FLORIDA INSTITUTE FOR HUMAN & MACHINE COGNITION

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While IHMC's research has an impact across the state, as well as around the nation and world, we play a particularly large and direct role in the economy and community of Northwest Florida by providing high-wage jobs and attracting talented and highly educated people to the panhandle region from around the world. DoD activities are particularly important in Florida's panhandle and the DoD is by far IHMC's largest and most important customer, accounting for approximately 75% of our federal funding. Much of this work directly supports the military missions of the Northwest Florida bases from Pensacola to Panama City. IHMC has active research contracts with DARPA, ONR, AFRL, ARL, and several other elements of DoD.

We recently had the opportunity to participate in the Northwest Florida Legislative Day in Tallahassee to showcase our research and help highlight the diversity of the regional economy (see page 14). The research prototypes demonstrated at the IHMC booth were quite an attraction and made a strong impression on the many visitors and government leaders who stopped by. Indeed, we kept our display booths open for two hours past the allotted time to allow busy senior state officials the opportunity to visit our presentations. Key to our success were the exceptional contributions of the researchers and support staff who traveled to Tallahassee to put in many long hours on that important day and I want to acknowledge their efforts.

IHMC is also utilizing its research to help improve the quality of education. We are particularly excited about a new collaboration with Brown-Barge Middle School in Pensacola. Brown-Barge is an internationally recognized magnet school emphasizing an integrated curriculum supported by technology. In this partnership, IHMC is bringing the CmapTools software to the Brown-Barge classrooms, and the IHMC staff will conduct workshops to train the Brown-Barge teachers in the most effective use of the concept mapping software. The IHMC software is a natural fit for supporting the team-oriented, collaborative experience in Brown-Barge's integrated curriculum environment. As another component of the new partnership, IHMC researchers will be sharing their expertise and enthusiasm to supplement various curriculum streams. This winter, for example, several IHMC scientists gave presentations and worked in small groups with Brown-Barge students in the Robotics stream. Outreach programs like this, and the extremely successful ongoing "Science Saturdays" program run by Dr. Megan Pratt, serve to improve education in our community and, we certainly hope, inspire future scientists and engineers for the Northwest Florida workforce.

IHMC is also heavily engaged in a new nation-wide project involving the use of CmapTools in the public school system of the country of Panama through a collaboration with the Secretary for Governmental Innovation and Ministry of Education. We are particularly excited about this bold undertaking and will be sharing more information in the next edition of this newsletter.

We are looking forward to continuing to expand our research programs and contributions to the community and state-wide economic development. With the continued extraordinary efforts of our IHMC team and the encouragement of our many supporters I remain confident of success.

Kenneth M. Ford, Director

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FIHMC BOARD OF DIRECTORS

Work System Design

"The mechanic that would perfect his work must first sharpen his tools."

—Confucius

The year is 2030. The first astronauts have touched down on Mars. They have started their exploration of the surface, headed to a place that may have once contained life. Immediately one astronaut is unable to communicate with base. After half an hour of troubleshooting the computer system, the team discovers that she had simply put her water supply in the way of the signal.

Later, after the exploration, the astronauts review their samples. Unfortunately, another half an hour is wasted determining where samples are from because the computer system allowed different astronauts to use different names for the same location.

Luckily, scenarios like these won't happen, thanks to studies of work environments being conducted by IHMC's Bill Clancey and his coworkers. Through the development of new methodologies for understanding work, the creation of novel simulation tools, and first-hand experiences simulating Mars exploration, they study the complex interactions of people, facilities, procedures, and tools. From this understanding they sharpen tools to improve work.

In any work environment, what can be accomplished depends on the knowledge of the participants. But whether an individual's knowledge comes into play depends on relationships and informal practices, the norms of the group. For instance, a person may ask a knowledgeable friend for help, rather than look for answers in books. In addition, physiological needs such as hunger or fatigue and the physical environment influence group interactions. A room of cubicles or open desks has a different dynamic than individual offices with closed doors.

All of these factors influence work activities. Such activities are contrasted with standard protocols or procedures, which are often quite idealized. If you ask a worker to describe how they accom-

SCIENTIST PROFILES

Bill Clancey

Hometown: East Brunswick, NJ
Education: B.A. in mathematical sciences, Rice University; Ph.D. in computer science, Stanford University

Joined IHMC: 1997

As an IHMC researcher on leave to NASA, Bill is pursuing many passions: space exploration, being outdoors, and photography. He has always been enamored by the space program, but he thought you had to be a military test pilot, astronomer, or rocket scientist to be involved. He enjoys spending time outdoors during experiments at the Mars simulation habitats. He takes photographs and videos during his participant observations. All this in addition to his professional interests of computer science and cognitive science.

