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INSTITUTE FOR HUMAN & MACHINE COGNITION

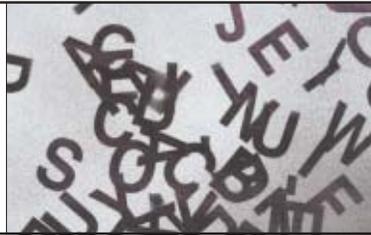
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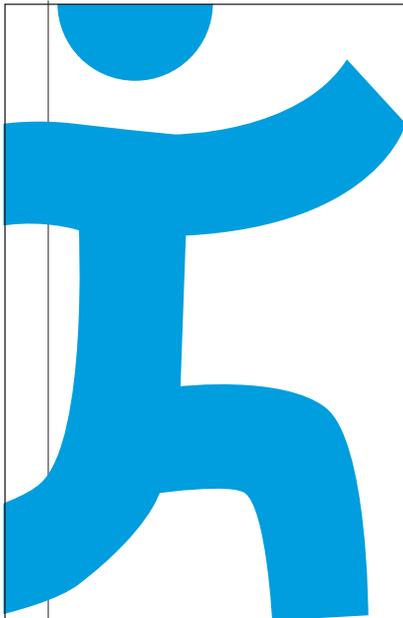
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INSTITUTE FOR HUMAN & MACHINE COGNITION

Welcome to the new IHMC newsletter. We hope to bring you up-to-date information on all of the exciting happenings here at the Institute.

IHMC was founded in 1990 with two part-time faculty positions. Since that time, IHMC has grown into one of the nation's leading research institutes with more than 110 researchers and staff. IHMC scientists investigate a broad range of topics related to understanding cognition in both humans and machines with a particular emphasis on creating novel technologies that amplify human abilities — from autonomous software agents to multisensory prostheses for situational awareness. At IHMC we design and adapt technology to “fit” humans rather than forcing humans to adapt to technology.

Our researchers are leaders in their fields. The selection of Henry Kyburg as an AAAI Fellow brings IHMC's (and Florida's) total of AAAI Fellows to five. We are particularly proud of Pat Hayes' recent selection as one of only five inaugural fellows of the Cognitive Science Society. I was honored this fall to be nominated by President Bush to serve on the National Science Board and am looking forward to the opportunity to work with my colleagues on the board to advance our nation's scientific goals.

IHMC provides a local forum for many issues of our day. In addition to the scientific conferences and seminars, we regularly host lectures by eminent urban planners and architects. Last fall we were honored to hear from Leon Krier, influential in the New Urbanism movement. These speakers address ways in which, like the technologies created by IHMC, cities can be built to leverage and extend human capabilities. Other recent speakers in this lecture series have included Robert Davis and Ray Gindroz and Jaquelin Robertson.

This newsletter provides a glimpse into the activities of IHMC. We plan to bring this insight to you quarterly so you can learn more about who we are, what we do, and our impact on the community, both the local UWF and Pensacola community as well as the national and international scientific community.

Kenneth M. Ford, Director

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“An expert knows all the answers – if you ask the right questions.”

– Author Unknown

Researchers at IHMC know how to ask experts the right questions. And they are helping others use the answers.

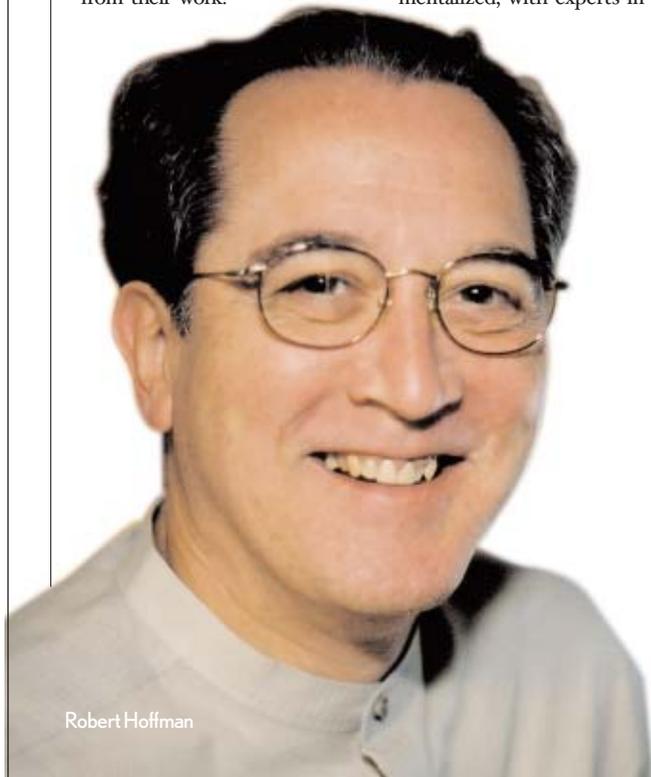
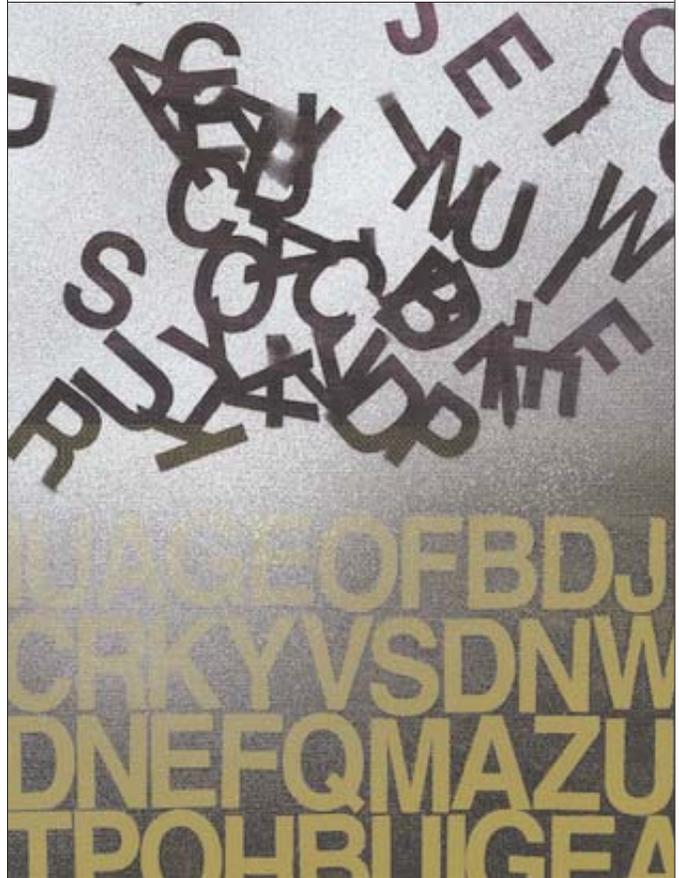
Robert Hoffman and Paul Feltovich, research scientists at IHMC, work in the field of “expertise studies.” They analyze how experts deal with complex tasks, using an array of techniques of cognitive task analysis and cognitive field research, then devise technologies based on this knowledge to improve training and provide performance support.

