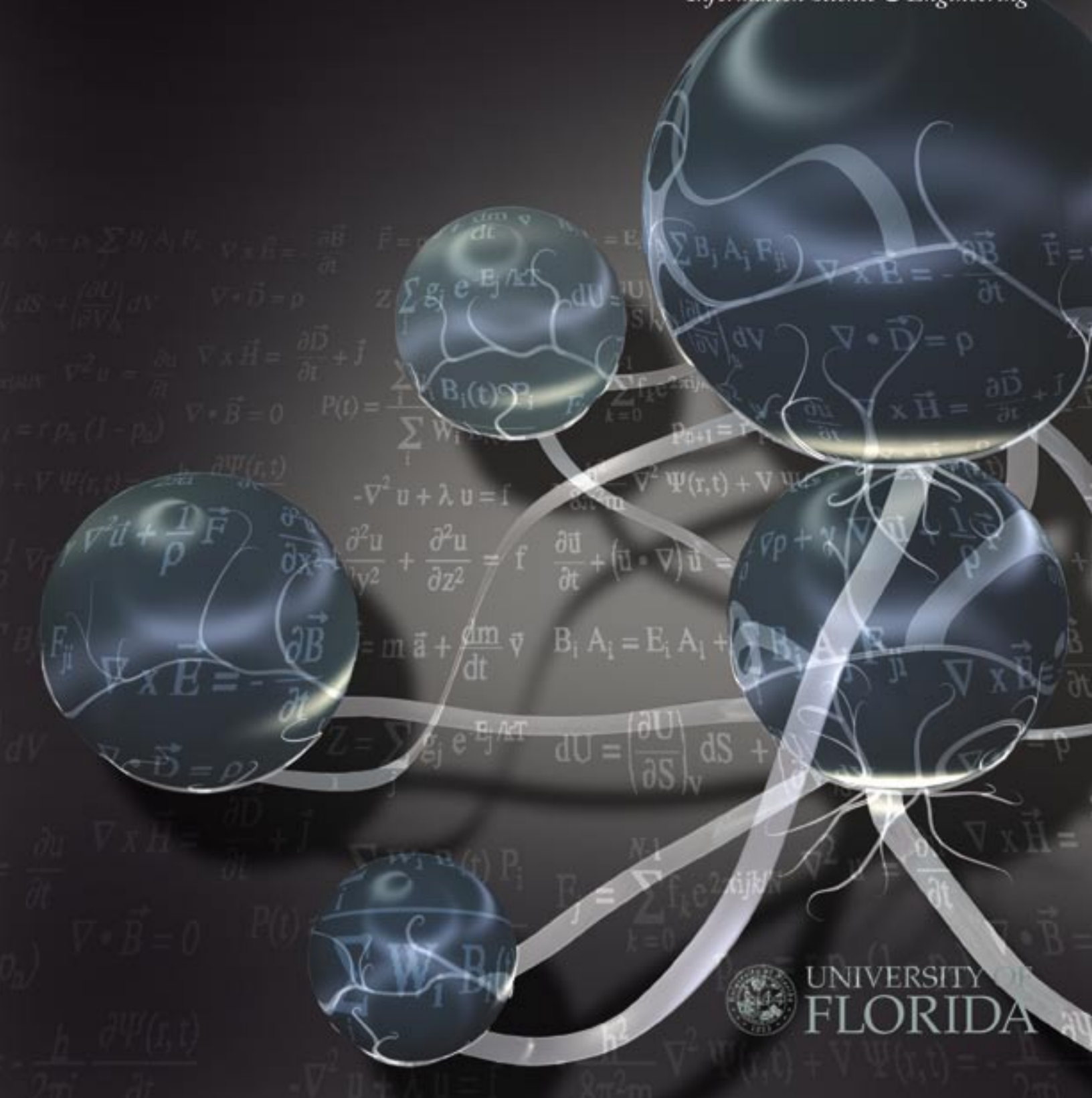
The Florida Engineer

Fall 2004

Images of the Future

Research in Computer & Information Science & Engineering



UNIVERSITY of FLORIDA

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Fall 2004

Dean & Publisher
Pramod Khargonekar

Publications Adviser
Cammy Abernathy

Managing Editor
Ron Franklin

Content Editor & Principal Writer
Martha Dobson

Copy Editor
Christine Hale

Contributing Writers
Christine Hale
Paul Fishwick
Sandra Braun
Shigang Chen

Photographers
David Blankenship

Designer
Christina Loosli

Printing
Boyd Brothers, Inc.

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COVER: Our cover image shows a frame from a dynamic model of a connected network of nodes that creates sounds like that of a Tibetan prayer bowl. The image was created by Joella Walz in spring 2003 for Professor Paul Fishwick's aesthetic computing class. The class teaches the application of art theory and practice to computing and mathematics as part of the Digital Arts and Sciences program at UF.

To see the model in action, visit www.eng.ufl.edu/home/pubs/videos

Joella holds the MA in the Fine Arts specialty of the Digital Arts and Science program. Walz is now the assistant director for production and services at UF's Digital Worlds Institute. Learn more about Joella and the institute at www.digitalworlds.ufl.edu

Read more about aesthetic computing in this issue of *The Florida Engineer* on page 14.

A Letter from

Dean Khargonekar

In 1925, an amazingly intelligent and inventive young man, John Vincent Atanasoff, received his BS in electrical engineering from the College of Engineering at the University of Florida. Born in New York, his family had moved to Florida when he was 10 years old. He went on to earn his doctorate in theoretical physics from the University of Wisconsin. During 1939-42, while serving on the faculty at the Iowa State University, he and his graduate student Clifford Berry built the world's first electronic-digital computer. The rest, as they say, is history. The engineering college's connection to information technology thus dates back to the very beginning of digital computers. Justifiably, we take great pride in the pioneering work of our own Dr. Atanasoff.

"I think there is a world market maybe for five computers," predicted Thomas Watson, IBM Chairman, in 1943. He could not have been more wrong. As it turned out, today's market for digital computers is measured in hundreds of billions of dollars. Information technology continues to change the world, deeply impacting business, education, arts and entertainment, defense, health care, transportation and many other fields.

To be sure, the industry has hit some recent rocky patches, notably the dot.com bust of 2001 and the commoditization of semiconductor technologies. Coupled with the outsourcing of IT jobs overseas, these developments have led to some doubts about IT's future prospects.

Despite these trends, I am confident that information technology's golden age is yet to come. From a historical perspective, our position is analogous to that of automotive technology in the 1920s. In the coming decades, information technology will become much more ubiquitous and invisible. Information technology will be seamlessly integrated into all aspects of our life and we will use it without being conscious of it.

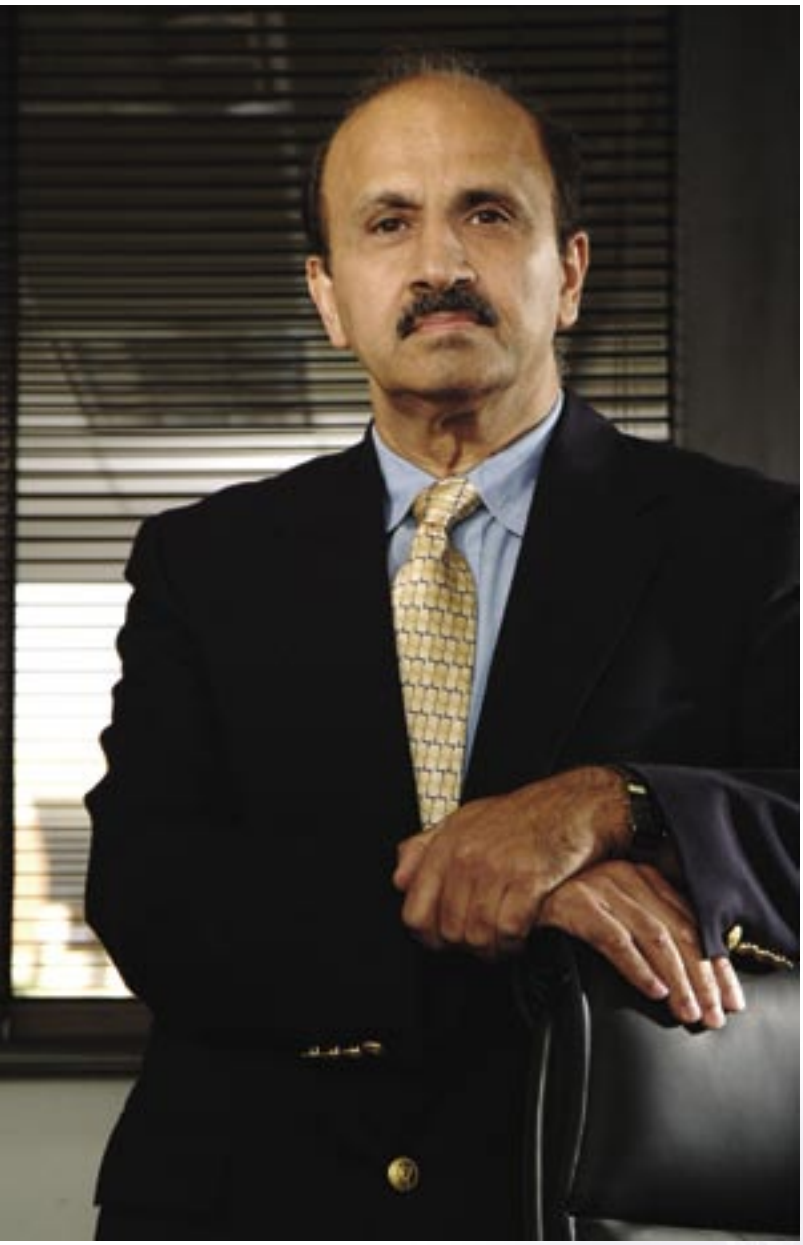
The realization of this golden age will face many hurdles. A January 15, 2004, headline in the *Economist* called it "The uncertain promise of computing that is foolproof, invisible and everywhere." The true promise and potential of information technology can only come to fruition with major advances in computer science and electrical engineering. In this issue of *The Florida Engineer*, you will read about how the exciting work of our faculty and students in the Department of Computer & Information & Science and Engineering will contribute to this revolution. (In the spring 2003 issue, we focused on the cutting edge work in the Department of Electrical & Computer Engineering.)

Our faculty and students are working on a number of exciting interdisciplinary problems involving biology and medicine and computer science. These range from bioinformatics to aging. UF engineers are also exploring the use of computer science in arts and entertainment under the digital arts and science program. And they are working on such core computer science areas as security, networks, high performance computing, distributed systems, databases, graphics, and so on. All of these inquiries are important to assuring the continued rapid pace of IT development.

I hope you will enjoy this issue of *The Florida Engineer*. We continuously strive to improve the quality of our research and education programs. Our aim is to be among the very best engineering colleges in the world. With strong support from all our stakeholders, we are confident we will reach that goal.

Pramod Khargonekar

CISE Calculates an Exciting Future



Distinguished Professor Sartaj Sahni envisions an exciting future for Computer & Information Science & Engineering (CISE), the department he has chaired since 2001.

About three years ago, Sahni and the CISE faculty evaluated the department's strengths to see where they could take a leadership role in emerging fields in computer and information science and engineering. As a result of their self examination, the faculty determined the best direction for CISE would be into computer graphics, modeling and art; computer systems; computer vision and intelligent systems; database and information systems; and high-performance computing/ applied algorithms.