As he tells students during his frequent visits to schools, Bill's discipline did not exist when he was in high school. While in graduate school at Stanford, his work was like making hammers and looking around for the right nail. During his years at the Institute for Research on Learning, he learned the importance of working with end-users to figure out what tools they actually need. Now as Chief Scientist for Human Centered Computing at NASA's Ames Research Center, Bill works on methodologies for how computer scientists can develop useful tools. He supervises a group of about ten people pursuing various aspects of work systems design as well as working directly as the principal investigator on multiple projects.

Though his academic background is in math and computer science, Bill has always had an interest in anthropology and philosophy, taking many courses in both fields. Without that background, he would never have been prepared to understand activity theory, which underlies most of his work in work systems design. As a cognitive scientist, Bill is particularly intrigued by understanding how conceptualization works. He is most proud of his heuristic classification paper, which, on Google's Scholar search, appears on the same page as giants in the field like Piaget. Much of his theoretical work, however, has been on hold for the last five years as the applied track, the Mars simulations, have been so successful.

plished a procedure, they will often omit many factors that influenced their success. They misremember the frequency of interruptions or take for granted a work-around they used.

To better represent the work environment, Clancey and coworkers developed the Brahms simulation tool. Using data from time-lapse videos and first-hand observations, work systems modelers create storyboards of activities. These simulations depict the interactions of people with each other, their tools, such as computational systems, and their physical environment.

How do the people actually carry out their activities? Maybe they crowd together at a small table rather than divide into two separate rooms. Maybe one person checks the map every few minutes while another relies mostly on memory. Based on participant observations, the simulations may highlight bottlenecks, useful and superfluous tools, or obstacles. The simulations then can be altered to visualize new operational concepts or the potential for automation, better physical design, or improved scheduling.

Working the kinks out of a plan is critical for NASA in planning their missions. A Mars mission will be expensive, without much opportunity for trial and error, and, with the round-trip communication time delays of up to 40 minutes, the astronauts will have to rely more on their coworkers and tools than did the astronauts on the Apollo lunar missions. Designing the appropriate tools, both computational, like software agents, and physical, like picks and sample bags, for these missions is vital. The Brahms models can include geography, objects such as spacesuits or vehicles, and activities such as eating meals and donning spacesuits. Models also can contain computational agents and simulated people. By including all of these realistic features, planners can better anticipate the time constraints and needs of the mission.

Based on simulated Mars Society missions at the Flashline Mars Arctic Research Station, Clancey created Brahms simulations to gain insights into how astronauts might work together. The crew's work centers on the geology and biology of a High Canadian Arctic island, and is viewed as an analog to a future Mars mission. As a participant observer, a member of the crew

of six, Clancey documented activities in the research station: who did what, where, when, and why. At the end of the week he had compiled about fifty different activities, both individual, such as writing emails and recording observations, and group, such as extra-vehicular activities (EVAs) and planning meetings.

Clancey focused on the drivers of activities as well as effects of layout on the use of the facilities. For example, group activities, particularly the EVA, define the chronology of the day. In Brahms these drivers are specified and influence the simulated activities throughout the day.

During group activities, the crew gathered together, but the workstation area along the wall was too small for the entire crew and their computers. In addition, crew members tended to gather upstairs for all activities. Simulations using Brahms could investigate alternative layouts, exploring the motivations for use of suboptimal arrangements and improving spacestation design.

In addition to being a modeling and simulation tool, Brahms can also serve as a runtime system where the simulated people and systems like rovers are replaced by real people and systems. The computational tools, such as personal agents for the people, are maintained. These agents take care of tasks at which computers excel, supporting the work that the people are doing. For example, there is no need for the astronauts, in their cumbersome spacesuits, to fiddle with GPS units or be concerned about which GPS standard to use—leave the path tracking to agents.

A Mars mission will be expensive, without much opportunity for trial and error, and the astronauts will have to rely more on their coworkers and tools than did the astronauts on the Apollo lunar missions. Designing the appropriate tools, both computational and physical, for these missions is vital.

Using Brahms as a runtime system, Clancey's research group, along with three NASA centers and several universities, developed the Mobile Agents system which he has tested at the Mars Desert Research Station in Utah during two-week stays. This system monitors astronaut health, tracks locations, and keeps them on schedule during planned activities. In addition, it allowed voice annotations and stored photographs. These features were all created based on obstacles noticed in direct observations at previous simulations, Brahms simulations, and analysis of the conversations between Apollo lunar astronauts and CapCom, their earth-based human coaches.

The overall idea was to automate the role of CapCom as much as possible—the distance to Mars would preclude such real-time conversations with Earth.

In the first Mobile Agents tests, each day started with a planning meeting determining the sequence of activities for the day. The Brahms system agents would then track the day's activities, following the lead of the crew in commencing and then guiding the crew in the tasks. Taking baby steps, the mission began with testing systems inside the habitat, then going on the porch, walking around the habitat, and exploring a nearby ravine. Through all of these steps, mistakes were found and either solved on site or noted for future system improvements. For example, the script had the astronauts tell the system that they were putting on their suits. Unfortunately, they didn't have their headsets on until their suits were on—and the GPS units didn't work inside the habitat, so the system couldn't find them.