What types of tasks benefit from their work?

Virtually any field with elements that humans find difficult to handle: dynamic situations where things are changing all of the time; situations with many things happening simultaneously, particularly if they are interconnected; situations with non-linear, irregular events which are difficult to predict. These situations are found in nearly all fields, from war to nursing, meteorology to beach renourishment, team-building to fire fighting.

Consider, for example, the army of the future. Current military structure is very compartmentalized, with experts in nar-

Researchers at IHMC know how to ask experts the right questions. And they are helping others use the answers.



Robert Hoffman

row domains such as terrain analysis or meteorology. Military planners envision a future, however, where commanders must be well-versed in multiple

domains. Troops will be in mobile, self-contained units composed of people, vehicles, sensors, and computers, responsible for everything that is hap-

SCIENTIST PROFILES

Robert Hoffman

Hometown: Cincinnati, OH
Education: B.A., M. A., and Ph.D. in experimental psychology, University of Cincinnati
Joined IHMC in: 1999

A lecture in Introductory Psychology inspired Robert Hoffman. In this lecture, the professor speculated that computers may someday be so complex they will need psychotherapy. An avowed "science fiction nut," he remembered that concept from science fiction books and decided to major in psychology.

His passion for science fiction also made him jump at the chance to combine experimental psychology with "satellites and space and such." As a postdoctoral fellow at the University of Minnesota, he visited a friend who was analyzing remote sensing data. There he saw the need for research in human factors in analysis of this data, and his career in expertise systems was launched.

His first project in the field was in terrain analysis for the Army Corps of Engineers. The Corps already had computer scientists working to develop an expert system. However, with no social science training, they were struggling to learn the analysis keys from the experts. Hoffman saw the tremendous need to bring psychologists and computer scientists together for the development of successful systems.

Hoffman first met IHMC director Ken Ford about 15 years ago while organizing the first conference for computer scientists and psychologists in expert knowledge elicitation. He was enticed to come to IHMC after years of collaborative work. Here he appreciates the opportunity to use his skills to their fullest potential and work with the best people in the world. He also enjoys the family-friendly community. His only regret is that he didn't come sooner.

Although Robert would love to go into space, he thinks motion sickness would ruin the experience. Rather, he would love to stand "toe-to-toe" with molten lava. His more practical pursuits include restoring Art Deco furniture, woodworking, and camping with his wife, daughter, and son.

Paul Feltovich

Hometown: Sharpsville, PA
Education: B.S. in math, Allegheny College; Ph.D. in educational psychology, University of Minnesota
Joined IHMC in: 2001

Paul Feltovich has won the lottery. He was a tenured full professor, chair of the Department of Medical Education at Southern Illinois University School of Medicine—an impressive situation. However, he was moving farther from research and wanted to do something good with his remaining years. So he cashed in his lottery ticket and joined IHMC.

He believes he has done more here in a year than he would have in ten in his old position. And he is eating better, too—he has gone to lunch with colleagues here more than he did in his 20 years at Southern Illinois. Lunch is more interesting when spent talking with people who are excellent at what they do, he finds.

Working with excellent people is also what excites him about expertise studies. He enrolled in graduate school hoping to become a higher education administrator. He was surprised when he started that it was actually a counseling psychology program. Feltovich completed the counseling coursework but wrote his dissertation in cognitive educational psychology. That dissertation, on diagnostic reasoning in pediatric cardiology, was his first introduction to studying the skills of experts. And he got hooked.

