UNIVERSITY OF FLORIDA

GATOR Engineering®

Electrical & Computer Engineering

Fall 2005

Back (L—R): Adam Barnett, Grzegorz Cieslewski, Dr. Eric Schwartz, Aaron Chinault, Carlo Francis, James Greco (Team Captain), Alan Melling, Kevin Claycomb. Front: William Dubel

UF's Winning Robotic Submarine Provides Peek at the Future

By Aaron Hoover/UF News Bureau

On the heels of the rescue of a Russian mini-submarine by a remotely operated sub, students are leading their compatriots in the design of the next generation of robotic underwater vehicles.

The eight electrical and computer engineering students' 30-pound submarine, SubjuGator, placed first in a national competition of 21 student-built robotic submarines earlier this month. Although still in the research stages, the sub points the way toward a future of smart, compact robotic submarines that could repair underwater pipelines, guard ports and conduct military offensive operations underwater.

"The military wants to have a significant percentage of its battle infrastructure done without humans in 10 years — by 2015, 30 percent of all U.S. military vehicles should be capable of autonomous navigation," said Eric Schwartz, the electrical and computer engineering faculty adviser for the SubjuGator project. "These robotic subs could serve as spy-bots or plant explosives. You don't always want to use humans because we value human lives and fighting is risky."

On Aug. 7, the remote-controlled British "Scorpio" underwater vehicle disentangled a Russian mini-submarine that had been trapped for days beneath the Bering Sea, saving the seven-member crew. The rescue highlighted the capacity of remotely operated subs to lend assistance in situations that are either too dangerous or too deep for human divers – in this case, cutting the mini-sub free of fishing nets and other debris that had trapped it more than 600 feet below the surface.

The next step is to make submarines autonomous, or able to navigate and complete tasks without human assistance. UF teams have worked on that thorny challenge since at least 1998, when they first entered the

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UF's winning robotic submarine provides peek at the future

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then newly created Autonomous Underwater Vehicle Competition. But while the UF team placed in the top three in four of the previous competitions,the Aug. 3-7 competition at the Space and Naval Warfare Systems Center near San Diego marked its first victory. The competition is sponsored by the Association for Unmanned Vehicle Systems International and the Office of Naval Research.

Three teams achieved one of the competition's main objectives: Finding an underwater pinger, or sound-generating device, in a murky pond, and then rising to the surface directly above the pinger. But UF took first place because SubjuGator's weight of 30 pounds was at least 40 pounds lighter than the other finalists.

"We forced ourselves into a small design by buying a small shell," said Jim Greco, who earned his bachelor's degree this spring and begins his doctoral program this fall, both in the UF department of electrical and computer engineering.

"All of our electronics had to fit within the shell. At UF, to save money, we make a lot of our electronics, whereas other teams might buy it off the shelf."

Besides the electronics, the compact SubjuGator has five thrusters, which gives the computer controller complete three-dimensional control, said another team member, Jose Carlo Francis. It is powered by lithium polymer batteries that allow it to operate for 90 minutes. The design is completely new, although students used a few parts from previous years.

Greco, the team's leader, said building the sub was a good introduction to collaboration and other skills of professional engineering.

"Our classes are great, but it's mostly just theory," he said. "There aren't a whole lot of practical applications, and this allows you to get a leg up."

He added that one problem with today's remotely operated submarines is that they require a cable or other communications link to the operator at the surface.

"If you're going down into the Marianna Trench, the deepest spot on Earth, you can't exactly drop a cable in there," he said.

Robotic subs, by contrast, remove this impediment, but as Grego noted "they have their own problems to work around." One major challenge: programming the subs to "see" and react to objects or changes in the terrain, a difficult task for land-based robots made even harder underwater by limited visibility and difficulty of controlling the vessel.

UF Research Grid for High-Performance & Data-Intensive Computing

What previously took researchers hours—and possibly days—to accomplish now only takes minutes or seconds, thanks to a growing grid of UF's computing resources and the UF High Performance Computing Committee, led by ECE professor Dr. Alan George.

At the heart of this campus research grid is a new high-performance computing center intended to provide a powerful baseline of computation and storage infrastructure for the grid coupled with high-speed communications. This grid will connect existing multiple independent facilities across campus for the efficient and effective sharing of resources, and will assist with collaborative research worldwide.