Clancey also observed many details about how the geologists actually worked, which will influence how activities are planned. In addition, baseline studies of how the geologists use tools without their spacesuits will influence the design of tools for a Mars exploration. One lesson they learned from the physical simulation was the need for the rover to serve as a relay of the communications network. This is a simple change, but one that would greatly improve the ability for the geologists to explore further and more safely.

The culmination of the second Mobile Agents experiments in Utah was a trip to a remote canyon, five kilometers from the base station, by two geologists in spacesuits. They had the computer transmit photographs, noting automatically the location and time, to the base station and then via satellite to a science team distributed around the world. Reaching this milestone was not without its challenges, particularly in setting up the communication relays in difficult terrain and each step along the way provided information about tools to simplify the activity.

Through the real life simulations at field stations and the computer simulations using Brahms, Clancey and coworkers are identifying real needs for Mars exploration. Instead of relying on perceived or anticipated needs, they and others can develop new technologies and tools that will indeed be used and improve the work environment.

HAPPENINGS

EVENTS, HONORS, AND NEWS AT IHMC

IHMC and UCF sign affiliation agreement

UCF President John Hitt and IHMC's Director Ken Ford sign Affiliation aggrement.

Continuing their efforts to broaden research partnerships throughout Florida, IHMC finalized an affiliation agreement with the University of Central Florida (UCF) at the Orlando campus on December 8, 2004. This affiliation, similar to affiliations with Florida Atlantic University and the University of West Florida, will streamline joint research efforts, faculty appointments, and a range of other activities. Complementary research efforts, particularly in the areas of computer science, simulation, and training, underlie the strength of this unique partnership.

"This forward thinking partnership represents the incredible progress Florida's IHMC is making to expand progressive research programs at Florida's universities," said Governor Jeb Bush. "This kind of scientific collaboration strengthens our state's intellectual capital and encourages economic growth and interest among high-tech entrepreneurs."

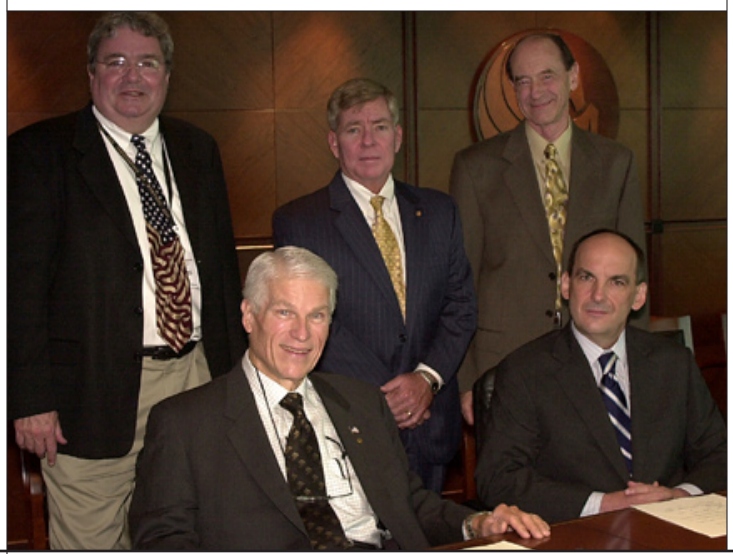
UCF President John Hitt signed the affiliation agreement along with IHMC's Chief Executive Officer Kenneth Ford. "Our partnership with IHMC provides a perfect example of how Florida can, and should, capitalize on the creative potential that exists in its universities and research institutes," Hitt said. "We look forward to a long and productive working relationship between the researchers at UCF and those at IHMC."

The potential represented by this agreement was noted by several state policymakers. "The residents of the greater Orlando community should be proud and excited by this incredible new partnership between UCF and one of the nation's most renowned research facilities," said State Senator Lee Constantine, R-Altamonte Springs. "I can only begin to imagine the innovative ideas that will be sparked by joining the minds of brilliant scientists and researchers from these two fine institutions."

State Representative David Mealor, R-Lake Mary, also commended the new affiliation. "The knowledge and commercialization potential created by this partnership meet our Governor's initiative to diversify the state's economy. This project also has the potential to be beneficial to our nation's defense industry. And as chairman of the Committee for Universities and Colleges, I am excited about the potential this creates for unique learning opportunities for our state's undergraduate and graduate students."