"I predict that in three or four years, CISE will be significantly more visible in these fields than at present," Sahni says.

Part of Sahni's plan has been a dramatic expansion of faculty numbers. CISE has hired 12 new faculty in the last three years, giving it 36 tenure track faculty and seven lecturers. The additional faculty have made it possible to offer many new courses, especially in graduate level special topics, leading to a major improvement in the CISE PhD program. During that time, the number of PhD students increased from 50 to 160.

"CISE will begin to be a major producer of PhDs. I estimate the department will be able to graduate 25 PhDs a year, a feat which would have been impossible without the new faculty," Sahni says. Sahni says the quality of the PhD students has also improved, and attributes this to the higher stipends the department is now able to offer them, with support from the College of Engineering. The anticipated dramatic increase in the number of PhD graduates implies a corresponding increase in the research done by the department.

CISE is making changes in its other degree programs, too. The department plans to offer both BS and MS degrees in computer science through the College of Engineering.

That probably sounds odd to people who are not aware of the cross-departmental computer science degree program that UF has had for many years. Previously, computer science degrees have only been offered through the College of Liberal Arts and Sciences. College of Engineering students have received computer engineering degrees. However, many engineering students are interested in having computer science degrees with an engineering emphasis.

The best prospect for a strong future in CISE, Sahni believes, is to establish endowed professorships in the department. He also hopes to have some smaller endowed chairs for younger faculty which would aid in the recruitment and retention of first-class faculty.

"The new faculty we have hired are real stars in their fields. When they reach full professorship, they will be looking for the next step up in their careers, which would be an endowed chair. If they cannot find them here at UF, they are likely to leave," Sahni says. "The same is true for existing first-class faculty. At least now we can offer competitive salaries, thanks to support from the college. We have made a major investment in recruiting. To make it worthwhile, we need to retain these faculty. Endowed chairs would go a long way to make this possible."

Martha Dobson

This issue of *The Florida Engineer* takes a look at CISE's three focus areas: bioinformatics (part of the applied algorithms area); networking (part of the computer systems area); and computer graphics and digital arts. CISE has far more happening than we can cover here. For more information, visit **www.cise.ufl.edu**

Smart Information Seeking in Bio-Cyberspace

When thinking about genital herpes or brain injuries, chances are your first thought isn't computers. But Computer & Information Sciences & Engineering Professor Su-Shing Chen is trying to change that with his research in bioinformatics, the use of computers to handle biological information and enhance biomedical research.

The term "bioinformatics" is often used to describe the use of computers to store and search large databases of genes, proteins, and their associated functions. The computers are able to search through a large amount of information and make relations between findings, making it easier to diagnose and treat an illness, and also easier for a patient to understand.

"The importance of bioinformatics research is to collaborate with biologists and medical researchers in laboratories using computational results," Chen said.

Genital herpes is caused by the herpes simplex virus (HSV). It remains in certain nerve cells of the body for life, and can produce symptoms off and on in some infected people. There are two types of HSV: HSV-1 and HSV-2. HSV-1 produces the common cold sore and HSV-2 is responsible for genital herpes. According to the U.S. Centers for Disease Control and Prevention, 45 million people in the United States ages 12 and older, or 1 out of 5 of the total adolescent and adult population, are infected with HSV-2.

In a potential genital herpes treatment, short interfering RNAs (siRNA) might suppress the herpes recurrence through a process called RNA interference. Chen's group is designing a software tool to quickly and effectively find potential siRNA target sites for the inhibition of recurrences of genital herpes infections. The software tool, siRNADesigner, is a web-based application that automates the process of finding all the possible siRNA target sites in both HSV-1 and HSV-2.

In another bioinformatics project, Chen has collaborated with researchers from the McKnight Brain Institute to help speed up the diagnosis and treatment of traumatic brain injury. Chen has worked with medical researchers to develop data mining strategies for detecting biomarkers in traumatic brain injury studies.

Neuroproteomic studies deal with biochemical mechanisms or pathways underlying various psychiatric, neurological, and neurodegenerative diseases. Medical researchers currently use brain imaging, which provides only coarse resolution, but proteomic analysis yields much finer resolution in brain research. Chen works with the medical researchers at the start of a study to help formulate a problem that can be analyzed computationally. Chen's bioinformatics approach is not only on the data analysis level, but is an integrated scheme of human patient records, animal modeling, instrumentation, and information architecture.

"We take their real-world problems, then we formulate an integrated information model, and we develop the analysis tools and the database systems to help people formulate biomedical problems," Chen said. "That way, they can formulate their problems in a more precise way computationally."

Chen and other researchers hope the technology will be useful for other neurodegenerative diseases like Parkinson's.

Another aspect of Chen's bioinformatics research is his development of a text data mining tool that uses both categorization and text clustering for building concept hierarchies. Because of the explosion in the amount of biomedical data, information overload is a common problem when searching databases as large as MEDLINE and PUBMED, which carry more than 12 million documents and 6,000 journals. Smart information seeking the cyberspace will help medical students, patients and average citizens gain necessary biomedical information.

Chen's text data mining tool organizes the large databases in three steps: (1) categorizations according to Medical Subject Headings (MeSH, the National Library of Medicine's controlled vocabulary thesaurus terms), MeSH major topics, and the co-occurrence of MeSH descriptors; (2) clustering using the results of MeSH term categorization; and (3) visualization of categories and hierarchical clusters. The hierarchies generated allow a user multiple viewpoints of a collection, enabling both inexperienced and experienced researchers to better utilize information contained in any document collection.

"We organize the search based on the content of those documents, not only on keywords as current search engines do," Chen said. "We have a visualization interface for users to select and look at the content very easily."

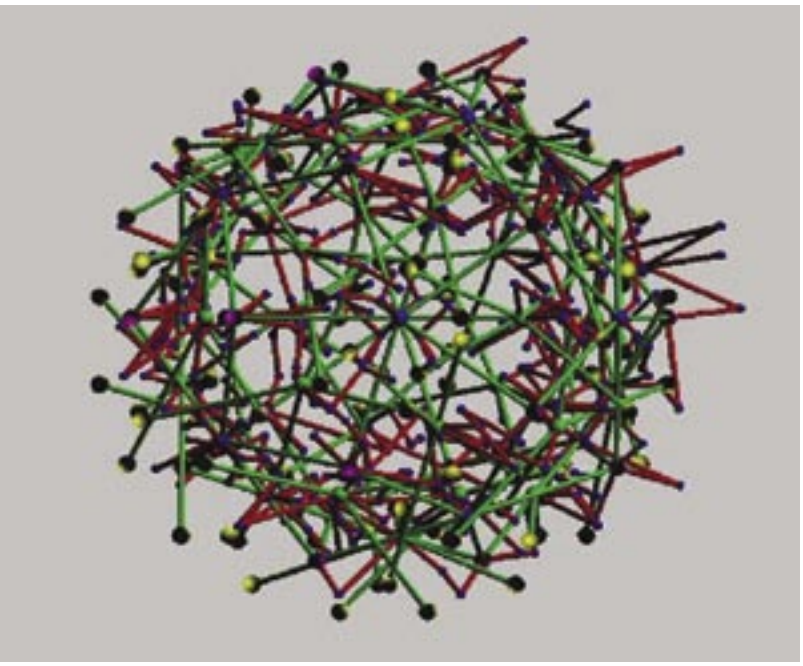
The research has been supported by the National Science Foundation for several years. Chen hopes his research and collaboration with biologists and medical researchers will benefit the society in a computational way.

Christine Hale

Unraveling the Mystery of How Viruses Form with Computer Simulation and Models

Meera Sitharam is using geometry, computer simulation, and modeling to explore how biological viruses form. "There has been much work on the study of viruses since the 1950s, but the issue of how they assemble and form is poorly understood," said Sitharam, an associate professor in UF's Computer & Information Science & Engineering department.

She presented her findings to the National Academy of Sciences Futures Conference on Nanotechnology in November 2004.



Computationally assembled virtual virus using simulation software.

Biological viruses consist of protein molecules that spontaneously come together and stop forming to make the spherical, symmetrical entity known as a virus. The self-assembly process is so quick that researchers have been unable to arrest the process sufficiently in order to study it. Sitharam believes that a focus on three-dimensional geometric relationships will help shed light on the mystery.

"I believe the geometry of these entities plays a key role in obtaining essential snapshots of the process," said Sitharam. "We may not get the entire movie, but we can do a lot with a likely sequence of snapshots."

Building on the principle of geometric constraints, used commonly in engineering mechanical parts and assemblies, Sitharam has developed algorithms and a software system called FRONTIER Geometric Constraint Solver. With FRONTIER, data about a particular virus can be mapped and dumped into the system to produce predicted pathways of how molecules come together to form that particular virus. The predictions are then tested in the wet lab setting to see if they hold true. Preliminary predictions are promising and consistent with biochemical observations, Sitharam reports.

Thus far, Sitharam and her collaborator, Mavis Agbandje-McKenna of UF's McKnight Brain Institute, supported by a grant from the National Science Foundation, have mapped the murine parvo virus, found in mice, and the maize streak virus, which attacks the leaves of corn. Mapping of the adeno associated virus, common among humans, is almost complete.

"These particular viruses were chosen because they are of the simplest construction and represent a diversity of basic constructions to test all points of the theory," said Sitharam.

Another collaborator, mechanical engineering Professor Carl Crane, will work with Sitharam and McKenna to produce a physical simulation or model of the pathways. UF Mathematics department Associate Professor Miklos Bona has also recently joined the project.

Sitharam feels that if we can understand how viruses form then we can successfully encourage or discourage formation to suit the existing needs of society. She sees applications for arresting infectious diseases and for developments in gene therapy.

Will it help with the problem of the cold and AIDS viruses? "Not likely," said Sitharam. "These are extremely complex, ever-changing, stubborn creatures. They continue to evade us. What we could get are some ideas on how to engineer or arrest nanoscale self-assembly."

Sandra Braun

Genomics Algebra

– A Structure for Future Research

National Human Genome Research Institute, National Institutes of Health

The explosive growth of genome research during the past decade has produced a flood of information that is accumulating in hundreds of databases and data repositories. To retrieve meaningful data, scientists must do separate searches, or queries, of each repository for the information they need. The data searches are complicated by the fact that not all of the repositories use modern data management technologies nor do they agree on the terminology that is used to describe the related data. Queries take considerable time and effort, and may result in errors due to conflicting meanings of terms that appear identical. In addition, most repositories require users to become experts in information retrieval or even skilled programmers since most of the user interfaces are programmatic and the returned results are rarely in the desired format.

Genomics algebra, an invention of UF computer scientists Joachim Hammer and Markus Schneider, may provide a way to ease access to the data and use the terms in a consistent and commonly understood way. Professors Hammer and Schneider, from the Computer & Information Science & Engineering department, devised genomics algebra to provide a domain-specific yet repository independent language (access mechanism) capable of retrieving genomics data stored in a unifying database.

Schneider says the first step in using genomics algebra is building a genomics ontology which provides a framework for clarifying the meanings of genomic terms in order to obtain precise descriptions of information for use in a database. "There is no standard of communication in genomics. This leads to conflicting terms, which in turn can lead to wrong conclusions when using the terms in data searches or research," Schneider says.

