun Chen, Kamen Y. Guentchev, Gongjun Li, Rossen N. Nedeltchev, Jason Q. Sperber, Jamal A. Wills  
SHOSLIF is a scheme for learning sensorimotor behavior through situated, interactive, incremental, real-time training. The primary objective is to achieve a task-independent, learning while performing capability for high dimensional sensory input, such as vision. SHOSLIF automatically derives optimal features in organizing incrementally learned cases into a SHOSLIF hierarchical partition and retrieval tree. It has a correct convergence property and a logarithmic time complexity. The SHOSLIF has been tested for several tasks, including autonomous navigation, object manipulation, face recognition and object recognition, moving hand-sign recognition (from American Sign Language). This exhibit displays an enhanced version of the physical robot. The videotape demonstration shows how the robot performs real-time navigation through the corridors and around turns inside the MSU Engineering Building using a single sensor — a video camera, and how a vision-guided robot manipulator is trained to perform task sequences, such as pouring milk from one cup into another, under the guidance of a stereo camera setup.

Competitor  
**Navy Center for Applied Research in Artificial Intelligence**  
Robot: Coyote  
Advisor: Alan Schultz  
Team Members: Bill Adams, John Grefenstette, Charles Loeffler, Mike Schuresko, and Brian Yamauchi

Exhibitor and Competitor  
**Northwestern University**  
Robot: Kluge  
Advisor: Ian Horswill  
Team Member: Ivan Yen

Competitor  
**Rob Turner**  
Team Member: Rob Turner

Competitor  
**Salem High School Robotics Club**  
Team Member: Luke Daminan Sowa

Exhibitor and Competitor  
**Texas Robotics & Automation Center Labs (TRACLabs)**  
Robot: ServerDroid  
Advisor: Peter R. Bonasso  
Team Members: David Kortenkamp, Dan Poivot, and Linda Williams

Competitor  
**University of Arkansas**  
Advisor: Douglas S. Blank

Competitor  
**University of Minnesota**  
Advisor: Maria Gini

Competitor  
**University of New Mexico**  
Advisor: Greg Heileman

Competitor  
**University of Texas – El Paso**  
Robot: Diablo  
Advisor: Chitta Baral  
Team Leader: Luis G. Floriano  
Team Members: Arron Hardesty and Son Tran

Exhibitor  
**University of Virginia**  
Robot: Bruce  
Advisor: Worthy Martin  
Team Members: Gabriel J. Ferrer and Glenn S. Wasson

As with many other researchers, we are developing a layered architecture for integrating planning and action. Our approach is distinct from the usual approach of interfacing a planner to a reactive system in a layered architecture, in that we replace the reactive system with a different kind of action system. Our action system uses small task-dependent repre-
sentations called markers. This system can no longer truly be called reactive (because it has state) and so we term it a Perception / Action (PA) system.

A PA system selects its actions from the current values of its sensors and the state of its representation. Here, we will discuss how an agent’s PA system can effectively use and maintain its representation. In addition, we will show how the addition of representation to the action layer of an architecture (that layer which controls the sensor / effector sub-systems) facilitates the communication of goal information from higher layers of the architecture. We demonstrate an application testbed in which our agent plays hide and seek against a human controlled opponent. This application allows us to show how our agent can use representation to facilitate behaviors which are difficult for reactive systems and how the highly-structured representation of the PA system provides hooks for communication with the higher layers of the architecture.

Hexotica has three degrees of freedom per leg, a feature that differentiates it from many other small walking robots already developed. The modularity of the control architecture simplifies the design and integration of new hardware and software components for the system. This is important as additional sensors and control systems are added. The control algorithms use typical industrial robot path interpolation techniques to move the “foot” of the robot in a straight line between two points in the working envelope of the leg. It is the aim of future research to use more adaptive and “fuzzy” control paradigms to move the robot within its environment, now that it has the ability to move its foot efficiently within its workspace.

Exhibitor and Competitor

University of Waterloo

Robot: Hexotica
Advisor: John McPhee
Team Leader: Dylan Horvath
Team Members: Rachelle Allin and Stefan Williams

Hexotica is a small, robust walking robot with a unique control paradigm. The project goals include the construction of a modular mechanical system capable of replicating the walking motion of biological entities and the development of a distributed control architecture to break up the control problem into manageable sub-problems. These goals must be accomplished at a relatively low cost due to a limited budget. The project emphasizes a modular design process that simplifies the design of individual components of the system.
Registration

Conference registration will take place outside Hall D, third level, Rhode Island Convention Center, beginning Sunday, July 27. Registration hours are:

- Sunday, July 27: 7:30 am – 6:00 pm
- Monday, July 28: 7:30 am – 6:00 pm
- Tuesday, July 29: 8:00 am – 6:00 pm
- Wednesday, July 30: 8:00 am – 6:00 pm
- Thursday, July 31: 8:00 am – 3:00 pm

Only checks drawn on US banks, VISA, Mastercard, American Express, government purchase orders, traveler's checks, and US currency will be accepted. We cannot accept foreign currency or checks drawn on foreign banks.