Established in 1963, UCF offers a comprehensive array of undergraduate and graduate programs, enrolling more than 43,000 students. In addition to its research strengths in computer science, simulation, and training, UCF is a leader in lasers and optics, biomolecular and life sciences, nanoscience, education, hospitality management and other areas. The main UCF campus is located in Orlando, and regional campuses are distributed throughout central Florida.

sitting: **UCF President John Hitt, IHMC's Director Ken Ford** standing: **UCF Dean Neal Gallagher, UCF Vice President Terry Hickey, IHMC Associate Director Jack Hansen**



SCIENTIFIC ADVISORY COUNCIL

IHMC is pleased to announce the distinguished members of our new scientific advisory board. These scientists from a range of disciplines and backgrounds will lend their expertise to steering the broad research goals of IHMC. They are leaders in government, corporate, and academic areas.

Dr. Rita Colwell is currently chair at the Canon US Life Sciences, the Arlington, VA based subsidiary of Canon USA, Inc. She is the former Director of the National Science Foundation as well as a highly cited microbiologist. She is a nationally respected scientist and educator and has authored or co-authored 16 books and more than 700 scientific publications.

Dr. Julio Escobar, a citizen of Panama, is the National Secretary of Science, Technology and Innovation of Panama and a member of the Presidential Commission on Education. He is in charge of building a national capacity for scientific research and development and of integrating it into the productive base of Panama's economy and into the national programs for human development. He has been a member of the editorial board of the IEEE Networks Magazine and is on the editorial board of the Journal of Fiber and Integrated Optics.

Vice Admiral Alfred G. Harms, Jr., recently completed over 33 years of active duty in the Navy while serving as Commander of the Naval Education and Training Command and Director of Naval Education and Training for the Chief of Naval Operations. In this role, he was responsible for a major transformation of all navy education and training for officer and enlisted personnel. Vice Admiral Harms' decorations include the Distinguished Service Medal, Defense Superior Service Medal, Legion of Merit (five awards), Defense Meritorious Service Medal, Meritorious Service Medal (two awards), University of Illinois 2005 Alumni Achievement Award, and numerous other personal and unit commendations.

Mr. G. Scott Hubbard is the Director of NASA's Ames Research Center. Previously he served as the sole NASA representative on the Columbia Accident Investigation Board (CAIB). Hubbard also served as NASA's first Mars program director and was one of the founders in the field of astrobiology, helping establish NASA's Astrobiology Institute. He has three times received NASA's Outstanding Leadership medal, and is a two time recipient of NASA's Exceptional Achievement medal.

Dr. Alexander H. Levis is a University Professor of Electrical, Computer and Systems Engineering and head of the System Architectures Laboratory of the C3I Center at George Mason University (GMU). For the last 20 years, Dr. Levis has conducted basic and applied research in and taught many aspects of command and control, from organization design for command centers to operational and system architectures to decision support systems. He served as the Chief Scientist of the U.S. Air Force for three years where he advised the Chief of Staff and Secretary of the Air Force on a wide range of scientific and technical issues affecting the Air Force.

Mr. Bruce E. Melnick is the Vice President for Boeing Florida Operations at the John F. Kennedy Space Center (KSC). Boeing's Florida operations include engineering, facilities, and maintenance support to NASA and the Department of Defense for Space Shuttle, International Space Station, and Delta rocket programs. Melnick also flew as a mission specialist on one shuttle flight and as flight engineer on another.

Ms. JoAnn H. Morgan was formerly the Director of the External Relations and Business Development Directorate at NASA's John F. Kennedy Space Center (KSC). She worked for NASA on the Mercury and Gemini Programs and was a key member of the KSC launch team for the Apollo, Skylab, and Apollo-Soyuz Programs. She has received many honors and awards, including an achievement award during the activation of Apollo Launch Complex 39, four Exceptional Service Medals, and the Sloan Fellowship for graduate study at Stanford University.

Dr. William Mularie currently serves as CEO of the non-profit Telework Consortium Inc. in Herndon, Virginia. He has served previously as Deputy Director of the National Imagery and Mapping Agency for Systems and Technology and as the Director of the Information Systems Office at the Defense Advanced Research Projects Agency. His major research interests and publications are in data recording, communications, optics, and materials science.

Dr. Alain T. Rappaport is Founder and CEO of Medstory, Inc., a software and services company focused on information solutions that increase the efficiency of healthcare industry processes, from drug development to personalized medicine. He was co-founder, President, and Chief Scientist of Neuron Data, Inc., a world leading company in artificial intelligence and other business-critical software components. He has published in the areas of artificial intelligence, cognitive science and neurosciences, in conferences, workshops and major journals.

Dr. Raj Reddy, Herbert A. Simon professor of Computer Science at the Carnegie Mellon University, has been one of the most important contributors to the information revolution in the United States. In addition to conducting groundbreaking research in human-computer action and artificial intelligence at CMU, he was Founding Director of the Robotics Institute, Dean of the School of Computer Science, and most recently Founding Director of CMU West in Silicon Valley. Additionally he served as Cochair of the President's Information Technology Advisory Committee under both President Clinton and President Bush.