The second step is creating the unifying database using the genomics ontology. The database would integrate as much existing data as possible in a unified structure. There are two possible approaches to integrating the data, Schneider says. The first is a complicated federated approach, where repositories of information are left as they are. Integration is handled by building a data management layer over them using a new language.

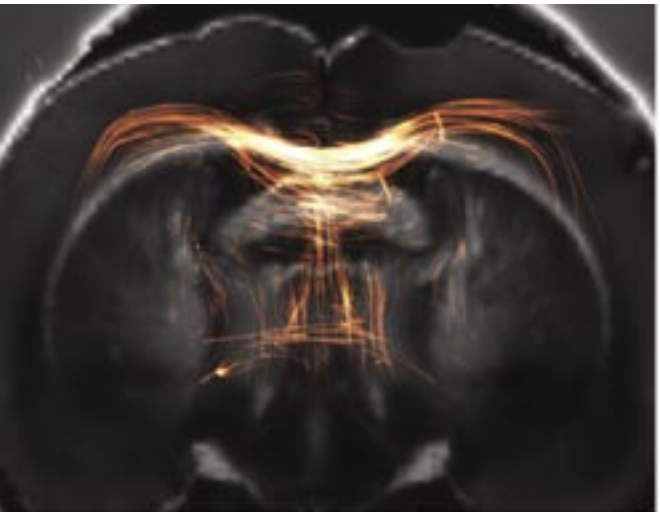
The second and preferred approach is data warehousing. Data is loaded in from repositories and correlated. The mechanics of database management remain inside the system. The genomics algebra overlays the database and provides the vocabulary and operations to use the system. The biological scientists do not need to know how to do standard database programming to benefit from the system.

Although it probably won't be possible to integrate all the existing genome data repositories within a single unifying database, the genomics algebra system will have obvious benefits for biology researchers. Biologists will be able to rely less on computer scientists to work with databases, and it will level the research playing field for the biologist who works alone or in a small group. The overall goal is to build an infrastructure that puts the data management burden on the software, leaving the biologists free to focus on what they can do best, namely analyze their data.

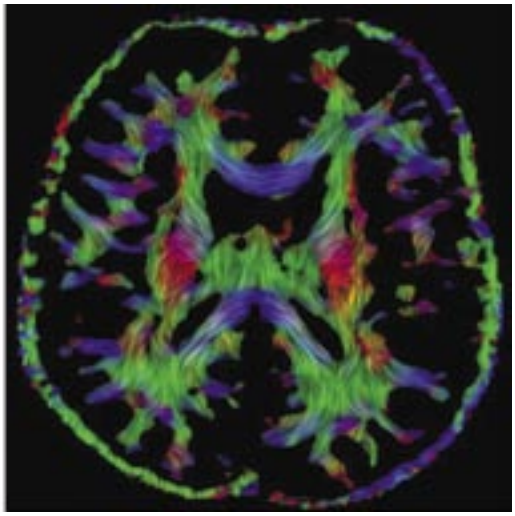
Genomics algebra and genomics ontology are in the earliest stages of development. Schneider believes that the system can establish basic principles for integrating algebras (type systems) into database systems and that it can be used as a testbed for similar problems. He acknowledges that to gain acceptance, genomics algebra must be able to connect to many database systems, especially the widely used commercial ones, and must be able to accommodate many different kinds of data.

Martha Dobson

Advanced Applications for Medical Imaging



Neuronal fiber tracts along the corpus callosum in a rat brain, visualized using lit particles tracing the pathways in 3D.



Neuronal fiber tracts in a human brain viewed in an axial view. Colors RGB correspond to XYZ directions with Z coming out of the paper.

New studies show potential for expanding the uses of computerized medical image analysis in disease diagnosis and treatment planning. Computerized tomography (CT scans) and magnetic resonance imaging (MRI scans) are done routinely for many ailments. Professor Baba Vemuri of the Computer & Information Science & Engineering department has been working for several years to develop methods for the computerized analysis of these scans so as to automatically identify changes in shapes of cortical and sub-cortical structures that are caused by certain types of neural disorders. His studies are all funded by the National Institutes of Health.

Vemuri and his team of researchers are investigating the automatic mapping of neural fiber tracks to identify brain areas that have been traumatized due to injury, stroke, epilepsy, or other ailments. Data from diffusion MRI scans can be used to extract three-dimensional structures and nerve fiber pathways in the brain by following how water diffuses anisotropically in fiber rich regions. The ability to visualize areas where the diffusion is anisotropic is extremely useful in diagnosis and treatment planning for stroke and other ailments. Vemuri, working with UF Neuroscience Professor Stephen Blackband, Biochemistry & Molecular Biology Associate Professor Thomas Mareci and Mathematics Professor Yunmei Chen, is developing image processing tools that will automatically identify these regions in three dimensions and show the shapes of these anatomical structures along with the nerve fibers mapped onto them.

Vemuri, with CISE associate professor Anand Rangarajan, leads a team that has developed techniques to automatically classify MRI brain scans into those belonging to people with epilepsy and those to normal people with no ailment. The scans can differentiate between normal and epileptic brains with 96 to 97 percent accuracy, based entirely on the shape of the hippocampus, the region in the brain that is responsible for memory and which shows atrophy due to epilepsy. With these techniques, clinicians can also identify whether the focus of the epilepsy is in the left or right temporal lobe, currently with almost 87 percent accuracy. Blackband, Neurology Assistant Professor Stephan Eisenshenk, and Radiology Assistant Professor Ilona Schmalfus are members of this team.

In another project, Vemuri is developing image processing tools to co-register – or superimpose and compare – multiple scans of a surgical patient obtained before and during the procedure. During surgery, internal organs move

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Efficient Algorithms for Radiation Therapy

Radiation therapy sessions for cancer patients may someday be shorter and more effective, thanks to new dosage planning techniques developed by a team of two UF computer scientists and a radiation physicist.

CISE Professors Sanjay Ranka and Sartaj Sahni are working with Jatinder Palta, a physicist with the Radiation Oncology department at Shands Hospital in Gainesville, to develop algorithms to improve delivery of radiation doses to a patient's cancer site. The research is funded by the National Institutes of Health.

The main goal of radiation treatment is to irradiate the tumorous tissue and make sure the intended target gets the prescribed radiation dose while minimizing radiation to healthy surrounding tissues. In planning the treatment, doctors need to determine how much the radiation dosage should be and where it should be applied. The treatment machines – or accelerators – can send rays from different directions so that the cancer is irradiated from all sides. The radiation is directed through an aperture that has overlapping leaves much like a camera lens. Opening the leaves controls how the dosage is delivered, and is planned mathematically with algorithms.

Ranka says that careful dose computation is necessary to avoid under- or overtreating the patient. Too little radiation will not destroy the cancer; too much radiation can give the patient serious side effects. "Sometimes the planning is not optimal in terms of the amount of radiation the patient receives. The more time on the table, the more radiation the patient gets," Ranka says. "The treatment goal is that the patient should get the minimum amount of radiation required. Our goal is to minimize the amount of time the patient has to spend on the table."

The team has developed new algorithms that reduce the exposure time. The second advantage of the new algorithms is that the dosage can be computed quickly. The treatment planning time can be reduced from one or two days, which is common today, to a few hours or even a few minutes.

Martha Dobson

Advanced Applications for Medical Imaging
continued from page 10

around and sometimes swell. Preoperative scans taken for reference to guide the surgery need to be corrected for these changes. The technique that Vemuri developed with Neurosurgery Professor Frank Bova is to take, for example, a CT scan or a fluoroscopy image during surgery and try to relate it back to the preoperative scan to adjust the reference with co-registration of the scan data. The technique is currently undergoing extensive testing.

Database technology is quite useful for performing content-based image retrieval on medical images especially when they include notes on symptoms and findings. If an ailing patient has a scan, the clinician can query the database and ask if there are any images in the database similar to this and if the image is typical of certain symptoms. Vemuri is doing a project in content based image retrieval from a medical image database with applications to skin burn classification and melanoma.

Martha Dobson

Simulated Patients Teach Real Diagnosis Skills

A patient complains about a pain in his side. The patient wants to know what's wrong and wants it fixed quickly. How well the doctor questions the patient about the problem and listens to the answers can affect the accuracy of the diagnosis.

Medical students traditionally learn patient interaction skills in role-playing situations where they work with standardized patients, who are actors hired to portray certain medical conditions. Unfortunately, the system does not allow students to repeat the sessions for more practice or provide much feedback to instructors. A new system that uses computer simulated patients to teach essential communications skills may solve the problem.

UF computer scientist Benjamin Lok and his students have been working to develop the system since early 2004. Help in developing the simulator, which uses characters much like those in video games, has come from medical doctors D. Scott Lind of UF's College of Medicine and Amy Stevens of the Veterans Administration hospital in Gainesville, and from Richard Ferdig, an assistant professor and technology specialist in UF's College of Education.

Lok, an assistant professor in the Computer & Information Science & Engineering department, explains that he and his team want to create a learning environment that allows medical students to practice the patient-doctor experience much like the way a flight simulator enables repeated exposure for pilots.

"We are trying to provide a simulator that will allow people to experience interaction with a patient before they meet a real one. We try to make the interaction between the student and the virtual person as real as possible," Lok says.

The simulator would be especially valuable for first and second year medical students, Lok says. After that, students need to work with real people. "We are not trying to replace real people, but rather augment current training methods," Lok says.

The simulator offers a scenario about a character with acute appendicitis. A medical student can sit in a room with DIANA, a virtual patient projected at life-size on the wall. The simulator has integrated speech recognition technology so students can speak to DIANA, and she will respond. The student asks DIANA a series of 11 standard questions designed to elicit information about her problem. The character answers the questions according to a programmed script. The system also uses gesture recognition, so the patient can recognize and respond to a student pointing, for example, to a location on her body or reaching out to shake her hand.

"We plan on expanding the characters so that they will be able to detect if you are looking at them and paying attention to them. The system will be able to tell if a student is maintaining enough eye contact with the patient," Lok says.

Simulated patient DIANA interacts with a medical student.

A second virtual character representing a medical educator is projected at the same time. If the student forgets to do something, the virtual instructor can give a reminder right then. With this feedback, and the chance to repeat the experience, students can sharpen their skills before seeing real patients. The virtual encounters also reduce student anxiety about working with real people.

Lok believes the system has the potential to provide medical school instructors with very good feedback about a student's performance. The system can provide information on such items as what question students most often forget to ask. Educators can then tailor classes to better prepare the students.

The first test of the system prototype took place during summer 2004 with seven students participating.

"We asked the first group of students how valuable the system was to them, and got very good results. On a scale of one to seven, the average response was over 6.3 on how powerful the system is as a training and teaching tool," Lok says. Further, on a scale from one to 10, DIANA scored a 6.6 on her 'realism' of portraying the symptom. As a reference, the average standardized patient score is a 7.4. The team believes with ongoing enhancements and formal evaluation, they can bring DIANA's performance very closely in line with traditional training methods.

Lok thinks the system could eventually be used as a standardized evaluation tool to test medical students from all over the nation for base line competency, in a similar role to the bar exam for law school graduates.

The final advantage is cost. "The equipment we are using is very affordable. We use off the shelf PCs, we use a standard office data projector, we use web cams that are very cheap. With the software, the whole is greater than the parts," Lok says. The total cost of the prototype system is less than $7,000.