Registration Fees

AAAI-97 / IAAI-97 Technical Program

The AAAI-97 technical program registration fee includes admission to all technical paper sessions, invited talks and panels, the AAAI-97 Exhibition, The Hall of Champions, The Robot Competition, the AAAI-97 Opening Reception, the IAAI-97 sessions and the AAAI-97/IAAI-97 Conference Proceedings. Note: Students must present proof of full-time student status to qualify for student rate. Onsite technical program fees are:

- Regular Member: $495
- Regular Nonmember: $570
- Student Member: $170
- Student Nonmember: $235

Tutorial Forum

The tutorial forum registration fee includes admission to no more than four consecutive tutorials and the corresponding four tutorial syllabi. Extra syllabi from other tutorials may be purchased separately for $15.00 each. A maximum of four consecutive tutorials may be taken due to parallel schedules. The tutorial forum registration also includes admission to all exhibit hall programs. Onsite Tutorial Forum fees are:

- Regular Member: $230
- Regular Nonmember: $300
- Student Member: $125
- Student Nonmember: $155

Workshop Program

Workshop registration is limited to those active participants determined by the organizer prior to the conference. Individuals attending workshops who are not registered for the AAAI-97 technical program must pay a $150.00 per workshop registration fee.

Robot Building Lab

The robot building lab registration fee includes admission to the robot building lab and the exhibition program. Fees are $150.00 for members or nonmembers, and $75.00 for students. Attendance is limited and preregistration is recommended. Check for availability onsite.

Exhibition

Admission to the exhibit hall programs is included in all other types of registration. For individuals interested in admittance to the exhibit hall only, an exhibits only registration is available in onsite registration. This fee is $10.00 for a one-day pass, and $25.00 for a three-day pass. Exhibit hall programs include vendor exhibits, the Robot Competition and the Hall of Champions. High-school students are welcome and will be admitted without fee upon presentation of a valid high-school student ID. Children under 12 will also be admitted without fee, but must be accompanied by an adult conference registrant.
General Information

AAAI Logo Shirts

Polo shirts with the AAAI logo will be for sale during registration hours in the registration area outside Hall D, third level of the Rhode Island Convention Center. Supplies are limited. Price $20.00 each onsite.

Admission

Each conference attendee will receive a name badge upon registration. This badge is required for admittance to the technical, tutorial, exhibit, IAAI, and workshop programs. Workshop attendees will also be checked off a master registration list at individual rooms. Smoking, drinking, and eating are not allowed in any of the technical, tutorial, workshop, IAAI, or exhibit sessions.

Baggage Holding

There is no baggage holding area at the Rhode Island Convention Center. Please check your luggage with the bellman at your hotel after you have checked out. Neither the AAAI, the Rhode Island Convention Center, the Westin Hotel, nor the Biltmore Hotel accept liability for the loss or theft of any suitcase, briefcase, or other personal belongings brought to the site of AAAI-97 / IAAI-97.

Banking

The closest bank is the Fleet Bank, located across from Kennedy Plaza. The closest automatic teller machine (ATM) is located on the far side of the Civic Center, which is next to the Rhode Island Convention Center. The networks available are VISA, Mastercard, Cirrus, NYCE, and Plus Systems. The Fleet Bank can also exchange all major foreign currencies.

Business Centers

Business Centers are available at the following locations:
• Third floor of the Westin Hotel. Hours: 7:00 a.m. – 7:00 p.m. weekdays, and by appointment only on Saturdays.
• Lobby of the Biltmore Hotel. Hours: 7:00 a.m. – 11:00 p.m. daily.
• First floor of the Holiday Inn. Hours: 7:00 a.m. – 10:00 p.m. daily.
Services include fax, copies, computer rental, laser printing, and other general office services. The Westin and Biltmore offer shipping by FedEx and UPS. The Holiday Inn offers cell phone and beeper rentals.

Career Information

A bulletin board for job opportunities in the artificial intelligence industry will be made available in the registration area on the third level of the Rhode Island Convention Center. Attendees are welcome to post job descriptions of openings at their company or institution.

Child Care Services

For information about child care services, you may contact We Sit Better Babysitters and Child Care Registry at (401) 421-1213. (This information is provided for your convenience and does not represent an endorsement of this agency by AAAI. Responsibility for all child-care arrangements must be assumed by the parents.)

