

Randy Davis announced the appointment of six new program managers at ARPA. He encouraged individuals to contact these managers to see where they can help. The meeting was adjourned at 3:00 PM.

New Officers for AAAI

At IJCAI-95, Randall Davis assumed the office of president of the American Association for Artificial Intelligence (AAAI). Davis is a professor of electrical engineering and computer science and associate director of the AI Lab at the Massachusetts Institute of Technology (MIT). Davis succeeds Barbara Grosz, Gordon McKay professor of computer science in the Division of Applied Sciences at Harvard University. "Barbara Grosz provided strong leadership in a variety of ways to our organization, and her contributions will benefit the association for years to come," said Carol Hamilton, executive director of AAAI. "We are fortunate that Randy Davis is stepping in, to guide the society as AI's key role in today's technologically advanced world unfolds."

The new president-elect of AAAI is David Waltz of the Computer Science Research Division of NEC Research Institute (Princeton, New Jersey) and adjunct professor of computer science at Brandeis University (Waltham, Massachusetts). Four councilors were also elected by the AAAI membership: (1) Steven Minton, principal investigator at the National Aeronautic and Space Administration's (NASA) Ames Research Center; (2) Lynn Andrea Stein, associate professor of electrical engineering and computer science at MIT; (3) Kenneth Ford, director of the Institute for the Interdisciplinary Study of Human and Machine Cognition and associate professor of computer science at the University of West Florida; (4) and Richard E. Korf, professor of computer science at the University of California at Los Angeles.

Montréal Wrap-Up

Sara Hedberg

For many attending the Fourteenth International Joint Conference on Artificial Intelligence (IJCAI-95), the most difficult problem was choosing which session to attend in the rich, varied program. From an award-winning data-mining application from the U.S. Department of the Treasury that identifies potential money laundering to a small mobile LEGO robot described as "the size of a shoebox, size 7 pumps, one-half-inch heels," IJCAI-95 offered a broad spectrum of leading AI research and applications from around the world.

Over 2000 attendees from 39 countries attended IJCAI from August 19–25 in beautiful Montreal, Quebec, Canada. They spanned the spectrum of the AI community, from founding fathers to undergraduate students. IJCAI-95 was held concurrently with the Seventh Annual Conference on Innovative Applications of AI (IAAI-95) and the First International Conference on Knowledge Discovery and Data Mining (KDD-95).

AI scientists and practitioners presented a broad range of research topics at IJCAI-95: intelligent agents, multimedia, knowledge sharing, reasoning about devices, case-based reasoning, constraint-directed scheduling, genetic algorithms, machine learning, temporal reasoning, natural language, music, the environment, artificial life, and more. The conference included several complementary programs: (1) technical program (249 papers, 13 invited lectures, 2 panels, 3 conference reports), (2) tutorial program (19 tutorials), (3) workshop program (37 workshops), (4) video program (15 videos), (5) exhibition (including the robot competition), and (6) vendor exhibit (publishers, software companies, labs, and so on).

"Over 1100 papers were submitted

for consideration this year," noted Ray Perrault of SRI International, chair of the conference. "This is more than at IJCAI-93 and at recent National Conferences on AI in the United States. The paper acceptance rate was under 25 percent, showing that there is a great deal of work going on, and the scientific standard of IJCAI matches or exceeds that of many journals. The invited talks and panels this year," continued Perrault, "reflected the interdisciplinary nature of AI, such as the links to physics, mathematics, biology, and philosophy." Since 1969, International Joint Conferences on AI, Inc. (IJCAI), has sponsored biennial conferences on AI that are the main forums for presenting AI research results to the international AI community.

IJCAI Honors Herbert Simon

IJCAI presented the IJCAI Award for Research Excellence at IJCAI-95. The IJCAI award is given to a scientist who has carried out a program of research of consistently high quality, yielding several substantial results. The winner was Herbert A. Simon, professor of computer science and psychology at Carnegie-Mellon University. "Professor Simon helped invent our field in the mid-1950s," said Edward Feigenbaum, professor of computer science at Stanford University and chief scientist for the U.S. Air Force, during his introductory remarks. "His creative genius has helped to nurture the field ever since. Herb Simon is quintessentially a behavioral scientist—perhaps the greatest of all time. He came to the point of invention of AI's technical beginning in 1955 and '56 as the critical bridge person between theories of human cognition and theories of mechanism."