The culture of IHMC fits Feltovich's approach to life well. He does things his own way, not focusing on pleasing others or padding his resume. Not that his resume is anything to scoff at, with the most cited paper in the history of the journal *Cognitive Sciences*, a "science citation classic," among many other accomplishments. He is, however, prouder of his 3 children than any professional accomplishment.

Pensacola is a welcome change from Illinois. However, he might have lost his hobby in the move. Paul enjoys growing vegetables, but the tomatoes he planted last summer were fried by the heat. A small price to pay for the beautiful weather.

pening in the air and on land in a twelve-mile radius. Under this scenario, the commanders will need to rapidly assimilate a broad range of information to formulate strategies.

Paul Feltovich is working on tools to help the commanders. He began by asking them to envision the battlefield of the future. What elements will it be vital to know? And what are the most difficult elements to understand?

Already terrain analysis appears to be one critical task which commanders will struggle with. So Feltovich needs to find a way to transfer the knowledge of terrain analysis experts to the commanders.

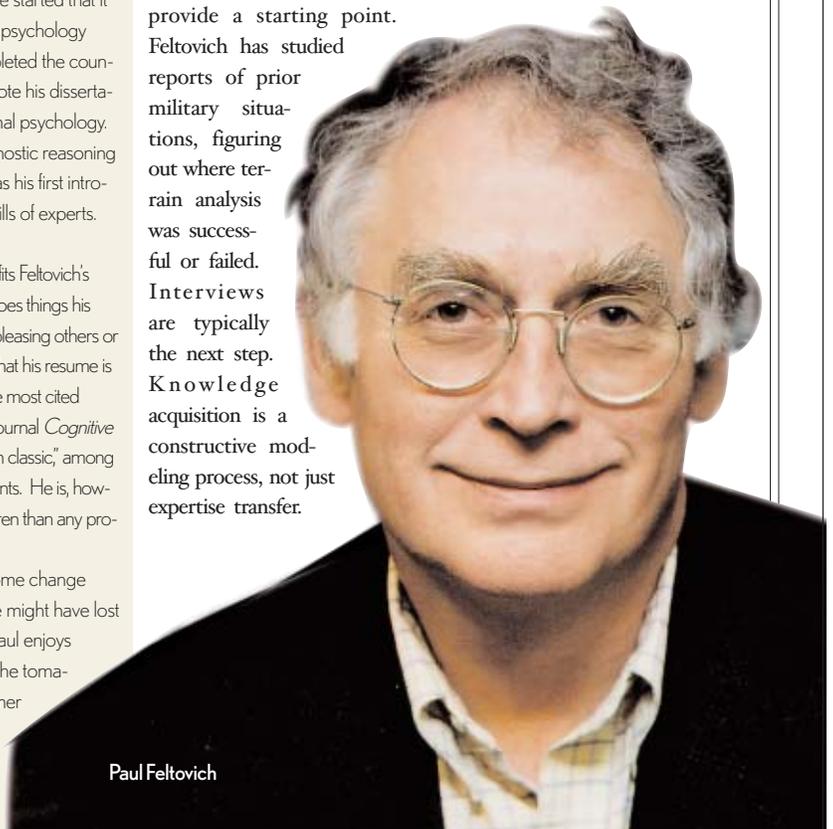
First he must learn how these experts think. Unfortunately, figuring out how experts know what they know, eliciting their knowledge, is harder than it might seem. Many experts have a hard time putting their thoughts into words, sometimes attributing their decision-making to a "sixth-sense".

Researchers, therefore, use various tools to model experts' knowledge. Documents can provide a starting point.

Feltovich has studied reports of prior military situations, figuring out where terrain analysis was successful or failed. Interviews are typically the next step. Knowledge acquisition is a constructive modeling process, not just expertise transfer.

Working together, the researcher and the expert construct explicit models of problem solving in a specific domain. For example, Feltovich might ask terrain experts to describe their thought-processes during a task, either real or contrived. Or, he might ask them to recall challenging cases and explain how they reached their conclusions.

During interviews, expert-use researchers frequently use software tools to facilitate the process of modeling and sharing expert knowledge. These tools, such as those designed by IHMC's Jeff Bradshaw, Bill Clancey, and Ken Ford, contribute to active collaboration between the experts and the researchers. They improve upon traditional interviews by increasing the speed of communication and limiting variation due to skill of the interviewers. In addition, they often result in models in a form that can be directly converted into tools for training and performance support.



Paul Feltovich



STORM CONCEPT MAP
www.coginst.uwf.edu/STORM-LK

In collaboration with IHMC, we hope to use these tools to do for electric power management what STORM did for meteorology.”

Meteorology is but one example of a flow system. Strategies used by an expert meteorologist, for example, may also apply to other flow systems such as cardiology or flood control. “Flow is one of the most poorly understood phenomena in biology, physics, chemistry, geology, meteorology, oceanography, and engineering,” says Richard Coulson, a professor of cardiovascular physiology and medical education at Southern Illinois University. A tool illustrating decision-making processes in many of these fields could provide a framework for analysis in all

One tool which has greatly improved knowledge acquisition is Concept Map Tools (CmapTools <http://cmap.coginst.uwf.edu>). These tools have been developed by a team at IHMC led by Alberto Cañas based on concept maps, invented by Joe Novak of IHMC while at Cornell, and are now widely used around the world. Many tasks can't be simplified as linear, step-wise decisions. Concept maps go beyond representing the procedural knowledge required to reach a decision, capturing the “why” of the decision in addition to “how”. Concept maps consist of nodes (elements of knowledge) and links (relationships between elements). Experts graphically describe their reasoning processes, indicating the multiple interconnections used to reach a decision. “Concept mapping is becoming a very useful tool for the research my colleagues and I perform. CmapTools enable experts to easily and rapidly convey their conceptual models,” comments Gary Klein of Klein Associates, a knowledge elicitation consulting firm.

