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Dear Friends:

As science and technology push the boundaries of what people and machines can do, IHMC's researchers continue to meet the challenges found at the cutting edge where human and machine meet. That was evidenced by the strong pace of research grants coming our way as 2012 drew to a close.

In this issue we shed light on several of those significant research projects at our facilities in Pensacola and Ocala.

One team of IHMC researchers, led by Senior Research Scientist Jeff Bradshaw, is helping to shape the new world of cybersecurity by creating novel ways for software agents and human analysts, working together, to identify, analyze and respond to cyber threats. The work is deeply informed by our past research on cyber sensemaking and the governance of software agents.

Another research team, led by Research Scientist Peter Neuhaus, is moving ahead in partnership with NASA on development of a robotic exoskeleton designed for use both here on Earth and in space. Whether used to help paraplegics walk or astronauts stay healthy in weightlessness, it is exciting technology.

In Ocala, Senior Research Scientist Yorick Wilks heads a third IHMC team using a DARPA grant to equip computers to truly understand human language, in all its complex meanings and intuited understandings.

And IHMC's international reach was enhanced by our co-sponsorship of the Fifth International Conference on Concept Mapping in Malta. The strong IHMC presence was led by IHMC Associate Director Alberto Cañas, who founded the series of conferences in 2004 with the first meeting in Pamplona.

Meanwhile, the Evening Lecture Series in Pensacola and Ocala continues to inform our community friends on cutting-edge research in areas as diverse as using the ocean for energy, understanding the latest science on food and nutrition, the exploration of Mars, and more.

Sometimes the growing complexity of the world causes people to wonder how they, or we as a society, can keep up. At IHMC, we are working hard to show the way.

Best Wishes,

Ken Ford

Kenneth M. Ford, Director

IHMC BOARD OF DIRECTORS

FEATURED RESEARCH

New tools counter new cyber threats

IHMC's cyber team members pose on the Pensacola waterfront with a statue of Don Tristan de Luna, who landed in Pensacola in 1559 and is the namesake of the Luna software agent framework. From left: Adam Dalton, Paul Feltovich, Tom Eskridge, Jeff Bradshaw, Marco Carvalho, Larry Bunch, James Lott and Andrzej Uszok

Despite a rapidly growing focus on cybersecurity threats, the ability to secure computer systems against the surging volume and sophistication of network attacks is seriously lagging. Merely throwing more computing horsepower at the problem is not the answer. What's needed is a radically new design of cybersecurity tools and the methods of cyberwork.

A team led by IHMC Research Scientists Jeff Bradshaw, Marco Carvalho and Andrzej Uszok is applying the concepts of human-agent teamwork to develop tools that combine the taskwork of human intelligence analysts with that of automated software agents. The resulting "sensemaking" strategy will help analysts understand, anticipate and act against complex cyber threats.

IHMC Senior Research Scientist Robert Hoffman, an expert in how cognition adapts to complexity, said, "Cyberwork as a form of critical thinking and vigilant action is difficult, for many reasons. But we can enumerate these reasons, making this domain perfect for the practical application of formal models of decision making."

Understanding how network analysts work, and what they really need, was a key problem.

"There is nothing worse than a 'smart' device that cannot tell you what it is doing or when it will finish."

"Today, most analysts use a piecemeal set of software tools," said Dr. Bradshaw. "Like a wrench or a hammer, each tool is used to perform a separate task, but no tool really 'understands' what the analyst is trying to do. In an effort to help, various 'smart' tools have been proposed to take over some of the analyst's tasks. Unfortunately, automation of a task sometimes makes the problem worse. As anyone who has wrestled with automation can tell you, there is nothing worse than a 'smart' device that cannot tell you what it is doing or when it will finish, and is incapable of taking human direction when something goes wrong."

Because of IHMC's reputation in developing sophisticated technologies that play well with people and leverage human

Order from KAoS

Because software agents provide powerful autonomous computational capabilities, IHMC uses strong policy management and enforcement frameworks to govern their actions.

IHMC's KAoS Policy Services framework relies on "ontologies"—formal models of concepts and relationships based on the OWL 2 standard. This approach received a high level of endorsement when the NSA-sponsored Digital Policy Management Architecture Group adopted the KAoS core ontology as the basis for future standards efforts. Andrzej Uszok leads the technical effort for KAoS with the cyber team, with additional collaborators Maggie Breedy, Matt Johnson, James Lott and Micael Vignati.

KAoS policies direct the "taskwork" of Luna agents and ensure secure operations. In addition, policies are the primary means to maintain good teamwork practices by software agents. Each agent is governed by policies designed to assure its observability (through progress and status reporting), directability (through dynamic changes to policy), interpredictability (assuring that required behavior will be executed within a specified time period), adaptation (policies governing the range of adaptations permitted and propagation to other agents), support for multiplicity (synchronization of multiple perspectives) and trustworthiness (policies assuring the observability of parameters indicating the reliability of agent operations).

Luna also relies on KAoS for capabilities such as registration, service discovery, self-description of actions and capabilities, communications transport and messaging.