A Great Leap in Scientific Thought

Feigenbaum went on to outline Simon's well-known, seminal work in collaboration with Allen Newell that set the paradigms for the modeling of problem solving and the landmark invention of the list processing language (Lisp), both so fundamental to the AI field. "Forty years later," noted Feigenbaum, "it's a little hard to appreciate what a remarkable set of scientific and technical conceptions that was. It literally framed our field and can be regarded as one of the great leaps in the history of scientific thought."

"Simon regards his AI work as the peak of his career—not the economics for which he later won a Nobel prize," continued Feigenbaum. Feigenbaum also outlined the revolutionary impact that Simon's work had on the psychology side of AI with computer models of human cognitive processes as well as his study of the process of scientific discovery. "He is a great role model for us all," concluded Feigenbaum, "an amazing mind, remarkable scope of contribution, big important ideas, a scientist of the greatest national and international renown."

His work in AI, economics, psychology, and cognitive science has brought Simon many major awards, including the Nobel Memorial Prize in Economics, the ACM Turing Award (with Newell), and the National Medal of Science. He joins past winners John McCarthy (1985), Allen Newell (1989), Marvin Minsky (1991), and Raymond Reiter (1993). Simon delivered an address entitled "Explaining the Ineffable: AI on the Topics of Intuition, Insight, and Inspiration," after receiving the award.

IJCAI Computers and Thought Award Recognizes Two Young Scientists

The IJCAI Computers and Thought Award is given to an outstanding young scientist in the field of AI. The recipients of the 1995 award, also presented at IJCAI-95, were Sarit Kraus and Stuart Russell.

Sarit Kraus is a senior lecturer in computer science at Bar Ilan University, Israel, and a visiting assistant professor at the University of Maryland. As part of her doctoral research, she wrote a program that plays the game *Diplomacy*. This research led her to investigate the application of game theory and nonclassical logics to automated negotiations. She has also made contributions to both the theoretical and the practical aspects of nonmonotonic reasoning.

Stuart Russell is associate professor of electrical engineering and computer science at the University of California at Berkeley. His early work was in machine learning, particularly analogical reasoning and inductive bias. A major contributor to the field of resource-limited reasoning, he proposed a set of reasoning control strategies, showing their use in a variety of applications from computer chess to automatic traffic surveillance. He was the recipient of a Presidential Young Investigator Award in 1990.

Robot Competition Pits Robots in Office Olympics

Continually pushing the state of the art for autonomous mobile robots, the Fourth Annual Robot Competition and Exhibition tested robots' abilities in office delivery and cleanup. These tasks tested basic capabilities in the complex tasks of navigation, perception, and manipulation by autonomous robots that must rely solely on the programs and power supplies they have on board. As such, the competition provided a glimpse into the robots that will be commercially available in the not-too-distant future.

"The robot events passed a major milestone this year," noted David Miller, principal scientist at MITRE Corporation (McLean, Virginia) and organizer of this year's competition. "All the robots that competed in the events accomplished the tasks. These events ... have reached a new level of applicability to people outside ... AI research. The robots were doing useful, practical tasks such as taking human direction ('Go down the hall

The 1995 Mobile Robot Competition Winners

Office-Navigation Task

First Place:

CAIR-2 from the Korean Advanced Institute of Science and Technology, South Korea

Second Place:

LOLA from North Carolina State

Office Cleanup Task

First Place:

LOLA from North Carolina State

Second Place:

CHIP from the University of Chicago

Wheelchair Limbo Task

First Place Tie:

WHEELSLEY from Wellesley College and NAVCHAIR from University of Michigan

and take your second left....') and doing trash sorting and disposal. The robot competitions are on a direct path to making useful robots that are easy for people to use.

"Proof of the usefulness of the robot competitions was found in the general and wheelchair exhibitions," continued Miller. "Robots were demonstrated that are being used for elementary school education. And the robot wheelchairs that were shown are prototypes of robots that people with severe disabilities will shortly be using to get around in the world." Other robots that operate safely around stairs and people were also demonstrated. "All ... these systems used technology that was first publicly shown in the robot competitions from past years," noted Miller.