Researchers develop tools to improve training and provide performance support based on the information gleaned from the experts. Just as they proved useful for eliciting knowledge, concept maps are effective for conveying that knowledge.

STORM (System To Organize Representation in Meteorology), demonstrates the power of concept mapping in disseminating experts' knowledge. STORM is a model of the knowledge of Gulf Coast weather forecasters. IHMC researchers, including Hoffman, Cañas, and Novak, designed STORM in collaboration with the Navy's Meteorology and Oceanography Training Facility to accelerate the training and improve the performance of experienced forecasters.

STORM was constructed using CmapTools. The nodes of the map contain links to resources, such as charts, text, or videos, and navigation between resources maintains the context of the decision process. The system also can be easily updated or expanded, creating a “living e-document”. After seeing STORM, Lew Hanes, a Human Performance Program Project Manager at the Electric Power Research Institute, decided a similar system would be extremely beneficial to his organization. “IHMC has created excellent tools for knowledge elicitation, modeling, and dissemination.

Researchers in expertise studies, such as Feltovich and Hoffman, ask the right questions to elicit all of the answers from the experts. These answers lead to better tools for training and support of workplace performance.

■ ■ ■ Figuring out how experts know what they know, eliciting their knowledge, is harder than it might seem. Many experts have a hard time putting their thoughts into words, sometimes attributing their decision-making to a “sixth-sense.” ■ ■ ■

flow systems. Coulson considers a multidisciplinary approach, like that by IHMC, powerful for improving comprehension of flow systems.

Feltovich and Hoffman have studied decision-making in different flow systems, Feltovich in cardiology, Hoffman in meteorology. With others, they aim to create a tool which enhances decision-making and knowledge acquisition across a range of flow systems, aiding many fields. Someone planning a beach renourishment project, perhaps, could analyze their task not only based on limited case studies but also based on an understanding of the complex flow system. The project would be better designed—and less expensive for the taxpayer.

The story doesn't end with constructing training and performance support systems. Or, it shouldn't. The installation of a new system changes the nature of work. Unfortunately, the current protocols rarely take that into consideration. Most systems are designed, prototyped, and installed, with few, if any, revisions. Once the innovation is passed to the client, the designers are done. To create a truly valuable tool, however, the researchers need to study the system in the workplace, looking at how the system is used and its effect on work.

There are numerous applications of expertise studies. With the knowledge elicitation tools developed to date, organizations which perform knowledge elicitation, such as IHMC and Klein Associates, help many organizations improve their training and performance or maintain institutional knowledge. The work of these and similar groups has already improved performance in a variety of fields, such as weather forecasting, firefighting and critical care nursing.

Researchers in expertise studies, such as Feltovich and Hoffman, ask the right questions to elicit all of the answers from the experts. These answers lead to better tools for training and support of workplace performance.

GRANTS

Between August and November 2002, IHMC was awarded over \$2.5 million for research.

■ ■ ■ AUGUST 2002 THROUGH NOVEMBER 2002

The 6th International Conference on Naturalistic Decision Making

Organizer: Dr. Robert Hoffman

Amount: \$60,000

Granting Agency: A number of agencies within Navy, Air Force, Army, NASA
Duration: 8/15/2002 through 10/30/2002

Traditional normative theories of decision making do not adequately represent how domain practitioners and experts solve problems and make decisions in "real world" settings. The emerging paradigm of "Naturalistic Decision Making" involves the study of effective decision-making in time-pressured, complex environments. The 6th International Conference on Naturalistic Decision Making will provide a forum for discussion of advances in the field. The grants are being managed through the Army Research Laboratory's "Advanced Decision Architectures Collaborative Alliance," and support conference planning and management. The conference, with approximately 200 attendees, will be held at the Hilton Garden Inn on Pensacola Beach in May 2003.

Integrated Approach to Reasoning Under Multiple Perspectives

PI: Dr. Pat Hayes

Amount: \$53,966

Granting Agency: NASA
Duration: 8/15/2002 through 3/14/2003.

Human beings often make intuitive leaps or find one thing reminds them of another. Computers, however, typically lack this ability. Using this grant, we will classify some intuitive patterns of reasoning and implement them in software. This software will then exhibit some of this ability to track inferences and make connections between events and things.

Concept Mapping (Cmap Tools) Software and Knowledge Model Project

PI: Dr. Alberto Cañas

Amount: \$1,700,000

Granting Agency: Naval Education and Training Command
Duration: 9/1/2002 through 12/31/2003

This project continues a long and productive relationship between IHMC and the Chief of Naval Education and Training (CNET). Since 1996, IHMC has been funded by CNET to research and experiment with new technologies to enhance computer-mediated learning leveraging on the Institute's expertise in knowledge modeling. Under this proposal, the CmapTools software will be extended and refined towards development of a proof of concept Career Master Plan Knowledge Model that will support CNET's Task Force Excel.