Coffee Breaks

Coffee will be served outside Ballroom A, fifth level of the Rhode Island Convention Center; in the Narragansett Ballroom prefunction area, ground floor, Westin Hotel; and in the Gallery, third floor, Westin Hotel. Coffee breaks are scheduled for 10:00 – 10:30 a.m and 4:10 – 4:30 p.m each day.

Copy Services

Copy services are available at:
Alphagraphic’s Printshops of the Future
55 Dorrance Street
Providence, RI 02903
Telephone: (401) 351-4000
Hours:
7:00 am – 9:00 pm, Monday – Thursday
7:00 am – 7:00 pm, Friday
9:00 am – 4:00 pm, Saturday.
Copy service is also available at the Business Centers in the conference hotels.

Dining
A Providence dining guide is available at the Visitor Information Booth in the registration area outside Exhibit Hall D. Concessions will be open in Exhibition Hall C / D during exhibit hours, July 29 - 31.

Handicapped Facilities
The Rhode Island Convention Center, the Westin Hotel, the Holiday Inn Providence Downtown, and the Biltmore Hotel are all equipped with handicapped facilities.

Housing
For information regarding hotel reservations, please contact the hotels directly. For student housing reservations assistance, please contact the Brown University Conference Services at (401) 863-7500, 9:00 am – 4:00 pm, Monday – Friday. Students requiring assistance after hours should refer to the contact information provided in the student housing registration confirmation letter.

Information Desk
An information desk / message desk will be staffed during registration hours, Sunday through Thursday, July 27 - 31. It is located in the registration area, outside Hall D, on the third level of the Rhode Island Convention Center. Messages will be posted on the message boards adjacent to the desk. The telephone number for leaving messages only is (401) 458-6272. Paging attendees is not possible.

Internet
AAAI, in cooperation with Microsoft Corporation and Brown University, will be providing internet access in Room 551 on the fifth level of the Rhode Island Convention Center. The internet room will be open during registration hours. As a courtesy, please limit your access time to 5 – 10 minutes if others are waiting to use the service.

List of Attendees
A list of preregistered attendees of the conference will be available for review at the AAAI Desk in the registration area, third level of the Rhode Island Convention Center. Attendee lists will not be distributed.

Message Center
See Information Desk.

Parking
A parking garage is available at the Rhode Island Convention Center. The maximum daily rate is $8.50.

Press
All members of the media are requested to register in the Press Room on the fifth level of the Rhode Island Convention Center, Room 553A. Press badges will only be issued to individuals with approved credentials. The Press Room will be open during the following hours:
Monday, July 28 8:00 am – 5:00 pm
Tuesday, July 29 8:00 am – 5:00 pm
Wednesday, July 30 8:00 am – 5:00 pm
Thursday, July 31 8:00 am – 12:00 pm
An AAAI-97 volunteer will be on duty during press room hours to assist the members of the press and media.

Printed Materials
Display tables for the distribution of promotional and informational materials of interest to conference attendees will be located outside Hall D, third level, Rhode Island Convention Center.

Proceedings
Each registrant for the AAAI-97 technical program and IJCAI-97 will receive a ticket with the registration materials for one copy of the conference Proceedings. During registra-
tion hours on Sunday, July 27, Monday, July 28, and until 10:00 am on Tuesday, July 29, Proceedings tickets can be redeemed at the AAAI Press Proceedings booth, located outside Hall D, third level of the Rhode Island Convention Center.

After 10:00 am on Tuesday, the AAAI-97 / IAAI-97 Proceedings ticket may be redeemed at the MIT Press booth #101, located in Exhibit Hall C, during exhibit hours.

Extra Proceedings may be purchased at the conference site at the above locations. Thursday, July 31, will be the last day to purchase extra copies of the Proceedings onsite.

The AAAI-97 / IAAI-97 Proceedings can also be redeemed by mailing the ticket with your name, shipping address and email to:

Exhibits
The MIT Press
5 Cambridge Center
Cambridge, MA 02142

Postage must be prepaid with a check or MasterCard / Visa and expiration date. USA: $10.50; Outside USA: $25.00 surface or $55.00 airmail.

Proceedings Shipping
See Business Centers.