IHMC researcher Paul Feltovich said, "Anytime people and machines work together there is a need for predictability and coordination. KAoS helps support these needs."
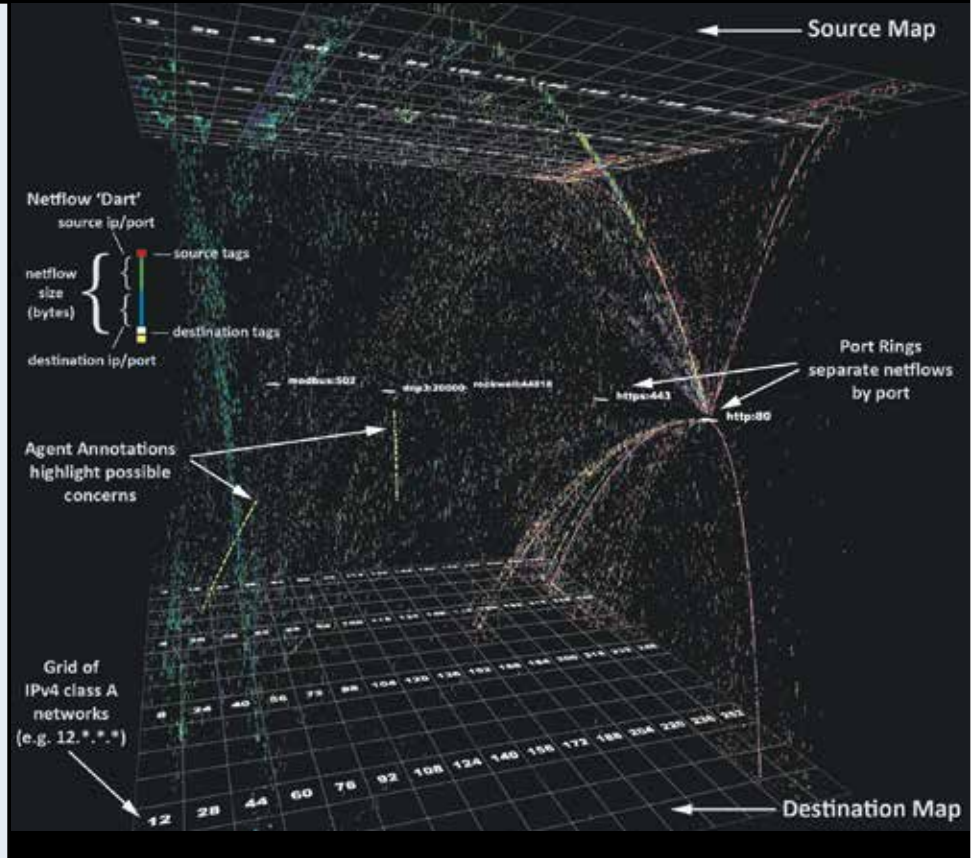
An annotated screen shot of the Flow Capacitor visualization bringing areas of concern to the attention of human analysts

strengths, the U.S. Department of Defense approached IHMC for help. The institute's team investigating the problem learned that the dream of analysts was not for a toolset, but for a new way to work. They wanted technological teammates that could actively assist them in making sense of a problem and deciding what to do—but without completely taking over for them. This sounded like a job for software agents.

Software agents are computer programs designed to assist with complex tasks such as cyber defense, disaster response or military operations. They are characterized by their active and adaptive nature—pursuing goals intelligently, potentially over long periods of time, and learning as they go rather than requiring constant human direction. Of crucial importance for their application as assistants to human analysts, the kinds of software agents developed at IHMC contain unique, built-in capabilities that allow them to collaborate effectively with humans and other agents without any additional programming required. *(See sidebar: Order from KAoS.)*

Software agents are characterized by their active and adaptive nature.

IHMC helped pioneer software agent technologies, and its innovations stretch back more than fifteen years. To address the demanding security, performance and human-compatibility requirements of cyber defense, IHMC researcher Larry Bunch led the effort to create a new

software agent framework, named Luna (for Don Tristan de Luna, the Spanish explorer who founded Pensacola's short-lived first settlement in 1559). "Luna makes agents better team players by ensuring human and software teammates can continually observe, direct and constrain the agents' actions," said Bunch.

Human-agent collaboration creates a superior analytical team. In a process of mutual interdependence, humans and agents "coach" each other—simultaneously leveraging the ability of agents to process and summarize complex high-tempo events, while taking advantage of human creativity, ingenuity and flexibility.

Together, humans and agents develop an understanding of significant patterns within countless millions of network events. Together, they learn, anticipate and act to counter the effects of cyber threats. Meanwhile, new understandings developed through human-agent teamwork can be ingested by the agents and passed on immediately to other analysts, so they don't have to re-invent the wheel when dealing with similar threats.

Human-agent collaboration creates a superior analytical team.

"The advanced visualizations and human-agent teamwork approach developed at IHMC have enabled the design of advanced command and control frameworks capable of supporting the practical deployment and coordinated control of moving target and dynamic defense capabilities," Dr. Carvalho said.

A key problem in cyber operations is visualization—presenting the findings of the agents about emerging threats in such a way that a human can quickly grasp and interpret them.