The Bayesian Network Lens

PI: Dr. David Danks

Amount: \$49,615

Granting Agency: James Scott McDonnell Foundation
Duration: 10/1/2002 through 10/1/2003

Data acquired from many disciplines, including epidemiology, cognitive neuroscience, and fault analysis on complex mechanical systems, frequently has underlying causal relationships. Causal Bayesian networks are a framework in which to represent such causal relationships. Using them, one can derive constraints for known causal relations or extract causal relations from new datasets. This tool has been applied to many fields, but only sporadically. Using these funds, Bayes net researchers and researchers in other fields, such as psychology and neuroimaging, will hold a series of workshops/meetings to explore the range of applications of Bayes nets. Viewing the world in terms of Bayesian networks can lead to wide changes in experimental methodology and data interpretation.

MAST: A Mobile Agent-based Security Tool for Administration and Training

PIs: Niranjan Suri and Marco Carvalho

Amount: \$509,991

Granting Agency: National Science Foundation
Duration: 10/1/2002 through 9/30/2005

The increasing reliance on networked computers by military, industry and other civilian organizations has made security a critical issue. This grant will fund the development of a tool to improve computer and network security. This tool will build on prior work at IHMC on mobile software agents and concept maps. Using this tool, administrators will be able to better secure systems against a variety of attacks. In addition, the tool will provide performance support, improving administrators' decision-making about security.

Intergovernmental Personnel Act (IPA) Agreement

PI: Dr. Anil Raj

Amount: \$10,079

Granting Agency: Naval Aerospace Medical Research Laboratory
Duration: 10/13/2002 through 2/13/2003

Human performance during aerospace operations is dependent on levels of arousal and attention. Human arousal and attention can be measured via self-reporting, assessments of physiological/reflexive responses, or assessments of operational performance. Under this grant, Dr. Raj will collaborate with researchers at the Naval Aerospace Medical Research Laboratory to develop a mutually useful physiological/reflexive measure of human alertness. Dr. Raj and NAMRL will then be able to compare this value with other arousal measures in future experiments.



Software Agents and Knowledge Discovery and Data Mining Research for Complex System Safety, Health, and Process Monitoring

PI: Dr. Jeff Bradshaw and Dr. Clark Glymour

Amount: \$200,000

Granting Agency: NASA
Duration: 10/1/2002 through 9/30/2003.

There are two rather distinct approaches to monitoring and controlling complex system safety, health, and process optimization. The first involves monitoring sensor outputs in real time and making adjustments or issuing alerts when predetermined exceedences are realized. The second is to collect data over a period of time and do complex post-analysis. Both approaches have been effective in selected domains. This grant will fund the development of fundamentally new methods for system safety, health, and process monitoring with capabilities beyond either of these currently used methodologies. These new approaches will incorporate software agents and intelligent system capabilities within the context of Human Centered Computing. Software agents will perform real-time monitoring and analysis that take human operator capabilities into account to maximize system safety. These tools will greatly improve health monitoring and process control.

HONORS

RECOGNITION FOR IHMC RESEARCHERS



Ken Ford nominated for National Science Board

President Bush has nominated Dr. Ken Ford, director of IHMC, for a six-year term on the National Science Board. NSB acts as the national science policy advisor for the President and Congress and provides oversight for the National Science Foundation, the leading agency for basic scientific research funding. There are 24 members of the board, with eight new members appointed every two years.

An ad hoc committee of the NSB reviews approximately 200 nominations submitted by scientists through-

out the country each appointment cycle. The committee selects 35 to 40 individuals based on their eminence in science, engineering, education, or public service. The President pares that list to the final 8 appointees, who must then undergo Senate confirmation. Henry McDonald, director of NASA's Ames Research Center in California, said, "This means Dr. Ford has been recognized nationally by his peers in the general science community as a person of considerable talent whose views are very much worth considering."

Ford commented, "This will be a new challenge and a new opportunity to have a positive impact on national science policy." The NSB meets five times a year to review new NSF programs and major awards, guiding the strategic direction of NSF. The NSB also initiates and conducts studies on a wide range of topics related to science research and education. These studies are presented to the President and Congress, as well as disseminated to the general public. The work of the NSB is influential in sculpting the direction of national science policy for years to come.

This appointment underscores Ford's influence on science in this country. The founder and director of IHMC, Ford will be the only Florida resident on the NSB. Retired Gen. Al Gray of Alexandria, Va., a former commandant of the Marine Corps, noted the broad implications of Ford's appointment. "It's a great honor for him personally," he said. "It's good for the Institute. It's good for the university, and it's good for your state. This is simply going to broaden people's understanding of the unique contributions he brings to the country."

Pat Hayes Named Inaugural Fellow of the Cognitive Science Society

Dr. Patrick Hayes was named as one of five inaugural fellows of the Cognitive Science Society. The Society brings together researchers who hold a common goal of furthering the understanding of the nature of the human mind. It promotes scientific interchange among researchers in disciplines of cognitive science, including artificial intelligence, linguistics, anthropology, psychology, neuroscience, philosophy, and education. This year, the Society began honoring those who have made significant contributions to the field by designating a set of Fellows to the Society. To ensure that the designation becomes a mark of distinction within the field of cognitive science, the Governing Board selected a group of five eminent scientists who have made outstanding contributions to the field throughout their careers. In the early 1980's, Hayes established the Cognitive Science program at Rochester University, the first major university to offer an accredited major in the field. Hayes joined the team of research scientists at IHMC in August 1996. Ken Ford, director of IHMC, notes, "In 1990, Dr. Hayes was also honored as one of the inaugural fellows of the American Association for Artificial Intelligence. Pat Hayes is the only person to have been selected to be a member of the inaugural class of Fellows for each of these prestigious scientific societies."