Pictures and short MPEG movies of many of the robots can be found on the World Wide Web at <http://www.>

ai.mit.edu/people/dmiller/ijcai/robots-95.html. Additional information can be found on the home page: <http://www.ai.mit.edu/people/dmiller/ijcai/robot-home.html>.

First International KDD Conference

The terabytes of data generated daily and stored electronically are outpacing our ability to use the data. Amid the terabytes might be an important insight or trend that could further science, industry, or government—but how to find it? Advanced techniques are being developed to mine “nuggets” of insight from the mountains of data. Called *data mining*, this new arena of the electronic age is rapidly becoming a high priority for many institutions around the world. Leading researchers gathered at KDD-95 to share their knowledge and experience in developing and testing advanced techniques for this important and fast-growing field.

“From supermarket checkout counters to ATM transactions to science and medical instruments that can generate gigabytes of data per day (or even per hour), we are fast coming to the realization that our ability to analyze and digest this data flood has not kept up with our ability to collect the data,” noted Usama Fayyad, program cochair of KDD-95 and head of the Machine Learning Systems Group at the Jet Propulsion Laboratory (JPL) (Pasadena, California). “At NASA, we call this the ‘drinking from the firehose’ phenomenon.

“The scale of the databases is now so large that human analysis is simply not feasible. Our only hope is to make machines smart enough to allow us to access and analyze the data in a reasonable way,” continued Fayyad. “This is a great niche where artificial intelligence, as well as other fields such as statistics, can help society in a substantial way in the near term.”

Trailblazers Recount Their Efforts

This first international conference grew out of AAAI-sponsored knowledge discovery in database (KDD) workshops that began in 1989 and

expanded with the growing interest and investment in data mining. The conference provided a forum for more than 340 researchers from a variety of areas: AI (machine learning, pattern recognition, knowledge acquisition, and expert systems), statistics, intelligent databases, data visualization, and high-performance computing. Research groups from leading universities, corporations (such as General Electric, AT&T, Hughes, ABN AMRO Bank (The Netherlands), IBM, and Lockheed), and government agencies attended. They represented such countries as Singapore, Japan, Finland, Germany, Slovenia, Israel, Canada, and the United States.

The papers for the conference were characterized by a blend of experimental data-mining tools and techniques as well as some actual applications. Presenters recounted their experiences and lessons learned, and some papers compared various approaches to the same problem. A few papers, such as that by Hughes Research Laboratories, pushed the frontier of data mining with experimental techniques from multiple databases in a heterogeneous environment.

The issue of data privacy in this bold new world of data mining was also explored, and some technical ideas on how to address it were presented by the German National Research Center for Information Technology. From the 56 papers, the panels, several invited speakers, and poster sessions, as well as a demonstration session, attendees gained a broad exposure to the current research in intelligent data-mining techniques.

Nine Data-Mining Applications

In addition to presentations about tools and techniques, nine conference papers discussed actual data-mining applications. Two of these applications are fully deployed, and the remaining seven are experimental at this stage. Together, they point to some of the new directions that data-mining applications might take. The two systems in production are from AT&T Bell Laboratories and the

U.S. Department of the Treasury. The AT&T system is used daily to predict channel failures in the AT&T telecommunications network. The system from the U.S. Department of the Treasury reviews databases of large cash transactions to identify potential money laundering. (This was also an IAAI-95 award-winning application.)

The seven experimental systems were from (1) ABN AMRO Bank (The Netherlands), a system that predicts the characteristics of bad or unpaid loans and develops a credit-scoring system for use in loan evaluation; (2) AT&T Bell Laboratories, a system that predicts the spread between borrowing and lending interest rates; (3) AT&T Bell Laboratories, a system that builds a model to predict uncollectible debt in the telecommunications industry to influence policy making; (4) Hydrometeorological Institute of Slovenia, a system that identifies the bioindicators of river water quality; (5) NASA Ames Research Center, a system that analyzes plume spectroscopy data to diagnose the Space Shuttle main engines; (6) Vanderbilt University, a system that discovers oil fields from geological databases (the system used real data from Alaska); and (7) Varian University (Israel), a system that discovers trends across articles in a textual database (in this case, an old Reuters news-feed database).