CAPT Winston Scott (USN Ret.) is the Executive Director for the Florida Space Authority and is responsible for the statewide development of space-related industrial, economic, and educational initiatives. Previously he was a Professor with the Florida Agriculture and Mechanical University (FAMU) and Florida State University (FSU) College of Engineering. In addition he served as mission specialist on two space shuttle flights. He represents the State's interests in the development of space policies and programs and advises the Governor and Lt. Governor on all civil, commercial, and military space matters.

Mr. William D. Smart is currently active in Pensacola civic affairs and is president of FavorHouse of Northwest Florida. His career with Abbott Laboratories spanned forty years, and he was a senior corporate vice president at the time of his 1987 retirement. He held management positions in R&D, manufacturing and marketing and was president for ten years of Abbott's then largest division, Ross Laboratories

Dr. David Waltz is the Director of the Center for Computational Learning Systems (CCLS) at Columbia University. His doctoral thesis on computer vision originated the field of constraint propagation, and he originated the field of memory-based reasoning with Craig Stanfill. Waltz's research interests have also included massively parallel information retrieval, data mining, learning, and automatic classification with applications in protein structure prediction, and natural language processing.

RECENT LECTURES

IHMC LECTURE SERIES

Kulash describes alternate theories on traffic

Relieving traffic congestion by simply adding more capacity is a futile cycle, according to Walter Kulash, principal and Senior Traffic Engineer with the Orlando-based community-planning firm of Glatting Jackson Kercher Anglin Lopez Rinehart, Inc. Instead, planning should focus on behavioral changes and the livability of a community. He described examples of the change in planning in his lecture "Stuck in (Thinking about) Traffic" on November 17.

While widening roads initially has the intended consequences of reducing delays and costs, such as gasoline wasted while waiting, the subsequent unintended consequences are many. Drivers will move farther and drive farther for errands, drive more and own more cars. All of this leads to more congestion over time. Conversely, if we accept some congestion, we do get the negatives of increased delays and costs. However, drivers will invest more in their homes closer to the urban core, use alternative transportation, drive less, and own fewer cars.

We have skewed so far toward the needs of vehicles that by increasing commute times by a few seconds, we can see huge improvements in livability. Commutes would be more pleasant with attractive scenery, which can also appeal to people outside of cars. Instead of simply adding road width, planners must also consider improving the traffic grid. Traffic demand can be decreased by increasing connectivity, the number of ways cars can get through a network.

Kulash is at the forefront of the field of traffic calming and "livable traffic" design. This inclusive view is not just about moving the greatest amount of traffic at the fastest speed but also the other qualities of a street, such as retail friendliness and community space. Kulash has applied this view, by changing motorist behavior through street redesign, in projects throughout the United States and Canada. His vision of transportation design incorporates the needs of motorists and pedestrians alike while respecting the human need for the presence of beauty.

Walter Kulash

Simberloff presents successes and challenges of invasive species control

We don't have to resign ourselves to biotic homogeneity around the world, according to Daniel Simberloff, the Nancy Gore Hunger Professor of Environmental Studies at the University of Tennessee. In his lecture "We Can Win the War Against Introduced Species!" on January 5, he identified successes and failures in controlling invasive species.

Daniel Simberloff

Introduced species such as zebra mussels in the Great Lakes or the Chinese tallow tree in the US southeast are currently causing severe ecological and economic damage throughout the world, more than habitat destruction or global warming. Keeping foreign species out is the first line of defense. A species that makes it past regulations such as in ballast water, packing material, and trafficking of plants and animals can often be eradicated if discovered quickly. However,

Livable traffic design is not just about moving the greatest amount of traffic at the fastest speed but also the other qualities of a street, such as retail friendliness and community space.

To view video of this and other lectures at IHMC, please visit http://www.ihmc.us/movies/index.php.

Simberloff described cases where land managers overlooked an invasive species during times when it would have been easy to eradicate using simple methods like manual removal and now face widespread problems.

Even when a species gets established, its population can be kept at a low level, Simberloff explained. A variety of tools are in the arsenal, each with its own advantages and disadvantages. Biological control, introducing, for example, a beetle that prefers to eat the invasive plant, can keep populations under control but might also result in damage to native species. Chemicals are very effective at controlling some species but tend to have broad impacts on all surrounding species. Mechanical control, hand-picking invasive plants, requires huge manpower; some communities are taking advantage of prisoner work-release programs and the like to stem the spread of species.

Simberloff directs the University of Tennessee Institute for Biological Invasions. He was instrumental in formulating the presidential Executive Order 13112 on invasive species, and serves on the IUCN Invasive Species Specialist Group and the IUCN Species Survival Commission. He is a current member of the National Science Board and past president of the American Society of Naturalists.