IHMC's past work on the OZ cockpit display, which revolutionized how flight data are presented to a pilot, is informing development of graphic displays that show real-time system performance in a new way.
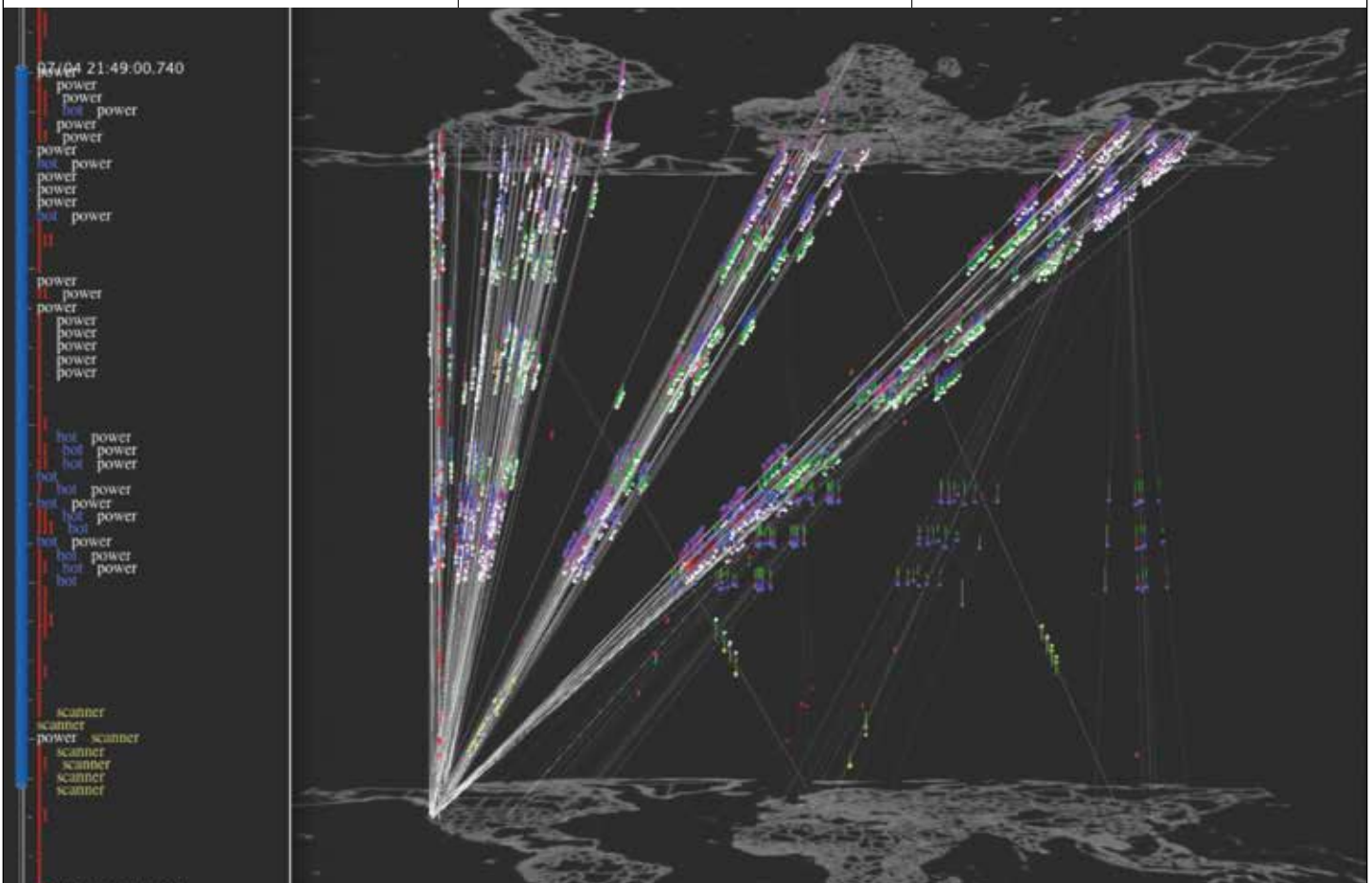
A screenshot from the Flow Capacitor shows the unfolding of a denial-of-service attack in graphic clarity

FEATURED RESEARCH

Cyber Defense Command and Control Visualization
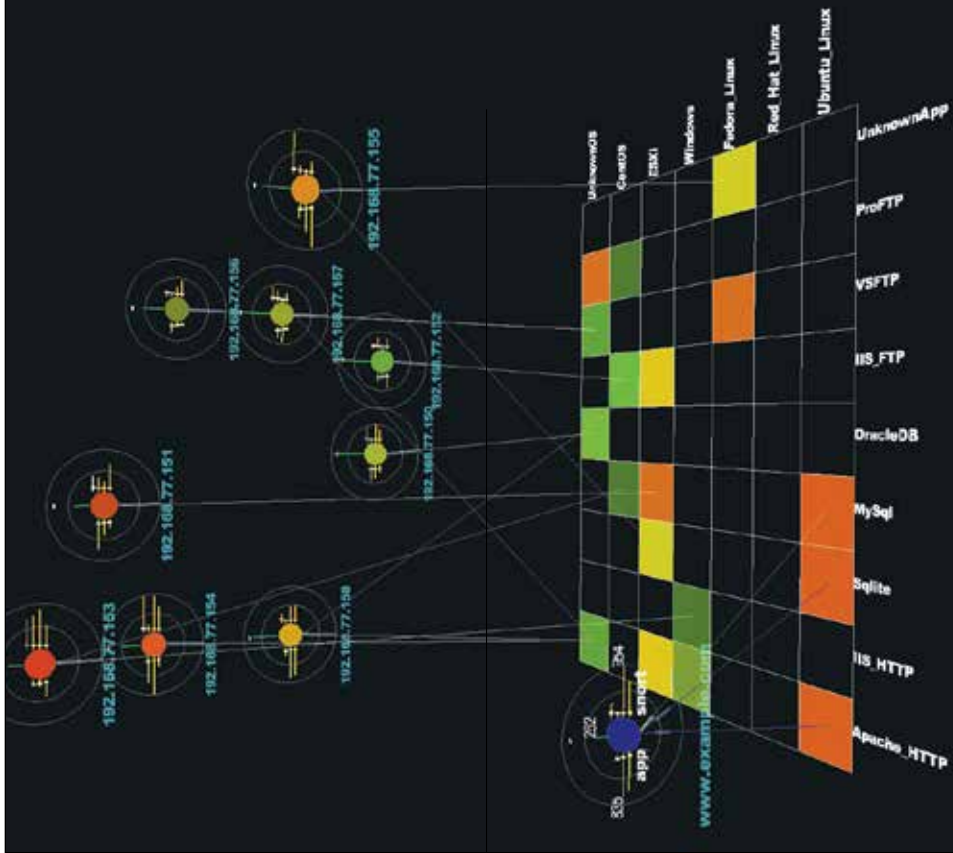
OZ-inspired visualization

The IHMC team's approach to real-time cyber sensemaking displays is informed by the previous design of the highly successful OZ flight display. Its simplicity is by design, based on a sophisticated understanding of the latest research results in human perception and cognition.

IHMC cyber team member and OZ-researcher Tom Eskridge said experimentation has shown that OZ minimizes error, reduces disorientation and helps pilots maintain situational awareness.

Researcher Larry Bunch, who came up with the basic idea for the "flow capacitor" visualization (also known as "Aurora"; see graphics on pages 4 and 5), wanted a way to show large numbers of "flows" moving across networks in near real-time. He drew on principles from OZ, but added ideas of his own. "The spark of inspiration was that we needed the simplest possible representation for a single network event in order to visualize millions of them simultaneously," Bunch said.

Behind the scenes, software agents "tag" data of interest to the analyst so they can be easily noticed in the visual display. The display can be adapted to show other types of events (financial transactions, travel, spread of diseases, disaster-related information), and then projected onto any number or kind of source and destination plane that would be helpful in answering questions about complex, high-tempo situations.