"This system is really a tool for both students and educators to get better," Lok says. "If we can help doctors to become better communicators, everybody wins."

Martha Dobson

Next Generation Computer Science

By Paul Fishwick
Professor
Computer & Information Science & Engineering

Digital Arts and Sciences (DAS) at the University of Florida began when UF's former President John Lombardi shared a plane ride with an expert from the special effects industry. After they talked, it was decided that UF should bridge the gap between fine arts and computer science in an effort to nurture students who can use both the left brain for logical thinking and the right brain for aesthetics and the arts.

Six years later, UF has a unique curricula and strong ties between the arts and computer science. The College of Fine Arts and the College of Engineering, through the Computer & Information Science & Engineering (CISE) department, both offer bachelor and master's degrees in DAS.

We take the view that the synergy of art and computer science improves and extends computer science as a discipline.

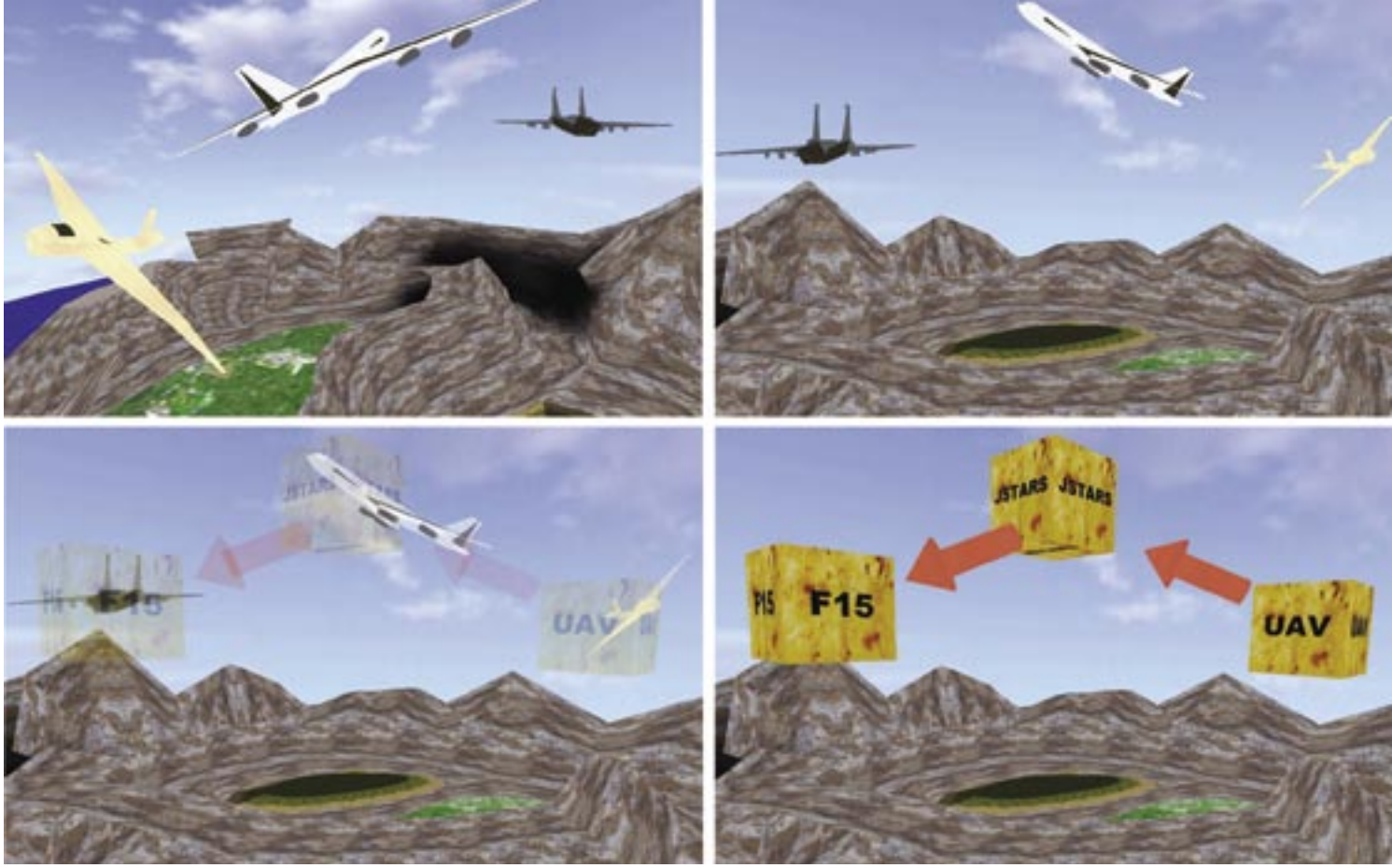
Inexpensive graphics hardware has amazing possibilities. We are on a rollercoaster driven by improving the scope of human-computer interaction (HCI) from graphics and audio to sensors and actuators. In graphics, the graphic processing unit (GPU) wars produce ever-faster, consumer-targeted graphics, rendering rates for games, and simulations.

Fast hardware and immersive environments will transform basic computer science, which consists of program and data structures, software engineering, machine organization, database methodology, and discrete mathematical structures. Computer science will branch into areas that examine the human/computer relationship. We now have ubiquitous, tangible, pervasive, and human-centered computing to add to virtual and augmented reality. Computing needs to be as focused on quality and sensation as on quantity and speed.

Human-centered experience, presence, interaction, and representation form the core of the arts. Perhaps the arts can lead computer science in new directions. Programs that build upon a solid mathematical and rigorous core of computer science within a shell of intense arts-based practice and knowledge could generate future Leonardos – the next – generation computer scientists. DAS attempts to build such a set of programs. The undergraduate BS-DAS degree has core science (chemistry, two-phase physics sequence) and mathematics (calculus, differential equations, numerical analysis) in common with the BS-CS degree. However, DAS students must also take arts classes, including drawing, sculpture, digital montage, and time-based media. Students are encouraged to choose classes in theatre, architecture, new media, electro-acoustic music, and hypermedia narrative composition.

The MS-DAS program assumes that not all students have a CS background, so an undergraduate core-CS equivalency is required. The MS-DAS core consists of modeling for geometry (graphics) and dynamics (simulation) and includes both disciplinary electives (vision, AI, visual modeling, aesthetic computing, virtual environments) and interdisciplinary electives like those for BS-DAS. Students choose either a master's thesis or a project/performance.

The most interesting part of DAS is creating new types of courses. Two years ago, colleagues Tim Davis, Jane Douglas and I created a course in aesthetic computing with funding from the National Science Foundation. The course allows students to create virtual and physical models of formal structures found in mathematics and computing, with the idea that by combining artistic aesthetics with CISE modeling and representation, we can explore new interface modalities for modeling and programming.



An integrative dynamic modeling demonstration, illustrating a continuous blending of data flow and 3D aircraft models (by Minho Park, in the Graphics, Modeling, and Art Laboratory). The user pauses the air reconnaissance simulation, and switches to the data flow view.

Aesthetic computing takes what is normally hidden in the text or diagrammatic languages of mathematics and computing, allows it to be customized, and places it in an immersive and engaging environment.

Fine Arts also has a substantial DAS program. Their students meet with ours in core classes, in team projects created during non-core art and CISE classes, and in the two-semester senior year project. The Digital Worlds (DW) Institute at UF provides infrastructure equipment, space, and facilities for students and faculty. Several new classes support the Fine Arts side of DAS. Students learn the elements of 2D and 3D modeling and animation in a two-semester interactive modeling and animation sequence. A new discrete math class with explicit artistic products and elements is under way, and we created courses to help students learn complex software programs like Blender, Maya, and 3D Studio Max.

Our first BS-DAS degree recipients have found they are well prepared for human-centered computer science, and are working in entertainment technology, special effects, and digital media to pervasive computing, augmented/virtual reality, simulation, computer graphics, and visualization. We plan to offer a PhD DAS curriculum. The existing CISE PhD can accommodate DAS-related dissertation topics; however, we need to perform research to see whether fine-tuning is required for a PhD-DAS program structure.

For more information:
www.cise.ufl.edu
www.arts.ufl.edu/ART/DAS/index.htm
www.digitalworlds.ufl.edu

The Internet is a vital global resource. Protecting it is the goal of

CISE Innovative Research in Internet Security

The development of the Internet has dramatically increased the productivity in our economy. It has also made a profound impact on our lifestyle. People make purchases, trade stocks, and access bank accounts without leaving home. Corporate databases, digital libraries, government services, and computers with sensitive information are connected to the Internet. All of these provide convenience not only to legitimate users but also to criminals with malicious intent. Network-based attacks have shown increasing sophistication. Cyber-warfare is a reality today.

Among the major threats are distributed denial-of-service (DoS) attacks and Internet worms. A DoS attack overwhelms a server with excess data packets so that the server cannot perform its normal operations. Studies have shown that tens of thousands of DoS attacks were carried out on the Internet each month and even high-profile servers from the major Web portals were vulnerable. An Internet worm spreads itself automatically across the globe to infect the computers with security loopholes.

Worms have beaten out viruses to become the top infectors of the Internet. A single worm is capable of infecting tens of thousands of computers in a matter of hours. It can steal information, remove files, slow down the network, or use the infected computers to launch DoS attacks.

The attacks have become increasingly distributed. Ironically, most defense systems, such as firewalls and intrusion detection systems, (IDSs) still perform "point" defense. A coherent distributed defense system is required to fight against today's Internet threats. The system should be able to synthesize and correlate the events from different sources to detect stealthy attacks, able to coordinate various devices to mitigate distributed attacks, and able to adapt itself to changes in the network. Shigang Chen, assistant professor in Computer & Information Science & Engineering, is spearheading an innovative design and experiment program for new distributed defense techniques against Internet threats, particularly DoS attacks and Internet worms.

Through collaborative work with Yibei Ling from Telcordia Technologies, and CISE Professor Randy Chow and Assistant Professor Ye Xia, Chen and his research group developed a prototype of a global anti-DoS service, called AID. Organizations on the Internet may register to AID for anti-DoS protection. The AID system ensures that all registered organizations can access each other even when one is attacked. The system represents a departure from the traditional router-based defense, which is limited in the scope of deployment due to administrative restrictions.

Chen and CISE Professor Sanjay Ranka recently designed an early warning system that detects an Internet worm outbreak at its early stage. An early warning system is essential in protecting against natural disasters such as hurricanes, floods, wildfires, etc. Even for less-predictable tornados or earthquakes, a just-in-time warning can be invaluable in saving lives and limiting damages. Similarly, in the Internet world, a worm early warning system is extremely important due to the worm's potential to cause enormous harm. Chen and Ranka demonstrated the feasibility of such a system and developed novel techniques to monitor the worm activity in the background of enormous Internet communication traffic.

In addition to worm detection, an important research project is to slow down the worm infection and even stop it. Chen and his group designed a distributed anti-worm system for an Internet service provider (ISP) to provide anti-worm service to its customers. The system is capable of reducing the worm activity to a minimal level while causing negligible disturbance to normal users.

Shigang Chen
Assistant Professor
Computer & Information Science & Engineering

"Smart Home" to be Unveiled at Oak Hammock Subdivision

Imagine a microwave that reads your Lean Cuisine bar code and knows how long it needs to cook; a cell phone that lets you know when your bottle of heart medication is getting low, and dials the pharmacy to let them know you need a refill; a washer and dryer that are one unit, with no need to transport clothes from one to another.