Henry Kyburg Named Fellow of the American Association for Artificial Intelligence

Dr. Henry Kyburg has been selected for fellowship by the American Association for Artificial Intelligence (AAAI). Founded in 1979, AAAI is a nonprofit scientific society devoted to advancing the scientific understanding of the mechanism underlying thought and intelligent behavior and their embodiment in machines. Each year, AAAI recognizes a select group of individuals who have distinguished themselves in the AI profession. Dr. Kyburg was selected for his seminal work (started in the 1950's) on issues related to statistical inference and its logical foundations. Dr. Kyburg is also a Fellow of the American Association for the Advancement of Science and the American Academy of Arts and Sciences.

Frank Andrasik Receives the Distinguished Scientist Award

Dr. Frank Andrasik was awarded the Distinguished Scientist Award at the 33rd Annual Conference of the Association for Applied Psychophysiology and Biofeedback (AAPB). The award is the highest given by AAPB and recognizes those who have made truly exceptional, long-term contributions to research in psychophysiology. Andrasik was recognized this year for his outstanding research on behavioral therapies in treatment of pediatric and adult headache. He is also recognized for his outstanding service as Editor of the AAPB research journal *Applied Psychophysiology and Biofeedback*. During his tenure as Editor, the journal has made major advances in presenting the best of scientific and clinical outcome papers. Andrasik, a psychology professor at the University of West Florida, joined the research staff at IHMC in the fall of 1999.

David Still awarded patent for OZ

Dr. David Still of IHMC and Leonard Temme of the Naval Aerospace Medical Research Laboratory were awarded US Patent 6,486,799, "Computer Based Human-Centered Display System", in November. The patent is based on OZ, a NASA-funded cockpit display which replaces traditional dials and gauges with a symbolic

display. Still drew on his knowledge of human vision, particularly the importance of peripheral vision, to design the display so that pilots can comprehend it in a single glance. Patent approval brings the technology one step closer towards taking flight.

Jeff Bradshaw appointed to honorary researcher position

Dr. Jeff Bradshaw will serve as an

Honorary Visiting Researcher of the Centre for Intelligent Systems and their Applications at the University of Edinburgh, Scotland. Bradshaw has had a long-standing relationship with the Centre, focusing primarily on the Coalition Agents eXperiment (see Recent Events, page 9). The appointment will facilitate further collaborations on this and several other planned projects.

ARRIVALS

SEPTEMBER 2002 THROUGH NOVEMBER 2002



James Allen The fifth AAAI Fellow employed by IHMC, James joins us on a joint appointment with the University of Rochester, where he has been a professor for 23 years. His research focuses on collaborative human-machine interaction, particularly the development of natural language processing interfaces. His research breaks down into two main subareas, broadly classified as research in discourse and research in plan reasoning. He combines these subareas in the TRAINS project, an intelligent planning assistant that can converse in spoken natural language with a person to create, discuss, and evaluate various plans involving freight shipments by train. One emphasis of his research in discourse is the representation and use of the context of dialogue to solve problems in semantic interpretations and the recognition of the intentions underlying the speakers' utterances.

Sheldon Brahms Sheldon is an experienced interaction designer skilled in human-computer interaction, interface, and graphics. Previously at the Advanced Technology Group at Apple Computer, at IHMC he will work initially on CmapTools.

Larry Bunch As a UWF and IHMC alumnus from the early 90's, Larry proudly returns to IHMC as a research associate focused on the Java Agent and CmapTools efforts. He brings extensive commercial software development experience to the team.

Nate Chambers A "virtual" employee of IHMC, Nate is a graduate student in computer science at the University of Rochester. He is developing a dialogue system for a collaborative planning assistant program.

Paul Chang Paul is a first-year PhD student at National Tsing-Hua University, Taiwan. He is visiting IHMC for 6 months to participate in KAoS and AgentCities and Grid Computing. His research interests include the interaction of software agents within networks.

Adrian Granados Adrian is an undergraduate computer engineering student at Instituto Tecnológico de Costa Rica. He joins the IHMC for one-year internship and is currently working on CmapTools as part of his graduation project.

Scott Nash Scott is a senior in electrical engineering at UWF who already holds a BS in computer science. He is working with Anil Raj on the Tactile Situation Awareness System.

Megan Pratt Megan returns to her hometown of Pensacola to join IHMC after receiving a BS in chemistry from MIT and a PhD in neuro-

science from Harvard. She has been tapped to write and edit various content for IHMC including the newsletter and web page.

Erin Snow Erin is a freshman at UWF and loves working as the IHMC receptionist at 127 Alcaniz St. She is a UWF cheerleader and the philanthropy chair for her sorority, Alpha Delta Pi.