Rather than asking a pilot or analyst to mentally piece together separate inputs to create the needed understanding, the technology provides a holistic view of performance; by manipulating graphical elements and noticing their mutual dependencies, the human quickly learns how the model components interrelate. *(See sidebar: OZ-inspired visualization.)*

In addition to the IHMC team, key collaborators include David Woods (Ohio State University), Chris Forsythe (Sandia National Labs), and Suresh Damodaran and Tamara Yu (MIT Lincoln Lab).

"Many people have worked on agents, visualization and policies as separate technologies, but I don't know anyone who can bring them together like we can," Dr. Bradshaw said. "It's the perspective IHMC brings. It is the integration of these diverse technologies with our understanding of how people work.

"IHMC has the unique technologies and experience needed to bring together agents, visualization and policies to address cyber requirements in a human-centered fashion." ⸙

Note: This research project is in-part sponsored by the U.S. Department of Defense. Any opinions, findings and conclusions or recommendations in this material are those of IHMC and do not necessarily reflect the views of the Department of Defense.

"Many people have worked on agents, visualization and policies as separate technologies, but I don't know anyone who can bring them together like IHMC can."

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NEW RESEARCH

RESEARCH NEWS OF IHMC

Do computers understand us? They will

Senior Research Scientist Yorick Wilks and his team at IHMC Ocala are working to equip computers with the ability to understand human language as we do, with an emphasis on improving national security. The project, called CUBISM (Conversation Understanding through Belief Interpretation and Sociolinguistic Modeling), is funded by the Defense Advanced Research Projects Agency.

Translated, it is aimed at empowering cybersecurity by using computers to pull information vital to national security from often-obscure blogs, where it is hidden amidst the blizzard of information on the Internet.

"The hardest part," says Dr. Wilks, "is trying to extract clear meaning from the loose ways in which people actually express themselves, particularly when they take no care for proper grammar, spelling or anything else!"

The volume of this activity is far too large for human analysts to mine for the relevant information buried within. Dr. Wilks' team intends to show that a computer can read, understand and filter such blogs to identify those with the greatest interest to human analysts.

The essential problem is "understanding." Until now, machines have not been able to comprehend language as humans do. While it is true that computers do well with translation, that requires a much lower level of understanding.
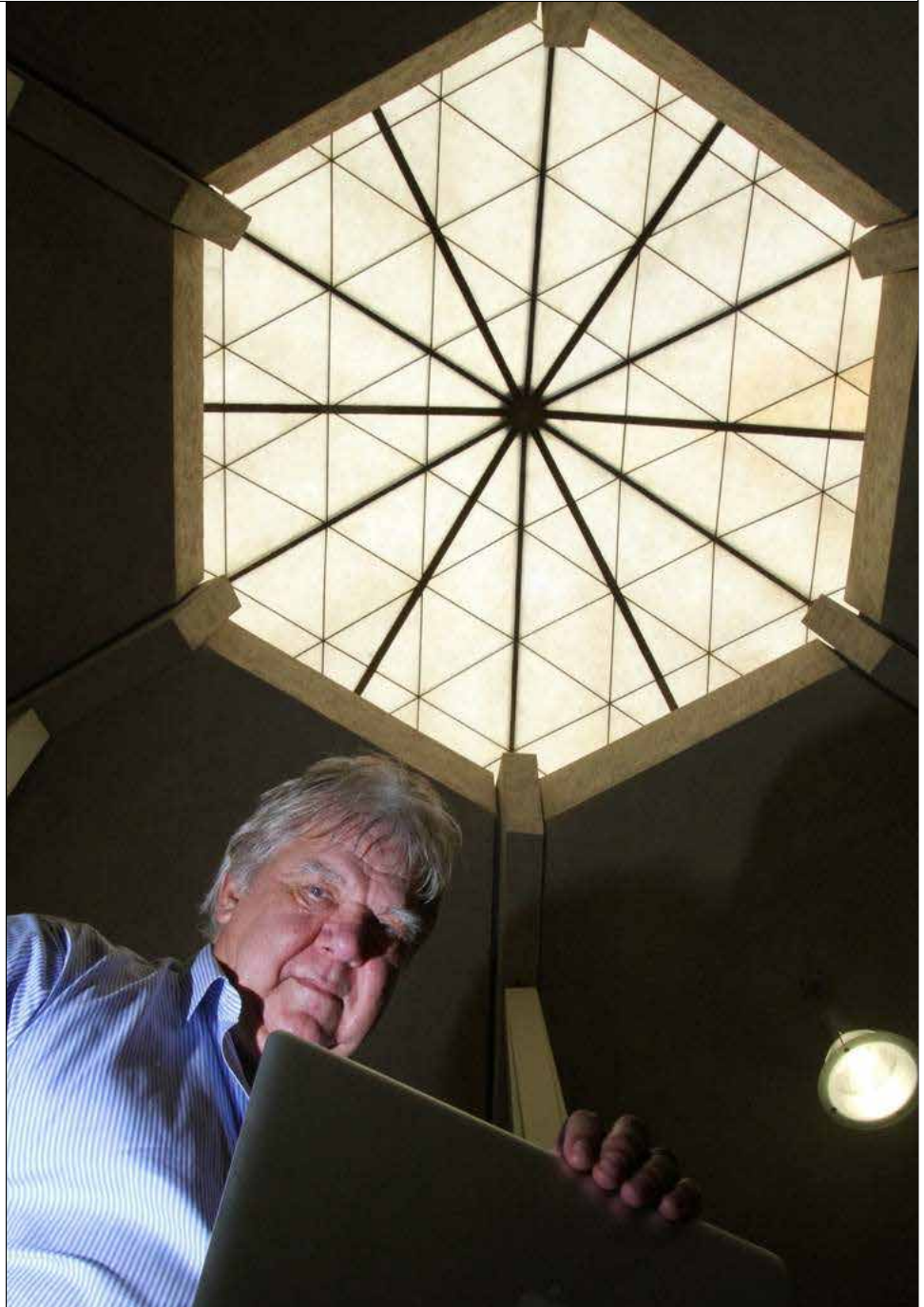
Dr. Yorick Wilks at IHMC Ocala

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NEW RESEARCH

■ ■ ■ RESEARCH NEWS OF IHMC

The central goal of this project is far more complex: to empower computers to understand the motives, desires, beliefs and plans of bloggers as revealed in what they say.