Introduced species are currently causing the most ecological and economic damage throughout the world, more than habitat destruction or global warming.

Hans Bleiker outlines steps to effective government

Hans Bleiker

"I'm with the government, and I'm here to help you." Why does this sentence bring chuckles and sneers from most people? During his lecture "Democracy and the Art of Building Consent" on January 24, Hans Bleiker detailed his research on effective government and explained techniques for improving the attitude of citizens toward government at all levels.

Bleiker's first two laws of effective government require government to be viewed as solving a problem (or taking advantage of an opportunity), and this problem must be viewed by the citizens as detrimental to the quality of life of someone in the community, though not necessarily theirs. Arguments such as "We have to do this because it's the law" don't tend to sway most people—witness the numbers of people who regularly break speed laws when driving. If the government appears to take seriously its role as a problem-solver, citizens will view government as legitimate.

One of the unique features of American democracy that Bleiker noted is our focus on the individual and individual rights. This focus allows one outspoken citizen to torpedo a project. Therefore, Bleiker stresses the importance of "informed consent." This is not consensus, where all citizens agree on a plan. Rather, it has a strong element of convincing those opposed to the plan that the government is acting in good faith and has explored all other options. While those opposed may never support the plan, they support the government and do not attempt to block the plan.

If the government appears to take seriously its role as a problem-solver, citizens will view government as legitimate.

Bleiker, along with his wife Annemarie, runs the Institute for Participatory Management and Planning (IPMP). With a Ph.D. in planning from MIT on the development of a problem-solving and decision-making process that allows public agencies to be both responsible to their missions and responsive to the public, Bleiker has worked in public planning and also at the University of Wyoming. At IPMP, Bleiker runs training sessions for local governments in improving their interactions with the public.

RECENT LECTURES

IHMC LECTURE SERIES

Computer Scientist explains estimation method

Mathematical models for describing physical phenomena and systems facilitate the transfer of complex and tedious tasks from humans to machines in many fields, such as engineering, finance, and biology. In many cases, finding an exact answer is too difficult, requiring too much processing time. Dale Joachim, assistant professor of electrical engineering and computer science at Tulane University, described an alternative method in his lecture, "Human/Machine Collaborations through Bounded-Error Parameter Estimation Method," on January 12. Bounded-error techniques can be used in collaborative human machine systems where the computer narrows the decision choices before human involvement.

Neuroscientist describes motor control system

David Sparks, professor of neuroscience at Baylor College of Medicine, detailed his research on the control of coordinated movements in his lecture, "The Neural Control of Saccadic Eye Movements," on January 13. Studies of saccades, the rapid movement of the eyes, have provided a detailed description of the formation of signals in premotor brain stem regions through to the communication of the signals by motor neurons. Using these descriptions, researchers have simulated many important behavioral features of saccades. Sparks described his research on the circuits involved in saccades control, particularly the differences in the way commands are represented at different levels.

Suri details opportunistic computing system

The battlefield of the future will benefit from distributed computing systems, running on such diverse platforms as unmanned aerial vehicles, ground sensors, tanks, and troop computers. In his lecture, "Agile Computing" on January 19, IHMC's Niranjan Suri presented his efforts to design and implement these systems. Agile computing opportunistically discovers and takes advantage of available resources on all computing platforms to improve capability, performance, and efficiency. In particular, Suri described testing of this system in an urban combat scenario.

Psychologist presents interface design perspective

An understanding of the work domain, the agents, and the interface is critical in designing effective computer decision support systems. Kevin Bennett, Associate Professor of Psychology at Wright State University, illustrated examples of different strategies during his lecture, "Interface Design: A Cognitive Systems Engineering Perspective," on February 15. For example, systems like process control benefit from analogical, geometric forms that reflect inherent constraints. Systems driven by user intention, such as locating a book in a library, benefit from iconic interfaces. Work domains in the middle, such as military command and control, must include elements of multiple interface types.

Blower describes prediction by information processors

Information processors, whether human, machine, or other animals, must routinely update their state of knowledge about the world. IHMC's David Blower presented a probabilistic approach to predicting future events based on given measurements and past knowledge in his lecture, "The Role of Information Geometry in Updating States of Knowledge," on February 17. Simple examples such as predicting the outcome of a coin flip illustrated the role of models in justifying a numerical assignment to probability. For instance, if the first flip resulted in heads, models could include a fair coin, a weighted coin, or a coin with two heads. As more data is collected, the relative weights of these models can be adjusted to improve the prediction. Similar concepts underlie predictions in more complicated problems.