No, these aren't inventions from some futuristic world, but are objects found in a three-bedroom home in the Oak Hammock subdivision in Gainesville. Elderly residents in the UF-affiliated community are soon to test out the "smart home" designed by Computer & Information Science & Engineering Professor Sumi Helal, Director of technology development of the UF Rehabilitation Engineering Research Center on Technology for Successful Aging. The focus of the Center is communications, home monitoring and smart technology for older people with disabilities.

Helal and his research group are hoping the prototype house will offer elderly residents and their families peace of mind as the seniors get older and less capable of doing day-to-day activities without assistance. Motor, cognitive and therapeutic impairments are the focus of the research, and with the first Baby Boomers turning 65 in seven years, the inventions will become ever-more important.

The house's first occupant will be 76-year old Minette Hendler, a former Plantation, Fla., resident who moved into the Oak Hammock community in Nov. 2004. Helal and his research group started turning a house in the community into an assisted living environment in Sept. 2004. When the house is complete on Jan. 28, 2005, Hendler will be fitted with a discreet electronic sensor that wirelessly transmits data to the home's computer network. The network is able to sense things such as the speed of her walk, or whether she has fallen. The computer can then notify a caregiver or relative.

Other seniors will take turns living in the house over its 10-year testing time, and researchers will use the other portion of the house to evaluate how the technology is working. The project is funded by a $4.5 million federal grant, which provided the $200,000 that the 2,500-square-foot home cost to build and the $80,000 worth of technology it contains. The group is hoping as the demand for the technology increases, cost will decrease and builders will see it as a viable addition to a home package or remodeling. Because it will be possible to install the technology into a home, fewer seniors will be forced to vacate their houses in favor of nursing homes.

Christine Hale

Landmines Reveal Themselves to Modern Signal Processing

A Computer & Information Science & Engineering faculty team is part of a national initiative to make landmine detection faster, more accurate, and safer.

Professors Paul Gader, Joseph Wilson, Gerhard Ritter, computer scientist Mark Schmalz, and their graduate students have developed signal processing algorithms for identifying plastic landmines. Their work began as part of a Multidisciplinary University Research Initiative (MURI) started during the 1990s with the ultimate goal of eliminating existing landmines deployed during war, and has been funded by a variety of landmine detection programs since then. UF, along with several other institutions, created algorithms for a hand-held landmine detection system by Cyterra of Orlando, Fla., which builds detectors now used in Afghanistan and Iraq by the U.S. Army, which funds the research.

Unexploded landmines in former war zones are a global human health issue. The 2002 Landmine Monitor Report notes that 90 countries are affected by landmines and unexploded ordinance. The number of landmines deployed in these countries may reach as high as 100 million and is constantly rising in active war zones.

Demining efforts are often slow because detecting modern landmines can be difficult. Older mines were made of metal and could be located with metal detectors. Modern mines are composed primarily of plastic, with metal present only in very small quantities. Metal detectors can easily confuse these mines with the large amount of metal debris left after battles.

The focus of the research is to develop a multisensor approach to finding plastic landmines. The system has to be able to differentiate between soil types, ground water, vegetation, and buried anomalies of all kinds, as well as find metal and plastic mines.

The resulting system uses both a metal detector and ground penetrating radar.

"Ground penetrating radar can see lots of things under the ground, including plastic. It can also see pockets of water, gopher holes – just anything," Gader says. "In order to find the plastic case but discard everything else the radar sees, you use both the radar and a metal detector."

When the hand-held detector receives a signal that indicates a mine, it sends out an alarm.

The signal processor learns to distinguish mines by analyzing signals from ground similar to that where the mines may be buried. It learns to recognize soil conditions and underground features, but cannot determine the size or shape of an object. The process still requires input from a human operator who has to learn a mandatory procedure to map out the edges of the mine.

"We have research now where we are trying to automate that and do spatial mapping," Gader says. "We are working on vehicle mounted automated systems, but they are still in the research stage. Most of the vehicles are driven by remote control and are blast resistant."

A related project for the team is the use of near infrared light (near IR) to detect

Near infrared light can detect booby trap bombs.

booby traps set alongside paths or roadways. A booby trap painted a camouflage color might not be visible to someone traveling along the road. Gader's team has discovered that scanning the site with near IR will reveal the trap.

In tests, the team painted mock bombs green and hid them at ground level in some shrubbery. Then they took pictures of the site using a modified Sony digital camera. (The Sony was selected because it has near IR capability.) When seen in near IR, the booby traps appeared as dark objects surrounded by luminescent leaves. The team has been able to design and build computer programs that can successfully differentiate between traps and other objects using the system; the near IR clearly revealed the spikes on top of the traps which connect to the trip wires.

Gader says the U.S. State Department is especially interested in humanitarian demining and ordnance removal because countries with a lot of unexploded ordnance have stability problems. "It's hard to have stability when people can't safely go back to their jobs or their farms," he says.

Martha Dobson

High Performance Computing with CASTOR

Today's scientific and engineering research programs depend heavily on the availability of data on a global, multi-institutional scale. Researchers require the ability to access, process, and store very large data sets at very high speed. For that reason, the University of Florida has begun structuring a high-performance computer backbone for data-intensive scientific and engineering computing. The system is known as CASTOR, which stands for Communication and Storage.

Computer & Information Science & Engineering Professor Sanjay Ranka is the principal investigator (PI) on the project. Co-PIs are Professors Peter Sheng, Civil & Coastal Engineering, Alan George, Electrical & Computer Engineering and Paul Avery and Samuel Trickey from the Physics department. The National Science Foundation (NSF) has provided $600,000 in support funds.

The system will be linked in a 10 gigabit-per-second network that will provide 24 terabytes of data storage. Several major research groups at UF will be linked in the network, including ECE, CISE, high energy physics, chemical physics and materials science, coastal and estuarine modeling, medical physics, and computational biology.

New data mining and grid computing technologies will be needed to make optimal use of CASTOR. CASTOR PI Sanjay Ranka and a team of researchers are working on several projects to create these technologies.

Ranka explains that data mining is a process of looking for patterns in large amounts of data. He says that the concept has been around for the last 10 or 15 years and is used commercially by companies like Wal-Mart to determine what products should be sold together. There are obvious scientific applications, Ranka says, such as using data collected from the Pacific Ocean over the past several years to predict future El Niño events.

To look for patterns, researchers need to bring large amounts of data into one place. However, this is not always possible because different institutions own the data and there are legal and other issues that prevent moving the data. In cases like this, researchers must either do the mining without all of the data needed, or do distributed mining on other sites. Data site owners prefer the latter approach, so Ranka and researchers from the universities of Minnesota and Chicago are developing distributed data mining middleware, with funding from the NSF.

In a related NSF project, Ranka is working with CISE Assistant Professor Chris Jermaine to develop data mining techniques to quickly detect outbreaks of biological pathogens. This work will have direct applications in homeland security efforts against bioterrorism.

Ranka is also working with UF physicist Paul Avery on a grid computing middleware program called SPHINX. Grid computing is a new paradigm, Ranka says, that allows the sharing of resources, including data, documents, software, and computers that belong to multiple organizations. The resources are shared through virtual organizations. SPHINX is intended to provide an infrastructure for resource management and execution within the virtual organizations.

Martha Dobson

Agricultural & Biological Engineering

Kenneth Campbell, professor, is now a Fellow of the American Society of Agricultural Engineers.

Carol Lehtola, associate professor, received the 2004 NAMIC Engineering Safety Award for distinguished accomplishments and leadership in agricultural safety and health programs for education and extension. The award is sponsored by the National Association of Mutual Insurance Companies.

Civil & Coastal Engineering

Marc Hoit, professor, will serve as UF's interim associate provost overseeing campus information technology. He will serve in this position until a new provost is named.

Computer & Information Sciences & Engineering

Paul Fishwick, professor, presented the keynote address at the 2004 SCS Summer Simulation MultiConference in San Jose, July 27.

Stanley Su, distinguished professor, received the best paper award at the IASTED (International Association of Science and Technology for Development) International Conference on Computers and Advanced Technology in Education.

Electrical & Computer Engineering

Mark Law, professor and chairman, and Kevin Jones, professor and chairman of Materials Science & Engineering, received the Faculty Recognition Award for Student Recruiting from the Semiconductor Research Corporation (SRC). The award recognizes SRC-funded principal investigators who successfully recruit a high percentage of students with citizenship or naturalization status in the country where the research is performed.

Environmental Engineering Sciences

Timothy Townsend was selected to receive the Jones, Edmunds, and Associates Professorship in Environmental Engineering Sciences.

Industrial & Systems Engineering

Panos Pardalos, professor, was named a Fellow of the American Association for the Advancement of Science for distinguished contributions in the design and analysis of algorithms for solving discrete and global optimization problems with applications in the sciences and engineering.

Materials Science & Engineering

Kevin Jones, professor and chairman – see Electrical & Computer Engineering entry

Mechanical & Aerospace Engineering

Bhavani Sankar and **John Ziegert**, professors, were named MAE Ebaugh Professors. Each has a five-year appointment starting October 1, 2004.

Bhavani Sankar, professor, is now a Fellow of American Society of Composites.

Greg Sawyer, assistant professor, received the Burt L. Newkirk Award from the American Society of Mechanical Engineers (ASME). The Newkirk Award is given to an ASME member under 40 years of age who has made a notable contribution to the field of tribology in research or development as evidenced by important tribology publications.

Industrial & Systems Engineering Creates First International Course for College

The Industrial & Systems Engineering (ISE) department has launched the first ever College of Engineering course given in an international setting. The course, "International Industrial Energy Consulting - Chile," was offered in Santiago, Chile during the 2004 summer C term through ISE's Industrial Assessment Center (IAC). ISE faculty member Cristián Cárdenas-Laihacar, who is the IAC technical manager, directs the program offered in Chile and taught the course.

In front of *El Mercurio* newspaper main facility, left to right: Cristián Cárdenas-Lailhacar, Michelle Hernandez, Jaime Lemus, Nancy Wetter, Alex Bertens, Michelle Wasserlauf and Sam Sadle.

Six ISE students participated, including Michelle Hernandez, Michelle Wasserlauf, Nancy Wetter, Alex Bertens, Jaime Lemus, and Sam Sadler. The course explored the economic and energy environment in Chile, the influence of climate, and Chile's characteristics as a NAFTA member. While in Chile, the students did energy audits of El Mercurio, a newspaper roughly equivalent to The New York Times, and Quimetal, a copper-based pesticides and fertilizer plant.

The group visited, but did not audit, a plant that produces pork feeding pellets, a pig breeding facility (136,000 pigs) with a tremendous biodigestor, and Viña Ventisquero, the biggest vineyard in Chile, where the team was invited to a special wine tasting. The students also gave three talks to students and faculty in the College of Engineering at Pontificia Universidad Catolica (PUC) de Chile, one of the most prestigious universities in Chile and Latin America.

Besides all the hard work, the team toured Santiago, a city of seven million, learning about the city by visiting a fort built in 1612, museums, old churches, and other sites. They also went to the beach and tried typical Chilean seafood; visited a ski resort in the Andes; and discovered traditional country food and Chilean arts and crafts.