Interest in capturing the beliefs of humans with computer models dates back to the 1970s. Initially, pure artificial intelligence (AI) was based on idealized reasoning and only slowly began to address more cognitive questions about the beliefs of real individuals. A belief may be fallible, false, weak or quantitative, as opposed to a logic engine, which does not set out to model any individual person's beliefs, but only to replicate logical thinking or perform correct deduction.

Dr. Wilks' interest in this field also dates to the 1970s, and was set out in a book he coauthored in 1991, "Artificial Believers." During that time, James Allen (now also at IHMC) created in his doctoral thesis one of the very first belief modeling engines. More recently, "sentiment analysis"—trying to determine with a computer the emotional "flavor" of a passage, i.e., is it positive or negative, angry or happy—has become an active part of AI and natural language processing.

The specific approach taken by Dr.

These methods will enable the IHMC team to construct models of what people believe and what they want ... all from the words they write.

Wilks is based on a "belief engine" he developed years ago to attempt to construct the beliefs people have about each other from a set of "base" beliefs. For instance, we tend to believe what people tell us unless we have a sound reason not to, such as when dealing with a known liar or an obvious non-expert.

Dr. Wilks has also worked on technology for information extraction, quickly getting facts out of text on a large scale. For example, when companies declare their annual reports, computers using information extraction can now dig out the relevant facts, automatically doing a job that used to take people many days.

This project advances the field by combining a belief engine with methods for large-scale text-extraction, using recent advances in natural language understanding.

Text extraction is used to process endless volumes of blogs and provide the engine with its beliefs, giving scalability. These methods will enable the IHMC team to construct models of what people believe and what they want, as well as what they believe about each other, all from the words they write. The underlying hypothesis is that by merging the two approaches, text extraction can provide data for the belief engine.

Also participating are IHMC researchers Dr. Micah Clark and Adam Dalton, along with Dr. Daisy Zhe Wang from the University of Florida, and Dr. Tomek Strzalkowski from the University of Albany.

There are potentially many uses for this work, but DARPA's focus is on national security, and wants to see it applied to blogs in several languages. ⚹

IHMC Director/CEO Ken Ford

Ken Ford named a Charter Fellow of the National Academy of Inventors

IHMC co-founder and CEO/Director Ken Ford has been named a 2012 Charter Fellow of the National Academy of Inventors.

The members of the select group in this NAI Charter class, totaling 98 inductees, represent 54 top research universities and research institutes. Together, they hold more than 3,200 U.S. patents.

The prestigious group includes eight Nobel laureates, two Fellows of the Royal Society, 12 presidents of research universities and non-profit research institutes, 50 members of the National Academies (National Academy of Sciences, National Academy of Engineering, Institute of Medicine), 11 inductees of the National Inventors Hall of Fame, three recipients of the National Medal of Technology and Innovation, four recipients of the National Medal of Science, and 29 AAAS Fellows, among other major awards and distinctions.

The NAI cited Ford for demonstrating "a highly prolific spirit of innovation

in creating or facilitating outstanding inventions that have made a tangible impact on quality of life, economic development, and the welfare of society."

U.S. Commissioner for Patents Margaret A. Focarino, from the United States Patent and Trademark Office, will induct the new members during the 2nd Annual Conference of the National Academy of Inventors on Feb. 22 in Tampa. The conference is hosted by the University of South Florida chapter of the NAI.

The Tampa-based NAI was founded in 2010 "to recognize investigators at universities and non-profit research institutes who translate their research findings into inventions that may benefit society," according to the group's website. "To join, an inventor must be affiliated with a Member Institution and be a named inventor on one or more patents issued by the United States Patent and Trademark Office."

The NAI Fellows Selection Committee was chosen from a wide professional field, including recipients of National Medals, a National Inventors Hall of Fame inductee, 14 members from the National Academies, senior officials from the United States Patent Office, the American Association for the Advancement of Science (AAAS), the Association of University Technology Managers (AUTM), the United Inventors Association and leaders from several research universities.

The NAI (www.academyofinventors.org) is a 501(c)(3) non-profit organization and edits the journal Technology and Innovation—Proceedings of the National Academy of Inventors.

Bear joins IHMC board

Pensacola businessman Lewis Bear Jr. has joined the IHMC Board of Directors.

Bear, recently named as chair of the University of West Florida Board of Trustees, assumes the board seat assigned to the chair. He replaces retired Air Force Gen. Charles A. "Chuck" Horner, whom Bear succeeds as chair of the UWF board.

Lewis Bear Jr.

"Lewis Bear seems to be involved in everything important that goes on in our community, from economic development to health care, higher education and the arts," said IHMC CEO/Director Ken Ford. "And his voice is as respected in Tallahassee as it is locally. He will be an important asset for IHMC."

Bear is a civic leader and philanthropist with an active role in regional economic development, health care and the arts.

"Over the past 22 years, IHMC has transformed from a UWF beginning into a world-class research institute," Bear said. "As a Pensacola native, I've been fascinated with that growth. Most great communities became great because they had a university and/or a focused research institute that was the driver for economic prosperity. It takes dedicated leadership at the helm of both organizations, and that is what we have with each of these institutions. I am honored to be able to participate, and hope to bring some value to the table."

Bear is chairman and president of the Lewis Bear Co., a major Anheuser Busch wholesale distributor headquartered in Pensacola. In addition to the UWF Board of Trustees, he currently serves on a variety of local, regional and statewide boards, including the Greater Pensacola Chamber (vice chair for economic development), Pensacola Economic Development Commission (chair), Florida's Great Northwest, the Pensacola Museum of Art, Gulf Coast Community Bank and the Florida Beer Wholesalers Association.

He is a gubernatorial appointee to the UWF Board of Trustees.