Recording

No audio or video recording is allowed in the Tutorial Forum. Audiotapes of the plenary sessions, invited talks and panels, and the IAAI sessions will be for sale in the registration area, outside Hall D, third level of the Rhode Island Convention Center. A representative from Audio Archives will be available to take your order during registration hours, beginning Monday, July 28. Order forms are included with registration materials. Tapes may also be ordered by mail from:

Audio Archives International, Inc.
3043 Foothill Blvd, Suite 2
La Crescenta, CA 91214
Telephone: (818) 957-0874
Fax: (818) 957-0876

Speaker Ready Room

The Speaker Ready Room will be located in Room 553B on the fifth level of the Rhode Island Convention Center. This room has audio-visual equipment to assist speakers with their preparations. It is important that speakers visit this room to organize their materials. The room will be open from 8:00 am - 5:00 pm Sunday, July 27, through Wednesday, July 30 and from 8:00 am - 3:00 pm, Thursday, July 31.

Invited speakers are asked to come to Room 553B one day prior to their speech. Representatives from AV Headquarters will be available from 9:00 am to 5:00 pm Sunday - Wednesday, and 9:00 am - 3:00 pm on Thursday to confirm your audiovisual needs, and assist with the preparation of your materials, if necessary.

Transportation

The following information provided is the best available at press time. Please confirm fares when making reservations.

Airlines & Rental Cars

The American Association for Artificial Intelligence has selected American Airlines as the official carrier and Hertz Rent A Car as the official car rental agency for AAAI-97 / IAAI-97. If you need to change your airline or car rental reservations, please call Conventions in America, our official travel agency at (800) 929-4242 and ask for Group #428. Internet: scitravel@aol.com.

Airport Shuttles

Airport Van Shuttle
Telephone: 401-736-1900
Located at T.F. Green Airport
$9.00 one way, $14.00 round trip
Contact: Richard Sprague

Cline Transportation
Telephone: 401-751-2546
Individual car or limo is $24.00 T. F. Green Airport to Providence
$9.00 one way, $16.00 round trip
Advance reservations needed
Contact: Linda Cline

Providence – Holiday Inn Hotel Complimentary Hotel Shuttles

Taxi

Taxis are available at T. F. Green Airport. Approximate fare from the airport to downtown Providence is $24.00.

Bus

Bonanza Bus Lines — New York, Boston. The depot is located at Kennedy Plaza. For infor-
mation on fares and scheduling, call (401) 751-8800.

Rail
The Amtrak station is located at Capitol Hill. For general information and ticketing, call (800) 872-7245.

City Transit System
Rhode Island Public Transit Authority (RIP-TA) is a statewide bus transit. Schedules are available at the main depot located at Kennedy Center (across from the Biltmore Hotel). Basic local fare is $1.00. For general information, call (800) 244-0444.

Tutorial Syllabi
Extra copies of AAAI-97 tutorial syllabi will be available for purchase in the registration area, outside Hall D, beginning Tuesday, July 29. Supplies are limited. Cost is $15.00 per syllabus. Preregistration tutorial syllabi tickets may be redeemed in the tutorial rooms.

Visitor Information
The Providence Warwick Convention and Visitors Bureau will have a booth in the registration area, outside Hall D, third floor, Rhode Island Convention Center. Maps and brochures with information on shopping, restaurants, outdoor activities, parks, and tours will be available. Hours are 10:00 am – 4:30 pm, Monday, July 28 – Wednesday, July 30 and 10:00 am – 3:30 pm, Thursday, July 31.

Volunteer Room
The volunteer room is located in Room 550B on the fifth level of the Rhode Island Convention Center. Hours are 8:00 am – 5:00 pm, Sunday, July 27 – Wednesday, July 30 and 8:00 am – 3:00 pm, Thursday, July 31. Extra volunteer instructions and schedules will be available. All volunteers should check in with Josette Mausisa, AAAI Registrar, in the registration area prior to their shifts. The volunteer meeting will be held Saturday, July 26 at 5:00 pm in Room 552 A, fifth level, Rhode Island Convention Center.

Disclaimer
In offering American Airlines, Babysitters, The Biltmore Hotel, Brown University, Conventions in America, Hertz Rent A Car, The Holiday Inn, the Westin Hotel, and all other service providers (hereinafter referred to as “Supplier(s)” for the National Conference on Artificial Intelligence and the Innovative Applications Conference), AAAI acts only in the capacity of agent for the Suppliers which are the providers of the service. Because AAAI has no control over the personnel, equipment or operations of providers of accommodations or other services included as part of the AAAI-97 / IAAI-97 program, AAAI assumes no responsibility for and will not be liable for any personal delay, inconveniences or other damage suffered by conference participants which may arise by reason of (1) any wrongful or negligent acts or omissions on the part of any Supplier or its employees, (2) any defect in or failure of any vehicle, equipment or instrumentality owned, operated or otherwise used by any Supplier, or (3) any wrongful or negligent acts or omissions on the part of any other party not under the control, direct or otherwise, of AAAI.