GRANTS

From January 2005 to April 2005, IHMC was awarded over $3.1 million for research

NEW GRANTS AWARDED TO IHMC FROM JANUARY 2005 THROUGH APRIL 2005

CmapTools: Security and Services

PI: Dr. Alberto Cañas
Amount: $1,748,000
Granting Agency: Department of Defense

Current CmapTools software provides a simple, intuitive way of generating complex concept maps as well as a means to share and further develop ideas among colleagues. However, for secure transfer of the information as well as communication among different standards, new modules must be added. This grant will fund the addition of numerous security and communication protocols. In addition, systems such as a trace/audit mechanism for tracking the history of map construction during synchronous collaboration sessions and classification banners to be used as headers and footers for published maps will improve the collaboration in construction of Cmaps.

Human Systems Technology

PI: Dr. Jack Hansen
Amount: $958,000
Granting Agency: Office of Naval Research

This multidisciplinary work addresses key needs of the Navy by exploiting advances in cognitive research together with those in computer science and related areas to optimize the cognitive, perceptual, and/or physical performance of experts and expert teams and the information systems that support them. The five areas addressed are (1) advanced tactile displays that enhance situational awareness in such complex operational domains as aviation and special forces operations; (2) improved algorithms for Knowledge Discovery and Data Mining (KDD) from large data sets and associated investigations of displays and training principles to improve human abilities to rapidly diagnose failures in complex systems; (3) trustworthy software agents through a more adequate theory and implementation for adjustable autonomy; (4) exoskeletons for human performance enhancement; and (5) an in-depth assessment of the research needs that must be addressed to fully exploit the promise of unmanned vehicles for future warfighting capabilities.

Rapidly Customizable Spoken Dialogue Systems

P.I.: Dr. James Allen
Amount: $375,000
Granting Agency: Office of Naval Research

Building a robust spoken dialogue system for a new application, task, or domain currently requires considerable effort, including substantial efforts in collecting data, building language models, developing a grammar/parser, building a custom dialogue manager, and developing the connection to the system's "back-end" components (e.g., a database query or knowledge based system). This project will develop a technology base from which spoken dialogue systems can be rapidly constructed for new domains. IHMC researchers will build on a number of other spoken dialogue systems they have developed. The long-term goal of this effort is to develop the technology that will allow the construction of a spoken dialogue system in a completely new application in only one week. The new domain will be created by defining only five things: a few sample scripts, the task models, the ontology mapping rules, new lexical items, and the back-end systems.

Integrated Battle Command Program

P.I.: Dr. Jeff Bradshaw
Amount: $56,000
Granting Agency: DARPA

DARPA's Integrated Battle Command program aims to enhance the capability of commanders and staffs to plan and conduct future campaigns by integrating joint, effects-based operations. A prototype Commander's Automated Decision Support System will consist of a suite of software tools that enable the creation of command-specific, customized, decision support capabilities by the ad hoc implementation and on-the-fly confederation of individual software tool components. IHMC researchers will provide expertise in the area of ontology and policy management to support the creation of realistic scenarios. The ontologies in this case will define various rescue and medical resources available in search and rescue scenarios.

LOCAL NEWS

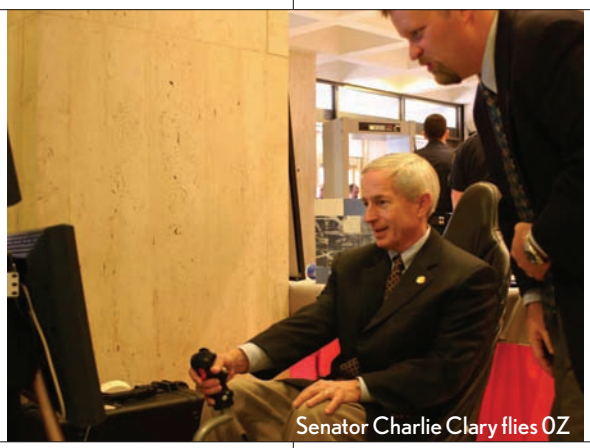
NORTHWEST FLORIDA LEGISLATIVE DAY

IHMC exhibits research at state capitol

IHMC participated in this year's annual Northwest Florida Legislative Day, held February 24, 2005. Showcased at the Capitol, this event provides an opportunity for organizations throughout Northwest Florida to exhibit our activities for legislators across the state. Coordinated by the efforts of Senator Charlie Clary and his staff, fifty-four groups from the sixteen counties that make up Northwest Florida hosted displays highlighting unique aspects of this region. Groups included military installations, cities, counties, chambers of commerce, cultural and arts groups, and local businesses. Other participants from Escambia County included Pensacola Junior College, the Pensacola Opera, the Wildlife Sanctuary of Northwest Florida, the Pensacola Chamber of Commerce, and several others.