Alejandro Valerio Alejandro is an assistant professor of the Computer Science Department at Instituto Tecnológico de Costa Rica. Recently he coordinated the Informatics and Technology component of the LIN-COS project. At IHMC he is working on the CmapTools project, integrating a lexical reference system called Wordnet into the CmapTools client.

DEPARTURES

Toni Hardin

Toni is moving to sunny California. She began at IHMC in 1997 as a senior fiscal assistant. Once at IHMC, she established the whole financial setup at the Institute and was quickly promoted to Budget and Grants Manager. She is marrying SSgt David Hutchins who is stationed at Camp Pendleton Marine Base, Fallbrook, California. They will be there until he retires from the Marine Corps, perhaps in two years. In early January, they will be taking a cross country trip (honeymoon), along with two horses, two dogs, and two cats (Toni's Ark), to their new home.

RECENT EVENTS

■ ■ ■ IHMC HOSTS SOFTWARE AGENTS MEETING, LEADS COALITION MILITARY SIMULATION



such as personal travel agents and audio-visual system agents.

IHMC led the US component of the international CoAX military simulation. IHMC's KAoS and Nomads technology proved critical to the success of the demonstration. KAoS domain and policy services provide the means to specify, deconflict, and enforce authorization, encryption, access control and agent mobility policies, among others. The policies enable selective sharing of information among coalition partners and control agent behavior. Nomads provides services for agent mobility while ensuring safety for the hosting platforms.

Through the combination of agent mobility and resource control, it optimizes network throughput and prioritization of computing resource usage.

■ For further information on either the conference or the military demonstration, please contact Jeff Bradshaw at jbradshaw@ai.uwf.edu or Niranjan Suri at nsuri@ai.uwf.edu or visit the FIPA website (www.fipa.org) or the CoAX site (www.aiiaied.ac.uk/project/coax).

The year is 2012. The UN is engaged against an expansionist nation. A submarine has attacked a coalition member's ship. The coalition members must plan the rescue and treatment of survivors and coordinate the hunt for the submarine.

Coordinated actions like these can be simplified by cooperative computer programs. These programs, called software agents, perform complex tasks by interacting with other agents and traveling over networks to perform tasks at remote locations. They communicate with humans and other agents to find, format, filter, and share information. They act in real-time, responding as situations unfold. The agent systems protect against component or network failures or deliberate information warfare attack. Future deployment of these agents will require meeting several challenges, including the development of

security systems and prioritization methods as well as standard interaction protocols.

Two recent events highlighted IHMC's role as a world leader in the research and development of software agents technology. The fictional scenario described above was the one simulated during the Coalition Agents eXperiment (CoAX) demonstration at the Naval War College, Newport, RI, on October 29 and 30. In addition, from October 14 through 18 IHMC hosted the quarterly meeting of the international Foundation for Intelligent

Physical Agents (FIPA) devoted to developing software agent standards.

Representatives from Fujitsu, Boeing, MITRE, Siemens, and universities in several countries attended the FIPA meeting at IHMC. Attendees collaborated on the development of standards for software agents during workshops at the meeting. Standards under development include those for agent communication, for intelligent interaction with new kinds of Web services, for systems for agents to move between computers, and for applications

■ ■ ■ **The year is 2012. The UN is engaged against an expansionist nation. A submarine has attacked a coalition member's ship. The coalition members must plan the rescue and treatment of survivors and coordinate the hunt for the submarine.** ■ ■ ■

RECENT EVENTS

■ ■ ■ ADDITIONAL EVENTS AT IHMC



Renowned architect and urban theorist addresses overflow audience

Leon Krier spoke on the ideal built environment at a lecture at IHMC on November 12. Krier said that "the modern suburb has become the symbol of a society under threat" and stressed the power of physical design in changing the social life of a community. Elizabeth Plater-Zyberk, one of the designers of Seaside, FL, states, "Leon Krier is one of the most important influences on the principles espoused by the charter for the New Urbanism."

Known locally as one of the consultants on Seaside, his influence spreads worldwide. Originally from Luxembourg, he has worked in Luxembourg, France, England, Italy, Spain, Germany, and the US. Krier has taught at the Royal College of Arts in London, Princeton University, and Yale University. A personal advisor to the Prince of Wales, he created the master-plan for Poundbury, a new settlement in Dorset, UK. His ideas are now being incorporated into recommended reforms for the entire European Community.

IHMC holds annual advisory board meeting

IHMC's advisory board met October 17 and 18 to review changes in the last year. Ken Ford, in his overview report to the Board, stressed the accomplishments of IHMC and especially the awards and recognition for some of our senior and key researchers (see Honors and Awards, page 7). The major point of discussion during the two day meeting focused on IHMC's impending transition to a 501.c.3 non-profit corporation affiliated with UWF. Ford brought the Board up-to-date on progress toward that goal, and the board members provided valuable insights and suggestions.

IHMC's advisory board is a distinguished group. The members include leaders in the Pensacola community as well as national leaders in the business and research community. A complete listing of members can be found on Page 2.

NASA scientist discusses research for space exploration

Nicola Muscettola, the Autonomy & Robotics Area Lead at NASA Ames, described current NASA research aims in his talk "Planning, Execution, Life, the Solar System and Everything" on September 24. A major focus of NASA research currently is the design, deployment, and operation of robotic systems that will reach planets, planet moons, asteroids, and comets searching for water, organic building blocks and signs of past or present microbial life. None of these missions will be achievable without substantial advances in the design, imple-

mentation, and validation of autonomous control agents capable of robustly controlling a robotic explorer in an hostile environment with very limited or no communication with Earth. Muscettola addressed the challenges of these missions and some of the results of NASA's research into autonomous agents.