Past board service includes the Florida Arts Council, the Florida Statewide Health Planning Council, the Ringling Museum, the UWF Foundation, Baptist Healthcare and Compass Bank.

Horner, who is also ending his tenure on the UWF Board of Trustees, spent more than 30 years with the Air Force, commanding two air wings, two air divisions, the Air Defense Weapons Center at Tyndall Air Force Base in Panama City, Fla., the 9th Air Force and the U.S. Space Command. He is best known publicly for commanding the air war against Iraq in 1991 during Operation Desert Storm.

Chuck Horner

"Gen. Horner brought a unique perspective to IHMC based on an outstanding level of achievement at the highest rungs of the Air Force," Ford said. "His advice and insights have been a major plus for us."

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HAPPENINGS
■ ■ ■ ■   NEWS OF IHMC

IHMC, NASA step into the future

Capitalizing on past technological collaboration with NASA and IHMC's own research into robotics, the institute and the space agency announced development of a robotic exoskeleton—the X1—for use in space and on Earth. Oceaneering Space Systems of Houston also participated.

"We have a tight relationship with the robotics group at Johnson Space Center," project leader Peter Neuhaus, a research scientist at IHMC, told the Pensacola News Journal. "They were following our exoskeleton work and got in touch with us and said, 'How can we do this in a collaborative way?'"

Announcement of the X1 drew wide media attention, from outlets as diverse as The Washington Post, slashgear.com, technewsworld.com and Wired magazine.

The technology is a spinoff from NASA's Robonaut 2 project, which IHMC also contributed to. The uses of the exoskeleton extend from helping paraplegics walk again to assisting astronauts with exercise in outer space.

Robonaut 2, the first humanoid robot in space, is currently a "crewmember" aboard the International Space Station.

The X1 weighs 57 pounds and is a robotic device that a human can wear, over the lower body, to assist or inhibit leg movement.

In space, astronauts would use it in the inhibit mode as an exercise machine to supply resistance against leg movement. Exercise is critical to maintaining the

Volunteer subject Mark Daniel stands in the exoskeleton in the IHMC Robotics Lab

health and physical strength of humans during weightlessness.

On Earth, the reverse mode would help paralyzed people walk again.

"Robotics is playing a key role aboard the International Space Station and will be critical in our future human explora-tion of deep space," said Michael Gazarik, director of NASA's Space Technology Program, in a news release from NASA. "What's extraordinary about space tech-nology and our work with projects like Robonaut are the unexpected possibilities

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HAPPENINGS

■ ■ ■ ■ NEWS OF IHMC

IHMC's exoskeleton team from left to right, back row: Nick Payton, John Carff, Peter Neuhaus, Jerryl Noorden, Travis Craig. Front: John Taylor, Mark Daniel, Doug Stephen and Jeremy Gines

space tech spinoffs may have right here on Earth. It's exciting to see a NASA-developed technology might one day help people with serious ambulatory needs to begin to walk again, or even walk for the first time. That's the sort of return on investment NASA is proud to give back to America and the world."

The project is one of many between NASA and IHMC over the years. In this case, NASA provided the hardware and IHMC developed the walking algorithms. The X1 has the potential to allow for assisted walking over varied terrain, including stair climbing. Preliminary studies using X1 for this purpose are underway at IHMC.

"We greatly value our collaboration with NASA," said Ken Ford, IHMC's director and CEO. "The X1's high-performance capabilities will enable IHMC to continue performing cutting-edge research in mobility assistance and expand into rehabilitation."

The X1 came from technology developed for Robonaut 2 and IHMC's Mina exoskeleton, an example of the institute's expansive research in robotics. NASA's work in robotic exoskeleton systems complements work done by other government agencies, such as DARPA.

Locally, IHMC uses expert volunteers to help safeguard the volunteer test subjects and improve exoskeleton performance. Dr. Neuhaus cited two individuals for their contributions.

Dr. Elise T. Gordon worked as a medical monitor, helping to ensure that volunteer test subjects were safe while using the device. For example, test volunteers who lack feeling in their lower bodies might not know if they are being injured during a test with the exoskeleton.

Daniel Eddins volunteered his services as an orthotist, providing information on human anatomy and issues dealing with alignment, comfort and balance for the volunteer test subjects.

NEW ARRIVALS

Gail Dorsey

Gail R. Dorsey, a licensed CPA, has joined IHMC in Pensacola as a research financial compliance analyst.

The Panama City, Fla., native is a 1983 graduate of the University of West Florida with a degree in accounting.

"I really enjoy working with the scientists here at IHMC," she said. "I like using my accounting skills to support them from a financial aspect."

She was hired out of UWF by the Coopers & Lybrand accounting firm in Miami, which was then one of the "Top Eight" accounting firms in the country. She eventually moved to Pensacola to get married.

In recent years she has been a consultant, most notably doing work for the Pensacola Blue Wahoos baseball organization. The Double-A Major League affiliate of the Cincinnati Reds played its first season in 2012 in a new waterfront baseball stadium in downtown Pensacola.

"My accounting background is my strength," Gail said, and credits her wide range of work experience as a major positive. "When you deal with a variety of people and industries, it makes you flexible in dealing with people."

Outside the office, Gail spends time with her husband, Tom, and they are devoted to watching the sporting activities of their four children. That often involves travel, as two of them, a son and a daughter, are collegiate golfers, and another son is a college baseball player.

HAPPENINGS

■ ■ ■ NEWS OF IHMC

Malta hosts Cmap conference

More than 120 people from 30 countries gathered in Malta in September for the Fifth International Conference on Concept Mapping (CMC2012), an event started by Alberto Cañas, a senior research scientist and co-founder and associate director of IHMC.

The event was co-sponsored by IHMC and the University of Malta, in Valletta. IHMC is the recognized world leader on concept mapping.

Dr. Cañas, the leading developer of CmapTools, served as chair of the program committee this year and delivered the closing session plenary talk together with Joseph Novak, a senior research scientist at IHMC and the developer of concept mapping with his research group at Cornell University. Novak is the conference's honorary chairman, and participated via videoconference. Jacqueline Vanhear of the University of Malta served as local organization chair.