Christine Hale

Graduate Engineering Research Center Brushes Ivan Off

Hurricane Ivan did little harm to the Graduate Engineering Research Center (GERC) when the storm came ashore just west of Florida's Panhandle. GERC, which is located at Eglin Air Force Base, fared exceptionally well, according to John Rogacki, GERC's new director.

Rogacki reports, "Other than damage to our landscaping (trees and branches down) and some minor damage to lighting fixtures, we were unscathed." GERC was closed from Thursday, Sept. 16 through Monday, Sept. 20 and reopened to a normal schedule on Sept. 21.

"Our facilities expert, Richard Runyon, did a yeoman's job in putting the pieces back together," Rogacki says.

The faculty and staff of GERC also received no injuries and only minor damage to homes and apartments.

UF civil engineers find that

Strict Building Codes Can Protect Homes from Storms

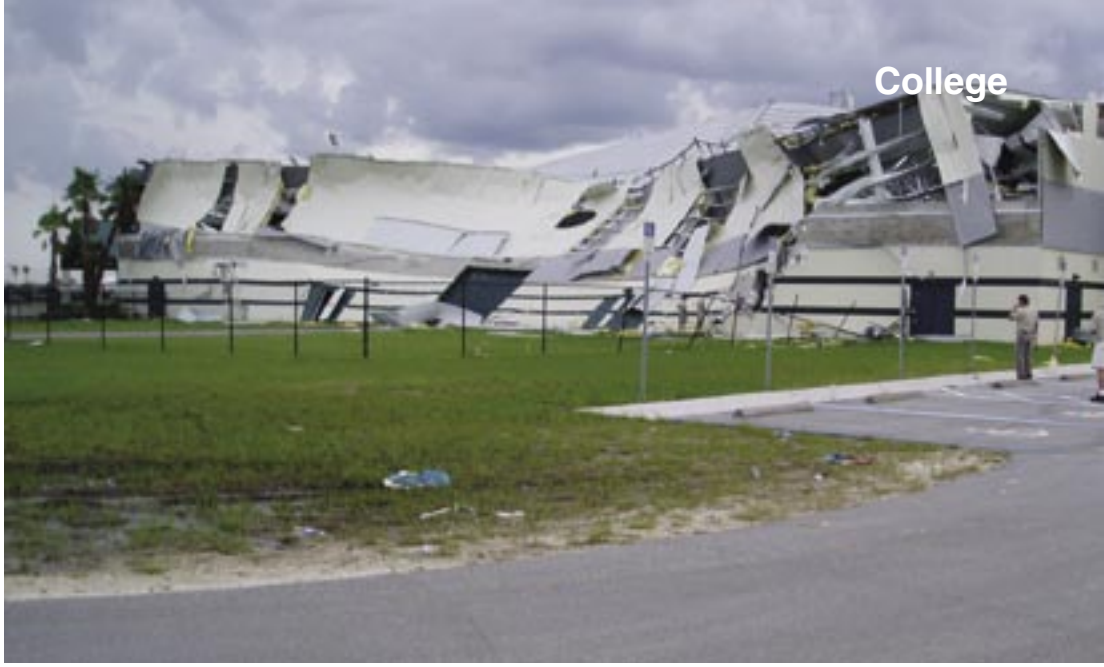
Kurt Gurley's research is part of the Florida Coastal Monitoring Program. Participants include UF, Clemson University, Florida International University, Florida Institute of Technology, and the Institute for Business and Home Safety. The research is sponsored by the Florida Department of Community Affairs, the National Oceanic and Atmospheric Administration, the National Science Foundation, and the Florida and South Carolina Sea Grant offices.
http://users.ce.ufl.edu/~fcmp

Tough building codes put in place after Hurricane Andrew seem to be working, says Kurt Gurley, a UF Civil & Coastal engineering associate professor who studies the effect of hurricane wind loading on homes. Both mobile and conventional homes built recently in Florida have weathered 2004's hurricane barrage well, Gurley says.

For the past two years, Gurley and his research team have studied data from several homes along Florida's Gulf and southeast coasts that were equipped with instruments to measure wind pressure. They also deployed portable towers near the homes during storms to measure wind speeds. The measurements are used to characterize damaging wind behavior.

Gurley's team took wind speed readings and conducted detailed, post-hurricane forensic damage surveys of manufactured homes and single family dwellings for every land-falling hurricane during the 2004 season. Now that the season is over, Gurley and his team have returned to the storm-impacted areas to do a three-month-long damage survey to enhance data from the earlier investigations. A calibration of the measured wind speed data to the observed wind damage will reveal the relationship between wind speed thresholds and the likely damage modes in common types of residential construction. Gurley believes the findings will be useful for building code committees.

"We are going to look at the relative performance of the building codes used in Florida during different eras," Gurley says. New homes between 1993 and 2001 were built according to codes created in the aftermath of Andrew, and 2001 saw the adoption of a common building code across the state that is stronger still. Thorough damage evaluations will be conducted on a statistical sampling of homes in the 2004 impacted areas. The study will bolster the mostly anecdotal conclusions drawn from 'drive-by' inspections of damaged areas with a more quantitative and deliberate report based on many homes with construction dates from 1993 through 2004.



"We know that homes built after 2001 did very well in all the hurricanes with the exception of certain components that were fastened to the outside of the homes," Gurley says. "During Ivan, the homes that suffered significant wind damage were very old, poorly constructed, or suffered damage from fallen trees. Storm surge did the majority of the major damage."

Gurley and his research partners at Clemson University in South Carolina and Florida International University in Miami also plan to use the data in studies that compare building code requirements to real life storm events. Building codes require that structures be designed to resist prescribed wind loads. "That information all came from wind tunnel tests that were done years ago," Gurley says.

One of the most important aspects of wind tunnel tests is to see how well they replicate boundary layer winds which are closest to the earth and are the most turbulent. It is the pushing and pulling action from this turbulence that usually damages structures. Therefore, the team will build scale models of the actual test-subject homes wired in the field to collect the full-scale data during a real hurricane. These models will be tested in Clemson's boundary layer wind tunnel, specifically built to recreate turbulent wind behavior. The team will measure scaled down wind pressures on the miniatures and compare the readings to the real pressures measured during the storms.

"If we can compare the new wind tunnel tests to what happened to that same structure in real life, we can help fill in the missing link between what wind loads the codes say we should design for and what really happens," he says.

In the future, Gurley's team will do research on the way human behavior influences how effectively engineering design can mitigate storm damage. "We saw lots of cases where people had nice steel hurricane storm shutters for their houses and didn't bother to put them up. The way people behave relative to risk is a limiting factor on how much an engineer can do to try to prevent them from getting hurt or lose property," Gurley says.

Gurley says it is always scary to see the destruction after a storm. "Just to see how seriously we have to take these events always leaves an impression, no matter how many times we go and do this," he says. "We have chased 14 storms so far. Not a one of them you could take lightly."

Martha Dobson

The Faculty Challenge Initiative

Gator Engineering alumni, industrial partners, and donors often ask, "When I make a gift to the College of Engineering, what is my best investment?"

The College of Engineering has many good investment opportunities where private gifts make a significant impact. Unrestricted gifts, student support, and program enhancement are always important to a college with almost 7,000 students and 300 faculty. However, if you want to make a real impact, consider a gift that supports the faculty.

President Bernie Machen has announced a Faculty Challenge Initiative to raise $150 million for faculty support over the next seven years. President Machen and Dean Pramod Khargonekar are making this our highest priority because recruiting and retaining top quality faculty are critical to our future success. As Dr. Machen stated, "In order for the University of Florida to reach its potential, we must do a better job supporting our faculty."

It is no accident that UF is Florida's flagship institution and the state's only member of the prestigious Association of American Universities. UF earned those rankings the old-fashioned way, with an outstanding faculty. Now, as we anticipate further recognition among the top tier of American universities, we understand that achieving higher status will depend heavily on how well we recruit, retain and support our professors and researchers.

How You Can Help

You can help by designating your support for a professorship, graduate fellowship, or faculty research program. To do this, you may:

- Endow a professorship
- Endow a graduate fellowship
- Endow a research fund
- Create a non-endowed term professorship

We encourage you to consider one of the following methods to make your gift:

- A gift of highly appreciated securities
- A gift of highly appreciated real property
- A bequest in your will or trust
- A five-year cash pledge

There are significant matching grant programs available from the state for gifts of $100,000 and more. Dr. Machen has pledged an additional match from a special discretionary fund for gifts of $1 million or more for the Faculty Challenge until the fund is exhausted.

Dean Khargonekar is dedicated to providing increased support for our current faculty and to recruiting promising new faculty. Your private gift can make the difference in his ability to reward our highest performing faculty and to attract the best new faculty in the world to the College of Engineering.

You can find information online at **www.uff.ufl.edu/FacultyChallenge** and you are always welcome to contact the College of Engineering Development Office. We will be glad to answer your questions and help guide your decision to support the College of Engineering.

Go Gators!

Steve Beeland
Senior Director of Development
College of Engineering

330 Weil Hall
P.O. Box 116575
Gainesville FL 32611-6575

Phone: 352.392.6795
Mobile: 352.256.6074
Fax: 352.846.0138
Email: sbeeland@eng.ufl.edu

Faculty Challenge Initiative Update

Robert M. "Gator" Handley (BSEE 1962) established the first professorship in UF President Bernard Machen's recently announced Faculty Challenge Initiative by designating $600,000 from his estate to fund an endowed professorship in the Electrical & Computer Engineering department.

Should the state's matching gift program be continued at present levels, Gator's gift will be eligible to receive a $420,000 match, thus creating a $1,020,000 endowment that will provide at least $40,000 per year in perpetuity for faculty support.

Gator graduated from Clearwater High School and entered UF in 1958, majoring in electrical engineering. Like many students in the 1950s, Gator worked his way through school. He earned his board at the student-athlete dining room in the old Student Union while earning his degree in the College of Engineering.

Following his graduation in 1962, Gator took an engineering position with Hughes Aircraft in California. While working in the aerospace industry, Gator earned his master's degree in electrical engineering from the University of Southern California.

UF President Bernie Machen and Robert M. Handley

Gator went on to several leadership positions with Allied-Signal (now known as Honeywell) before retiring to his native Clearwater in 1998. He is a member of the Engineering Advisory Council and also serves on the Electrical & Computer Engineering Advisory Board.

"Bob Handley's gift will create an endowment that will allow us to recruit an outstanding faculty member to the College of Engineering," said Dean Pramod Khargonekar. "More and more, our ability to offer a professorship in the recruitment process is the critical factor in successfully attracting outstanding faculty to the University of Florida."

"I am very pleased that I was able to make this contribution to the College of Engineering," said Handley. "I am convinced that to build lasting excellence, the college and the Electrical & Computer Engineering department must build permanently endowed support for our faculty. I am pleased to do my part and hope my classmates and others will join me in supporting the faculty that made our careers possible."

Steve Beeland

Chemical Engineering Department Receives $100,000 Grant

Joyce E. Morway of Clark, N.J. has established an endowed graduate fellowship to honor her father, Arnold J. "Red" Morway. Her gift of $100,000 is eligible for a $50,000 matching grant from the state of Florida. The Arnold J. "Red" Morway endowed fund will support master's level students in Chemical Engineering.

"Red" Morway (1906-1985) received his BS in chemical engineering from UF in 1929. Morway delayed coming to UF for a year after graduating from Duval High School in Jacksonville, Fla., so that he could work to raise the $42 UF tuition. He went on to receive his MS degree from Columbia University and began doctoral studies at Brooklyn Polytechnic Institute.