IHMC researcher presents advances in design and control of walking robots

Walking is an easy task for most humans and animals. In his talk on October 3, entitled "Exploiting Inherent Robustness and Natural Dynamics in the Control of Bipedal Walking Robots," Jerry Pratt, a research scientist at IHMC, described factors which simplify natural walking. By exploiting those factors, Pratt aims to improve models of human gait as well as bipedal and quadrupedal robots. He presented simple physical models of bipedal walking which he used in controlling bipedal robots and simulations. These control strategies result in natural walking and have been

adapted to such things as exoskeletons that augment human performance.

IHMC researchers learn basics of intellectual property law

Nevin Shaffer, an attorney and partner at Shaffer & Culbertson, LLP, who specializes in intellectual property, provided an introduction to IP law at his talk, "Intellectual Property (IP) Law and Science: Oil and Water? or Hand in Glove?" at IHMC on November 4. With IHMC research leading to valuable intellectual property, he argued that an understanding of IP law is essential.

IHMC hosts EPRI workshop

Managers from power companies that are members of the Electric Power Research Institute (EPRI) attended a three-day workshop at IHMC on using CmapTools. These managers will use CmapTools to document the knowledge of soon to retire workers, preventing "brain drain". This workshop was one in a series of such workshops funded by EPRI.

HOT LINKS

Click on Website links below to be taken directly to the site

IHMC Web Site ▶ <http://www.coginst.uwf.edu>

IHMC CmapTools ▶ <http://cmap.coginst.uwf.edu>

STORM ▶ <http://www.coginst.uwf.edu/STORM-LK>
System To Organize Representation in Meteorology

FIPA ▶ <http://www.fipa.org>
Foundation for Intelligent Physical Agents

CoAX ▶ <http://www.aiai.ed.ac.uk/project/coax>
Coalition Agents eXperiment

LOCAL NEWS

■ ■ ■ IHMC AND PSYCHOLOGY DEPARTMENT COLLABORATION

Humans can only process so many things at once. When they are overwhelmed, they might let some tasks slide or do a mediocre job on all the tasks. Anil Raj of IHMC and Steve Kass of the UWF Psychology Department, with others in both organizations, are working together to develop a computer system that will determine, using several physiological measures, when a human is overworked. Based on these measurements, the system will determine the appropriate work load and take over more mundane tasks as necessary. By pooling their resources, these researchers will create a tool which complements human capabilities.

This collaboration is one of many undertaken between the UWF Psychology Department and IHMC. The late Bruce Dunn of the Psychology Department played a pivotal role in the founding and development of IHMC, setting the stage for the importance of psychology to IHMC. UWF President John Cavanaugh states, "Strong collaborative ties between IHMC and the Department of Psychology are highly beneficial to both. The assets of the departments are complementary, and the few hurdles to collaboration can be easily overcome."

The contributions of psychologists are integral to the mission of IHMC. IHMC has pioneered an emerging perspective for the design of new technologies. This perspective, human-centered computing (HCC), places human/machine interaction at the center of technology

design; human thought and action and technological systems become equally important aspects of analysis, design, and evaluation. HCC research requires a broader interdisciplinary range than has traditionally been associated with artificial intelligence work, including computer scientists, cognitive scientists, and psychologists, among others.

Several psychologists, including Robert Hoffman and Paul Feltovich (see Scientist Profiles, page 4), work at IHMC. In addition, some members of the Psychology Department, including Kass and Frank Andrasik, hold joint appointments with IHMC. However, the work of these researchers covers only a portion of the areas where psychology research can contribute to the mission of IHMC. Collaboration with other members of the Psychology Department can expand the range.

Research in the UWF Psychology Department emphasizes the analysis, description, and prediction of behavior. This understanding of behavior is central to IHMC's goal of designing novel tools and applications that extend human abilities. Along with the specialized knowledge of the faculty, the facilities of the department, such as an EEG being used in the collaboration between Raj and Kass, compliment the resources of IHMC.

Research collaborations between IHMC and the Psychology Department are only one way these organizations strengthen one another.

In addition, several IHMC researchers give guest lectures or even teach entire courses on campus. A masters program in cognitive sciences, in the planning stages, may bring together researchers from IHMC, psychology, computer science, and perhaps other departments such as biology. The relationships forged in this new program may spark new collabora-

tions between IHMC and researchers on campus.

Psychologists have a deep understanding of human behavior. Computer scientists are skilled at the design of novel technologies. By working together, researchers in the Psychology Department and IHMC can pursue truly human-centered computing.



EVENTS

■ ■ ■ COMMUNITY AT IHMC

Gulf Coast Crimestoppers, 2nd Tuesday of each month

Association of Environmental Professionals, 3rd Friday of every month

Clean & Green Board Meetings, 3rd Tuesday of every month

UWF courses, Spring semester

Strategic Management for Public and Non-profit Organizations (PAD 6335), Dr. James Munro,
Mondays, 5:30-8:30 pm

Advanced Computer Architecture (CDA6158), Niranjan Suri,
Tuesdays, 5:30-8:30 pm