The conference, put on every two years, alternates between Europe and the Americas. It was organized to share research and experiences and foster a sense of community among Cmap researchers and users.

"It is a very different conference than most," Dr. Cañas said. Most conferences are dominated by scientists and researchers in a particular field, he said, but "the majority of the attendees (at the CMC conference) are people who use concept maps, but for whom concept mapping is not their main field of interest, and so they come from very diverse fields."

Dr. Alberto Cañas

He said users of concept mapping cover a wide variety of professions and disciplines, including school teachers, scientists, businesses and the military.

The client base includes Microsoft, the U.S. Navy and Cirque de Soleil, among many others. Dr. Cañas has collaborated with schools, universities and governments of many countries on using concept mapping to improve education.

CmapTools has been downloaded millions of times by users round the world, and continues to be accessed about 40,000 times a month, Dr. Cañas said.

IHMC provides it as a free download for anybody to use.

Also attending the conference from IHMC were Research Associate Roger Carff, a member of the CmapTools development team, and Senior Research Scientist Robert Hoffman, who was a featured guest speaker. Dr. Hoffman uses Cmaps extensively in his research on expertise, in particular on how to capture and preserve an expert's knowledge in any particular field.

Former IHMC researchers at the conference included Alejandro Valerio, now with Google; Moffitt Research Center scientist Rodrigo Carvajal; and Thomas Reichherzer, now with the University of West Florida.

The previous conferences were held in Spain, Costa Rica, Estonia and Finland, and Chile. The next conference, scheduled for 2014, will be held in Brazil. ✝

CMC 2012 malta
Fifth International Concept Mapping Conference

What is concept mapping?

Concept maps are graphical tools for organizing and representing knowledge. They are used by people of all ages and domains of knowledge to express graphically their understanding about a topic. For example, through concept maps a teacher can determine how much a student understands—or does not understand—about a subject, and develop a plan to help the student learn. An expert can use Cmaps to express expertise in a way that others can comprehend, and groups of people can brainstorm about a topic to develop a common perspective.

The CmapTools software can be downloaded at http://cmap.ihmc.us
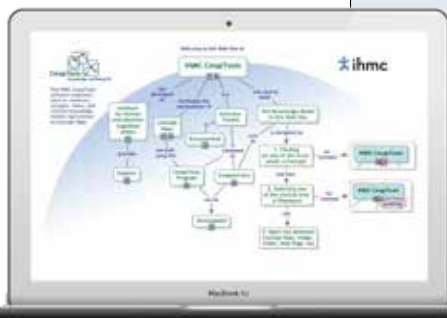
HAPPENINGS

■ ■ ■ ■ NEWS OF IHMC

Dr. Manal Fakhoury, center, a clinical pharmacologist, led a Science Saturdays session in Ocala on paper chromatography. With her are local high school students who volunteered to assist. From left: Jacob Howe; Ilene Boetger; Dr. Fakhoury; Daniel Gal; Lucas Weakley

Outreach, education

IHMC staff in both Ocala and Pensacola continue to reach out the community to foster education and equip students for a technological future.

In Ocala, the 2012-13 academic year marks the expansion of the high school volunteers program that exposes students to accomplished scientists and researchers. Four students from Vanguard High and 13 from Forest High volunteered to assist with IHMC's Science Saturdays program. All volunteers received community service credit.

A team of six volunteers for each session assists IHMC's Science Saturdays presenters. They help the attending students with hands-on activities.

In March, IHMC will support the Marion County School District by hosting a training session for elementary school teachers. Sixty teachers from grades 3-5 were selected by the district for their potential to make a difference in science education.

Like so many elementary school teachers, they are generalists who haven't had extensive, science-specific training in the past. IHMC will welcome three afternoon groups of 20 teachers each for sessions that will include information about IHMC and Science Saturdays.

The teachers will be able to attend a Science Saturdays event, and hopefully become part of the network spreading the word about IHMC's educational outreach programs.

Ocala's fall Science Saturdays focused on using paper airplanes to explore flight, building Jello lenses for lasers, secret codes and paper chromatography.

In Pensacola, Science Saturdays events continue to attract an average of 40 students a month for activities that recently included exploring basic electrical circuitry, building efficient paper airplanes, working with American Chemical Society members to analyze how the characteristics of fire change based on the chemicals involved, and building crank-powered

devices from shoe boxes, foamie and skewers. The paper airplane session featured Ken Blackburn, an engineer from nearby Eglin Air Force Base who holds the world record for time aloft for a paper airplane. Participants got templates of his record-setting plane.

IHMC also takes science into the musical sphere each year by participating, along with other community groups, in the Pensacola Symphony Orchestra's annual Music for Families event at the historic Saenger Theatre in the heart of downtown. During the January event kids learned about music and musical instruments before attending a concert. IHMC sponsored a table delving into the science of music. 🚶

Science Saturdays

Science Saturdays is a science enrichment program for kids in grades 3, 4 and 5 and takes place at 9 a.m. and 11 a.m.

PENSACOLA
February 23- Engineering: Exploring Structures
March 16- The Power of Air
April 20- Computational Thinking

OCALA
March 2- Fun with Fossils
April 6- Exploring Florida's Springs
May 4- Rockets and Robots

RECENT LECTURES

■ ■ ■ IHMC'S EVENING LECTURE SERIES

www.ihmc.us/evening_lecture.php

JOEL SALATIN

Joel Salatin, proprietor of Polyface Farm in Virginia's Shenandoah Valley, is one of the most-cited voices in the growing locavore food movement. He had a prominent part in the Oscar-nominated documentary "Food, Inc.," and was featured in the best-selling book "Omnivore's Dilemma."

Salatin talked to the Pensacola IHMC audience about his "beyond organic" food philosophy, focusing on the importance of buying locally grown food produced in an environmentally sound way, even if it isn't certified organic. And he stressed the importance of locally produced, high-quality food as a part of healthy, sustainable lifestyle that is as good for the economy and human health as it is for the environment.