Morway became famous for his research in industrial greases while working for Exxon Research and Engineering Company, receiving 293 different US patents and numerous foreign patents for grease formulations. The United States Patent Commissioner personally congratulated Morway upon his 200th patent. The New Jersey Inventors Congress and Hall of Fame inducted Morway after his death.

Morway's first patent in 1936 was for a discovery that resulted in the development of more than 50 products. In 1938, he invented some of the first premium quality, widely used high temperature greases for anti-friction bearings. Morway's other inventions included a multi-purpose grease for use in diesel ships operating on residual fuels, which decreased engine wear by 50 percent; the first commercially produced lithium-based aviation greases used during World War II; and the first extreme-pressure calcium acetate multi-purpose grease for industry and automotive use.

Morway's best known invention was never patented. Eisenhower grease was used widely during World War II to enable the waterproof operation of landing craft, tanks, trucks and other vehicles carrying men and war materiel in beach landings.

Health issues forced Morway to retire before he reached his goal of 300 US patents. His patents are displayed in six bound volumes, along with news clippings and his publications, at the library of the New Jersey Institute of Technology in Newark, N.J.

Morway was an avid gardener and was well known for having more than 300 bow ties, which he made himself out of fabric from his wife's or daughters' dresses. Morway was the subject of good-natured kidding from his lab associates for being hard of hearing. Former research director Per K. Frolich once commented, "Red apparently didn't hear very well in our meeting, so he just went back to his laboratory and tackled the problem his own way, coming up with a patentable result."

Christine Hale

Mark Jager of the Boeing Company (c) presented a check for $25,000 to Dean Pramod Khargonekar (r) and Mechanical & Aerospace Engineering chair Wei Shyy (l) at the Dean's Advisory Board Meeting November 18, 2004. The donation will support master's degree fellowships and undergraduate scholarships in the MAE department.

Reaching Out to Industry

The Industry Programs Office Update

The College of Engineering Industry Programs Office continues to take on new challenges and opportunities as it builds greater collaborative relationships with industrial partners of all sizes – from Fortune 100 to start-up companies. Erik Sander, the program director, says, "I look back over the last two years with satisfaction as the office has participated in over $31 million of collaborative proposals and programs with industry."

Industry Programs has established a blanket research agreement with Harris Corporation that enables diverse research projects to be initiated without renegotiating the terms of the agreement every time; a broad industrial support base for over $20 million of nano-medical research program proposals; and UF research relationships with the University of Central Florida Photonics Center of Excellence.

Industry Programs also organized and chaired the First Annual Florida Technology Transfer Conference on behalf of the Florida Research Consortium, and organized a series of "Industry Days at UF" to bring senior administrators and researchers from key industrial partners to UF for lectures and research discussions with faculty and students.

Industry Programs supports the college's goal to encourage an entrepreneurial culture among the faculty and students. Sander says, "Supporting an entrepreneurial environment on campus, where faculty and students can expand their boundaries is key to their future success. Most of our students may never start their own companies or even work in start-ups, but almost all will work in entrepreneurial teams at some point in their careers. It's important that we prepare them to take full advantage of all opportunities as well as we can."

As part of this effort, Industry Programs in fall 2003 collaborated with the UF Warrington College of Business Center for Entrepreneurship and Innovation (CEI) to start an Entrepreneurship for Engineers course which has already been taken by over 100 graduate engineering students. The office also works with UF's Office of Technology Licensing and the College of Engineering Integrated Product and Process Design Program (IPPD) on the Integrated Technology Ventures Program (ITV). ITV is an offshoot of IPPD that provides engineering and business students with a start-up company experience working with serial entrepreneurs to develop UF technologies for commercialization.

"We are never satisfied with where we are," Sander says. "As we look ahead to new challenges, we'd like to continue to leverage the strong relationships that the college has with great corporate partners like Harris, IBM, Intel, Sandia National Laboratories, and many more to focus on multidisciplinary programs of value to all parties." Sander welcomes contacts from interested corporations and individuals. For those not familiar with how the college can work with industry, Sander can serve as a first contact and make the relationship as easy and mutually beneficial as possible.

330 Weil Hall
Phone: 352.392.8049 x1005
Email: esander@eng.ufl.edu

Friends We Will Miss

1925 Wayne A. Cooper, of Winter Park, Florida, died September 22, 2002.

1926 John M. Boyd, BSCHE, MS 28, of Clermont, Florida, died February 3, 1996.

1927 Charles J. McDowall, BSME, of Jacksonville, Florida, died July 12, 1996.

1928 William H. Johnson, BSEE, of Watkinsville, Georgia, died December 1, 2001.
James G. Keck, BSEE, of St. Petersburg, Florida, died July 23, 2004.
Orren L. Van Valkenberg, BSCE, of Ringgold, Georgia, died November 10, 2002.
Joe P. Windham, BSEE, of Livonia, Michigan, died January 1, 1982.

1929 R. A. Menendez, BSEE, of Tampa, Florida, died December 16, 1999.

1930 Elio Fueyo, BSEE, of Miami, Florida, died January 12, 2004.
Robert W. Hart, BS, of Murphy, North Carolina, died May 24, 2001.
Parker W. MacCarthy, BSME, of Bowie, Maryland, died May 7, 2002.
Thomas R. Meeker, BSEE, of Panama City, Florida, died October 14, 2000.

1932 George D. Freeman, BSCHE, of New York City, New York, died July 1, 1976.

1933 Robert L. Crownover, BSCHE, of Dade City, Florida, died March 8, 1998.

1934 George E. Rollins, Jr., BSCE, of Columbia, South Carolina, died August 2, 2004.

1935 Henry I. Mossbarger, Jr., BSCHE, of Maryville, Tennessee, died January 1, 1992.
John J. Tigert V, BSME, of Lake Placid, Florida, died July 12, 2004.
Note: Mr. Tigert was the son of former University of Florida president John J. Tigert.

1936 Joseph A. Craig, BSCE, died July 2, 2004.

1945 Ewen K. Cameron, BSCE, of Vero Beach, Florida, died April 18, 2004.

1947 Robert Bawer, BSEE, of Vienna, Virginia, died June 22, 2003.
John H. Crisp, BSIE, of North Ft. Myers, Florida, died September 20, 1996.
William M. Horton, BSME, of Port Arthur, Texas, died June 5, 1995.
Arthur N. Winsor, MSIE, of Gainesville, Florida, died August 5, 1990.

1948 Oscar H. Stroh, BSIE, of Alva, Florida, died September 15, 2001.
Jack Wellhoner, Jr., BSEE, of Davenport, Florida, died November 3, 2003.

1949 Wilfred J. Curry, Jr., BSEE, of Atlanta, Georgia, died April 1, 1975.
Basil E. Ellis, BSCE, of Jacksonville, Florida, died March 14, 2001.
Robert B. Nieland, BSME, of Solon, Iowa, died September 1, 2004.
William D. Rinehart, BSME, of Spring Hill, Florida, died April 25, 2004.

1950 Henry E. Nawotka, BSEAE, MS 52, of San Pedro, California, died September 1, 1977.
Arthur L. Sprott, BSME, of Ormond Beach, Florida, died February 8, 2000.

1952 Joseph C. Payson, BSME, of Brooksville, Florida, died May 30, 2004.
William L. Watson, BSCE, of St. Petersburg, Florida, died April 23, 2004.

1954 Harold A. Meeler, BSCE, of Cocoa Beach, Florida, died January 20, 2004.

1955 Kenneth W. Martin, BSIE, of Gainesville, Florida, died December 13, 1997.

1956 John M. Clark, BSEE, MS 58, PhD EE 66, of St. Petersburg, Florida, died June 1, 1981.

1958 Robert L. Armor, Jr., BSEE, of La Habra, California, died July 7, 1994.

1959 Robert W. Bowman, BSME, of Merritt Island, Florida, died August 21, 2004.
William J. Larkin, BSNE, of Newport Beach, California, died July 1, 1993.
Eugene L. Sanders, BSEE, of Huntsville, Alabama, died January 1, 2004.

1960 Robert E. Sovik, BSIE, APO San Francisco, California, died January 5, 2001.
Herbert F. Whitman, BSEE, of Azusa, California, died September 10, 2000.
Charles R. Williams, BSEAE, of Montgomery, Alabama, died May 6, 2004.

1961 Alex L. Gilmour III, BSCHE, of Jacksonville, Florida, died February 12, 1990.
Bruce G. Nimmo, MS, of St. Petersburg, Florida, died August 19, 2000.

1962 John T. Page, BSIE, of Longwood, Florida, died October 15, 1998.

1965 John H. Agee, BSCHE, of Baton Rouge, Louisiana, died October 25, 2002.
Edward L. Root, BSCHE, of Gretna, Louisiana, died November 23, 2003.
William M. Taylor, ME, of Alpharetta, Georgia, died January 4, 2004.

1966 Earl R. Greene, Jr., BSEE, of St. Petersburg, Florida, died May 4, 2004.
Bruce B. Henriksen, MS, PhD ASE 68, of Centennial, Colorado, died February 12, 1998.
Henry A. Luten, Jr., BSCE, of Little Switzerland, North Carolina, died March 27, 1996.
William H. Spiller, BSEE, of Waynesboro, Tennessee, died December 3, 1999.

1968 Raymond M. Clock, PhD ENE, of Melbourne, Florida, died February 24, 2004.
Joseph M. Horowitz, MS, of East Meadow, New York, died August 1, 1981.

1969 Edward N. Lawrence, ME, of Washington, DC, died February 15, 1993.

1970 Oneal Estenoz, BSCE, of Lauderhill, Florida, died September 1, 1979.

1972 Jose Lorenzo Martin, BSCE, of Gainesville, Florida, died November 8, 1978.

1975 Richard A. Long, BSET, of Gainesville, Florida, died August 9, 2002.

1978 Stephen J. Monagan, MS ASE, of Williamsville, New York, died March 1, 1981.
Kevin R. Mulling, BSME, of Memphis, Tennessee, died May 29, 2004.

1982 Nancy S. Austin, BSEAE, of Crystal River, Florida, died August 15, 2004.

1995 John H. Robinson, Jr., MSEE, of Ocala, Florida, died June 13, 2004.

1997 Steven J. Boyle, BSENE, of Niles, Ohio, died April 16, 2003.

2003 James R. Howell, BSCE, died January 6, 2004.

Information is provided by the University of Florida Foundation, Inc. Academic major or hometown data may not be available.

Alumni Notes

write

send

pubsmail@eng.ufl.edu

Editor, The Florida Engineer
University of Florida
PO Box 116550
Gainesville, FL 32611-6550

www.eng.ufl.edu/home/pubs

David Gwynn

1988

David Gwynn, Jr., MS CCE, has joined the HNTB engineering firm as vice president and officer-in-charge of the Orlando, Lake Mary, and Tallahassee offices. Gwynn was the co-founder of TEI Engineers & Planners, a transportation consulting firm in Lake Mary. Gwynn and his partner, Andres Nunez, formed TEI in 1991. The firm specialized in transportation planning, traffic engineering, Intelligent Transportations Systems, and highway design. Under his management, TEI was named by Civil Engineering News as one of the Best Engineering Firms to Work For in 2002 and 2003. HNTB Corporation purchased the stock of TEI in July, 2004. Gwynn is a resident of Seminole County, Fla. He was named Small Business Person of the Year in 2002 by the Seminole County/Lake Mary Chamber of Commerce. His community activities include mentoring Seminole High School students, the Take Stock in Children and Lake Mary High School Success-at-Work programs, and the Seminole County Teach-in.