IHMC table at Northwest Florida Day

In addition to an outside exhibit with general information about IHMC, the Institute provided research demonstrations, both static and hands-on, in the Rotunda. Tom Eskridge manned the OZ flight simulator booth, allowing visitors to fly the plane. The OZ flight system is an alternative method of presenting cockpit information which capitalizes on what the human eye was designed to see best, quickest, and easiest. Another interactive booth that drew attention was the tactile interfaces system, manned by Dr. Anil Raj and Jeremy Higgins. By integrating tactile stimulation through a vest and a high-resolution tongue display, this system can substitute for and augment sensory input. In complex, dynamic environments such as piloting a plane with low visibility, this system can augment the cognitive processes of the user, improving safety.


Senator Charlie Clary flies OZ


Florida's Chief Financial Officer Tom Gallagher tests tongue display

IHMC's other displays included information on an underwater exoskeleton currently being designed and tested for improving divers strength and endurance. A prototype robot for urban warfare systems which will more easily navigate obstacles such as stairs and rubble was exhibited. Additionally, IHMC's expertise in software agents, particularly in creating systems which include robotic agents, was also on display.

Events like this give the Institute an opportunity to illustrate dramatically the impressive research we conduct, in part thanks to state funding. While state funding typically only accounts for about 10-15% of our annual budget, the flexibility it allows provides opportunities for our researchers to explore and advance cutting edge ideas into federal funding opportunities.

While we were participating in a regional event, an additional focus of our efforts that day was to highlight the research collaborations we have throughout the state. Our affiliation agreements with the University of Central Florida and Florida Atlantic University and research with military bases through Florida allow us to leverage our expertise with these partners to improve research efforts around the state.

IHMC partners with local schools

IHMC is continuing our commitment to Pensacola's public schools by initiating a partnership with Brown-Barge Middle School, an internationally known leader in integrated curriculum. This project is a long time goal of IHMC's Associate Director, Alberto Cañas. The first phase of the partnership began with the installation of the school's own Cmap server, along with the CmapTools client software on all of their Mac OS X computers. Dr. Cañas is scheduled to conduct a workshop to train the Brown-Barge faculty in the tools on April 20th.

Most recently, approximately one hundred and fifty enthusiastic 6th, 7th and 8th grade students at Brown-Barge were paired with IHMC's resident roboticists, Dr. Jerry Pratt and Dr. Peter Neuhaus. The students were part of the school's Robotics Stream and were designing, programming, and building their own Lego Mindstorm robots. Dr. Pratt spoke with the students about his own experiences and caught the imaginations of the kids, who had been studying all aspects of robots for three months. Dr. Neuhaus met with smaller groups of student work teams and was seen sitting on the floor, surrounded by young scientists and a white-board, brainstorming and problem-solving design challenges. The students also invited Pratt, Neuhaus, and Brahms to their Robotics Symposium as judges. The Symposium was a veritable Olympics of Robots, with robots racing along a course in the Sprint Rally, moving along an intricate path of connected curves, sharp turns and straight-aways in the Line Following event, and the crowd-pleasing Sumo Wrestling match, pitting the battling 'bots' against each other. Nobody doubted that all the roboticists, young and old alike, were engaged and enthusiastic scientists.

A formal partnership between IHMC and Brown-Barge is in the works and expected to be finalized before the end of this school year. We anticipate opportunities for our scientists and researchers to volunteer time and expertise at the school and the Brown-Barge students are interested in lending their enthusiastic participation as student assistants for IHMC's Science Saturdays.

ARRIVALS

FIHMC WELCOMES TWO NEW DIRECTORS TO ITS BOARD

Dr. Sandra Flake: Dr. Flake is provost of the University of West Florida. Prior to joining UWF, she served as dean of the College of Arts and Sciences and professor of English at the University of Northern Colorado. Previous appointments include associate dean of the College of Arts, Letters, and Sciences and dean of the College of Liberal Studies and professor of English at the University of Wisconsin-La Crosse.

Flake earned her bachelor's degree in English and secondary education from the College of St. Catherine in Minnesota and her doctorate in English from the University of Wisconsin-Milwaukee. Flake served on the Board of Directors of the Council of Colleges of Arts and Sciences for three years. She also has served on the Board of Directors of ASTEC Project 30, an alliance of universities promoting collaborations between the Arts and Sciences and Colleges of Education. She was also a consultant-evaluator for the Higher Learning Commission of the North Central Association of Colleges and Schools. Dr. Flake replaces Dr. John Cavanaugh, UWF President.

Kenneth "KC" Clark, of St. Pete Beach, is the executive vice-president and COO of Heritage Asset Management, Inc. He currently serves as the Chair of the University of West Florida Board of Trustees and as a member of the College of Business Advisory Council. Clark is the past president of the UWF National Alumni Association and served for nine years on its board of directors. He also served on the UWF Foundation board from July 2000 to June 2003. The City of St. Pete Beach named KC Clark 2000 Volunteer of the Year. KC Clark received both a Bachelor's degree in accounting and a Master's degree in accounting information systems from the University of West Florida. K. C. Clark replaces outgoing UWF Chair Collier Merrill.

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