Salatin's talk was based on the theme of his latest book, "Folks, This Ain't Normal," that as a culture we have lost touch with the fundamentals of healthy living. He believes that we need to go back in order to go forward, using technology to re-establish historical normalcy that restores the primacy of good, healthy food to a central place in our lives. In the process he believes we will regain what we have lost, a visceral relationship with life's fundamentals: food, energy, water, air, soil, fabric, shelter.
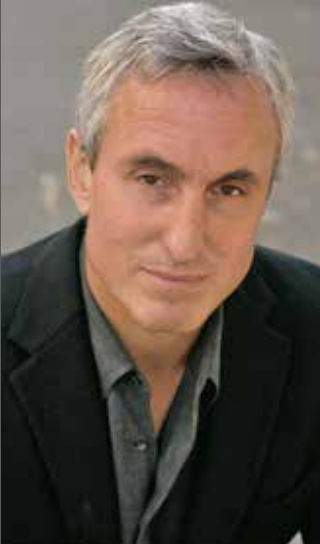
GARY TAUBES

It isn't how many calories you eat that makes you fat, it's what kind. That's the message author and science writer Gary Taubes brought a Pensacola audience in his talk, "Why We Get Fat."Eat less, exercise more? No, he said, cut out the bread and sugar and don't worry about the bacon and butter.

Taubes said his seminal book, "Good Calories, Bad Calories," can be a hard read for many people. But it contains the gist of his findings: Calories from carbohydrates, even in whole grains, are responsible for this nation's epidemics of obesity and diabetes. "Get rid of carbohydrates," he said, "and everything gets better."

Taubes, sporting a physics degree from Harvard, is a correspondent for Science Magazine and the only print journalist to win three Science in Society journalism awards from the National Association of Science Writers.

He stirred the debate over the causes of obesity in 2002 with a controversial cover article in The New York Times Magazine, "What if it's all a big fat lie?" He synthesized decades of research into nutrition and health to argue that consuming the right kind of calories was far more important than counting the number.

His latest book: "Why We Get Fat: And What To Do About It." (Note: Due to contractual obligations, this lecture is not available on the IHMC website.)

WILLIAM DAVIS

Modern wheat, including whole grain, is not just not healthy, it is toxic to people. And getting it out of your diet has a wide range of dramatic, positive health impacts. That's what Dr. William Davis told an Ocala audience in his talk, "Wheat: The UNhealthy Whole Grain."

Davis, a cardiologist from Milwaukee, said he's well aware that grains, especially wheat—and especially whole wheat—have been sold to the American public as a healthy alternative to meat and other fat-laden foods. Saying wheat is bad for you, he said, is "obnoxious" to most people.

But, he says, "I was unhappy with the way things were going. I was unwilling to accept this notion of take your Lipitor and cut your fats and you're done," Davis said. In his cardiology practice, he said, he was watching too many people do that, but still die of heart disease.

And, he said, the wheat we eat today is significantly different than the wheat that evolved naturally, and there is abundant scientific evidence that the changes, and how we use wheat, are taking a serious toll on human health.

His bottom line? "Humans have no business eating grains."

RECENT LECTURES

ROY BAUMEISTER

Researchers made "an honest mistake" in believing that self-esteem was a cause, not a result, of success in life. But the more powerful life-force is self-control, says Dr. Roy Baumeister.

In his lecture, "Willpower: Self-control, decision fatigue, and energy depletion," Dr. Baumeister told a Pensacola audience that ultimately, "self-control is the ability to change oneself," to "self-regulate": change yourself based on ideas. The benefits are wide-ranging, he said, including a longer life.

"Self-control has been called 'moral muscle,' " he said. "It forms the basis for free will."

But exercising self-control takes energy, and making decisions reduces your ability to continue making good ones. So your physical and mental energy must be husbanded and renewed, especially in a way your mother would approve of: by eating well and getting plenty of rest.

Dr. Baumeister has a Ph.D. in social psychology from Princeton. He is the Frances Eppes Professor of Psychology and head of the Social Psychology Graduate Training Program at Florida State University. The Institute for Scientific Information lists him among the handful of most-cited psychologists in the world.

CHARLIE KENNEL

Climate change "is a grim topic," Charlie Kennel told his Ocala IHMC audience. "But there are things we can do" to slow it down and mitigate its impact.

But, he warned in his talk, "The Climate Threat We Can Beat," it is coming no matter what we do now, because the scope of dealing with it is so immense. For instance, in California alone it would mean building 30 nuclear power plants, by 2050, in a state where six exist now. "We are already committed to a 2.4-degree rise" in global temperatures that can't be stopped, he said.

"Dealing with carbon dioxide is the existential problem in climate change, and it is exceptionally difficult to solve," he said. Especially because politicians are so slow to take action. He lays out a number of actions that can "take the edge off" climate change.

Kennel is the former director of the Scripps Institution of Oceanography, and vice chancellor of Marine Sciences at the University of California, San Diego. He is the distinguished professor, emeritus, of Atmospheric Sciences at Scripps, and chaired the National Academy of Science's Board on Physics and Astronomy and its Committee on Global Change Research. He chaired the NASA Advisory Council from 2000-2005.

WES HUNTRESS

Are we alone in the universe? Probably not, Wes Huntress told an Ocala audience. "Most scientists believe there probably is life" elsewhere, he said, perhaps in our solar system, perhaps farther out in deep space.

Dr. Huntress is chair of the NASA Science Advisory Council's Science Committee and director emeritus at the Geophysical Laboratory of the Carnegie Institution of Washington. In his talk, "Roving the Solar System: Looking for Signs of Life," he said that advances in exploration of the Earth, the solar system and beyond have equipped us to "dare now to ask questions we weren't prepared to ask before." The big one: "Are we alone?"

Over the last 20 years, he said, "monumental discoveries" about life on Earth have shown that life is extremely old, complex and capable of existing "in the most extreme environments." It doesn't need sunlight, oxygen or soil. It can survive extreme pressure and temperatures and feed on hydrogen, sulfur or methane.

Explorers seeking life elsewhere will look for the three conditions that are necessary to life, he said: liquid water; a source of biogenic compounds; and a source of chemical energy. This search is one of the primary forces driving NASA's exploration of the solar system.

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