1990

Jerry Paul, NRE, is now the principal deputy administrator at the National Nuclear Security Administration. He is the second highest ranked administrator at the government agency responsible for maintaining and enhancing the safety and security of U.S. nuclear weapons. Paul was nominated for the post by President George W. Bush and confirmed by the U.S. Senate.

1992

James S. Marotta, MSE, PhD MSE 97, is on the editorial board of the Journal of Biomedical Materials Research: Applied Biomaterials. He is the technology manager for biologics at Medtronic Sofamor Danek in Memphis, Tenn.

1996

Amy Y. Lee, BSME, is the global business manager for General Electric (GE). She is focused on developing and implementing strategic plans to grow the business globally, in addition to maintaining the business market leadership position. She leads a team of engineers, marketing and commercial operations professionals, and interns. Previously, Lee was manager of new business development with a subsidiary of The Carlyle Group, where she was involved with a company turnaround and the divestiture of a $900 million business. This year, she is the regional GE company leader for Heart Walk, the American Heart Association's #1 annual fundraiser to fight heart disease and stroke.

2001

Brian J. Dlouhy, BS ChE, has completed his third year at New York University Medical School. He has been selected as a Howard Hughes Medical Institute Scholar and will conduct a year of research at the National Institutes of Health at Bethesda, Maryland, before returning to NYU for his final year of medical school.

Gator Engineers Honored as UF Distinguished Alumni

Gator engineers are not only lauded at the University of Florida, but have made significant contributions to engineering technology in the US and abroad. Alumni Robert O. Powell and Sachio Semmoto were honored at the fall 2004 commencement ceremonies as University of Florida Distinguished Alumni for significant contributions in their respective fields and commitment to the success of the university.

Robert O. Powell
(BSCE 1955)

Powell, a pilot, engineer, sportsman and philanthropist, has both helped to change the landscape of Florida and worked to preserve and protect its human and natural resources.

A veteran of the US Air Force, Powell, with his brother, Steve, also a UF alumnus, was a partner in a family business that helped in the development of Broward County and the Port Everglades seaport. Powell Brothers Barge Terminal Inc., a heavy marine equipment company, was founded by his father and uncles in 1932. Powell Brothers innovated many of the techniques used today in marine engineering.

Powell Brothers built bridges for the Florida East Coast Railroad and along the Alligator Alley highway. The company also built the Bahamian bridge from Nassau to Paradise Island, as well as many of the canals and marinas in South Florida and the Caribbean Islands. Called upon to help at the dawn of the Space Age, the company worked with NASA laying cables for downrange tracking equipment when the first space probes began.

Both Powell and his wife Ann have extensive roots within the UF community. They met while both were pursuing degrees at UF. In appreciation of their education, they have been generous supporters of the university, providing funds for construction of the Powell Structures & Materials Laboratory in the College of Engineering and for Powell Hall at the Florida Museum of Natural History.

The Broward County Gator Club recognized Robert Powell with its Distinguished Alumnus Award in 1997 for his work for the UF Foundation's Its Performance that Counts Broward Campaign Committee. Robert and Ann Powell are strong supporters of other causes in Broward County, including the Cystic Fibrosis Gold Coast Guild, Bonnet House Alliance, Jack and Jill Children's Center, the Alzheimer's Women's Association for Resources and Education, and the Museum of Discovery and Science. Robert also has served on the board of directors for several businesses, including SunTrust Bank of South Florida.

Sachio Semmoto
(PhD EE 1971)

The University of Florida is an international center where many distinguished scholars from around the world have received their education. Sachio Semmoto, a leader in Japan's information technology industry, is an extraordinary example of UF's success in providing the academic springboard to international acclaim.

Semmoto began his career with Nippon Telegraph & Telephone (NTT), where he led the development of Japan's first optical fiber system. After 17 years at NTT, he left to help launch DDI Corp., Japan's first fully private telephone company that revolutionized the Japanese telecommunications industry. Semmoto is credited with sharply reducing long-distance call costs, promoting free competition in long-distance service, and introducing innovations such as customer service centers, detailed bill reporting, and least-cost routing among long-distance carriers.

Linking telecommunications to home computers, Semmoto founded eAccess Ltd. in 1999 to help bring Japan into the Internet Age with an inexpensive, fast Internet connection using ADSL (asymmetric digital subscriber line) technology. He serves as chairman of the board and chief executive officer for eAccess, which is Japan's first entrepreneurial and global IP/telecom start-up company.

With a propensity to create new systems for future generations, Semmoto is a founder of Eco-Power Co. Ltd., Japan's first wind-power generating company, and has helped lead the movement for eco-friendly technology in Japan.

Semmoto's entrepreneurial spirit inspired him to co-found the Japan Academic Society of Ventures and Entrepreneurs so he could help others commercialize their inventions. From 1996 to 2000, he joined the Graduate School of Business Administration at Keio University in Tokyo as a professor in entrepreneurial management and information technology. Due to his research in entrepreneurship and mentoring of others, Keio Business School's entrepreneur school has created many new companies, some of which are now public.

Semmoto has served as a visiting professor at Carnegie Mellon University and the University of California at Berkeley. He has lectured at Harvard, Stanford, and Northwestern universities in the US and Cambridge University in England. He is a Fellow of the Institute of Electrical and Electronics Engineers. In 2002, Semmoto presented a presidential lecture at UF. He has agreed to serve as a visiting professor in the College of Engineering and is a member of the Dean's Advisory Board.

The University of Florida and the College of Engineering take pride in the accomplishments of its alumni and acknowledge their success in hope of inspiring future graduates in their endeavors.

Christine Hale

Commencement Honors Go To Outstanding Students

Flying caps and tears of joy marked a significant milestone in the lives of hundreds of Gator Engineers on December 17, 2004. Graduates, family and friends crowded the Stephen O'Connell Center at 2 p.m. to celebrate the awarding of 311 bachelor's, 184 master's, and more than 50 doctoral degrees.

Special student honors at the ceremony went to Yamal E. Yidios, the Gator Engineering Two-Year Scholar, and Tyson Brown, the Gator Engineering Four-Year Scholar.

Yamal Yidios is a 22-year-old from Cartagena, Colombia, who graduated cum laude with a BS degree in civil engineering. Due to his outstanding academic achievements and leadership involvement in high school, he won a full academic scholarship to Stetson University to study physics and pre-engineering. At Stetson, Yidios maintained a 3.9 GPA, successfully completed the pre-engineering program, and received a minor in physics. He was also president of the Hispanic Organization for Latin Americans and played for the Stetson NCAA Division I Tennis Team.

In August 2002, Yidios transferred to UF to study civil engineering. He has been an active member of the American Society of Civil Engineers, Society of Hispanic Professional Engineers, Colombian Student Association, and Hispanic Student Association. Yidios belongs to several honor organizations including the Golden Key International Honor Society and National Civil Engineering Honor Society (Chi Epsilon), and earned a place on the College of Engineering Dean's List. He received several scholarships from the College of Engineering and Department of Civil Engineering.

Yidios received his bachelor's degree through the BS/MS program in civil engineering and after graduation will continue working toward a master's degree in civil engineering in construction management. He already has worked with several engineering consulting and construction firms in central and south Florida over the last four years, including Kimley-Horn & Associates, Parker Mynchenberg & Associates, Lynn Townsend & Associates, and Yidios Brothers Constructions.

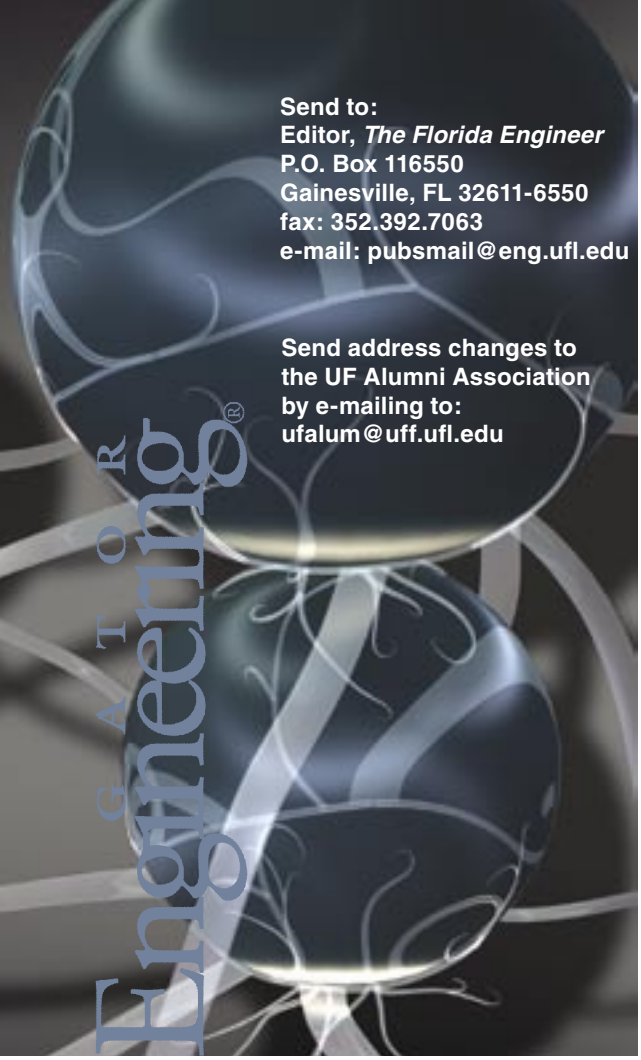
Christine Hale

Tyson Brown graduated summa cum laude with a BS in electrical engineering, a BS in computer engineering, and a minor in business administration. Brown is a member of the Eta Kappa Nu Electrical and Computer Engineering Honor Society, serving as president in 2003-2004. He is a member of the Tau Beta Pi Engineering Honor Society, serving as vice-president of electees in 2002-2003.

Brown received the Andersen Scholar of Highest Distinction in fall 2002 and was on the President's Honor Roll and the College of Engineering Dean's List multiple times. He received a National Merit Scholarship from the University of Florida, the 2002 Golden Key Senior Inductee Scholarship, the Robert C. Byrd Honors Scholarship, the Craig Dickinson Memorial Scholarship, and the Florida Bright Futures Academic Scholarship.

Outside of school, Brown is active in Baptist Collegiate Ministries and the Westside Baptist Church, and has been to the Dominican Republic and Brazil to do mission work. He plays intramural sports, is a PADI-certified scuba diver, a snowboard and snow skier, and breeds ball pythons. He has tutored students in calculus and physics. After graduation, Brown plans to work in management in a family-owned electrical contracting company in the Tampa Bay area.

Christine Hale



Send to:
Editor, *The Florida Engineer*
P.O. Box 116550
Gainesville, FL 32611-6550
fax: 352.392.7063
e-mail: pubsmail@eng.ufl.edu

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YEAR OF GRADUATION DEGREE MAJOR

NEWS OF INTEREST ABOUT YOUR ACTIVITIES, RECOGNITIONS, ETC.

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