KDD-95, collocated with IJCAI-95 and IAAI-95, was sponsored by the AAAI, AT&T Global Information Solutions, GTE Laboratories, JPL, and the NASA Office of Space, Access, and Technology, in cooperation with IJCAI.

Seventeen Applications Win Prestigious 1995 Innovative Applications of AI Awards

Seventeen outstanding AI applications received awards at IAAI-95. IAAI is the premier conference that showcases ways that AI technology is having a strategic impact in business, government, and science. The winners demonstrate the broad spectrum of AI applications being deployed

1995 Innovative Applications of AI Awards

Manufacturing

- Generation of new product plans (IBM)
- Schedules for the building of large carrier and container ships (Daewoo)
- Routing of truck fleet for timber procurement management (Enzo Gutzeit)
- Self-maintenance photocopiers (Mita)
- Gear design (General Motors)
- Jet engine diagnostics (United Technologies and Pratt & Whitney)

Government

- Identification of potential money laundering (U.S. Department of the Treasury)
- Scheduling of marine resources in a busy international port (Singapore Port Authority)
- Expert system adviser for agriculture (Egyptian Ministry of Agriculture and Land Reclamation)
- Planning of overseas troop deployment (U.S. Army)
- Troubleshooting of interplanetary communications networks (NASA-JPL)
- Image correction and enhancement for incomplete scientific data (NASA-JPL)

Finance

- Risk-assessment products for the capital mortgage industry (GE Capital Mortgage) (2 awards)

Telecommunications

- Cellular network management (Singapore Telecomm)
- Network alarm correlation shell (GTE Labs)

Business (Sales-Management)

- Generation of new product plans (IBM)
- Sales cycle management (Canon USA)

today around the world. Winning applications were selected because they use various AI techniques (for example, expert systems, intelligent agents, data mining, neural networks) in creative new ways to solve pressing problems.

"This year's winners of the Innovative Applications awards demonstrate that AI is having a broad-ranging, strategic impact," noted Jan Aikins, IAAI-95 program chair and principal researcher for technology strategy at Xerox Palo Alto Research Center (Palo Alto, California). "From Singapore to Finland to Egypt, various AI techniques are solving a wide spectrum of strategic problems—from identifying criminal money laundering to growing cucumbers in the desert to troubleshooting interplanetary communications networks."

The 17 IAAI winners were Daewoo Heavy Industries (Korea); Mita Industrial Co., Ltd. (Japan); Singapore Telecom; Enso-Gutzeit (Finland); Canon USA; General Electric Capital Mortgage Corporation (2 awards); General Motors; GTE Laboratories; IBM; and United Technologies with Pratt & Whitney. The award-winning government agencies were the Ministry of Agriculture and Land Reclamation (Egypt); Port of Singapore Authority; NASA-Jet Propulsion Lab (2 awards); U.S. Army; and the U.S. Department of the Treasury.

High Payback

One of the main features that has characterized all the winning IAAI winning applications over the years is the substantial return on investment that organizations realize from

AI-based applications. Generally, most companies report payback on the initial development investment in under a year. More than that, many report as much as an order of magnitude improvement in productivity. This year was no exception. IBM, for example, reports that prior to using its AI-based system, producing a business plan typically took days to months; now, it takes fewer people approximately one-tenth of the time, with the same accuracy as previous planning methods.

Daewoo Heavy Industries Ltd. (Korea) increased production productivity by an estimated 30 percent and planning productivity by 50 percent—translating into about \$4 million annually—after installing an intelligent scheduling system for building very large ships. Singapore Telecom reported increased revenues of \$1.27 million, as well as better consistency and quality of service, and reduced staff time (from days to hours and hours to minutes) by using its intelligent agent-based system that manages traffic on the company's cellular mobile network.

Each winner made a 30-minute presentation on its application at the conference, giving attendees an opportunity to hear about the systems first hand and ask questions of the developers. "This process has proved very valuable," noted Aikins. "Managers and developers can learn much about what has worked in the past—and what hasn't worked. Many come away from the conference with new ideas for potential high-impact applications for their own organizations."

In addition to the papers being presented, there were invited panels and an invited talk over the course of the three-day IAAI conference. The panels were "AI and the Capital Markets" and "SIMNET (Intelligent Simulation in the Military)." Eric Grimson of MIT gave an invited talk entitled "Image-Guided Brain Surgery."