Phase I, installed in October 2004, focused on the College of Liberal Arts & Sciences. Dr. Paul Avery of the Physics Department was the first faculty investor. His investment was matched by the CLAS and the UF Office of Information Technology.

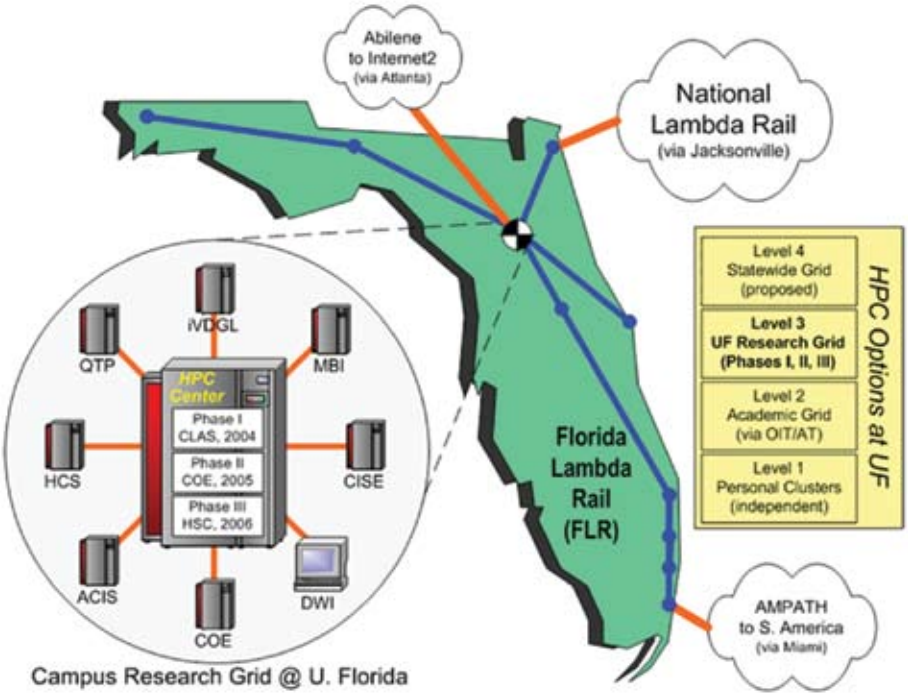
"Phase II, which now focuses on the College of Engineering, will be approximately twice the size of Phase I," George said.

To date, the ECE Department is the largest investor. The new equipment for Phase II arrived in October and will be temporarily housed in the New Physics Building until renovations in Larsen Hall are finished.

In November 2004, UF for the first time was included in the Top500 (www.top500.org) rankings (No. 221) at the global Supercomputing Conference. Twice a year, Top500 generates a list of the sites operating the 500 most powerful computer systems in the world.

"We anticipate that UF will be in the top 100 when Phase II is completed," George said.

Phase III, which incorporates the UF Health Science Center, is already under development and is expected to be operational in October 2006.



Student Chapter News

Eta Kappa Nu (HKN)

Fifty new members attended HKN's first information sesion of the fall semester. According to HKN President Jeff Van Dyke, goals for this year include: increasing visibility among the student body, building up funds to award a scholarship to an HKN member the next academic year, staying better in touch with past members, and creating a book of companies that hire interns.

Front (L-R): Brian DeCarlo, Daniel Cummings, Ningyuan Ding, Bradley Morin,
Back (L-R): Dr. David Arnold, Brian Sapp, Joseph Gaita, Jeff Van Dyke, Adam Winter, Joseph Wade, Adam Radwan

Institute of Electrical & Electronics Engineers (IEEE) Student Chapter

IEEE began the fall semester by speaking to freshmen and sophomores at the COE New Student Orientation about reasons for becoming an engineer. This semester, the chapter will host technical speakers from Texas Instruments, Microsoft, and Siemens. Future activities include a camping trip, the IEEE Southeast Conference, and chapter fundraising. Goals for this year include increasing membership, becoming better known throughout the IEEE national organization, and bringing more recognition to the Department and the University.

L-R: Brian Kindinger, Weijia Xia, Eric Siegel, Julio Suarez

ALUMNI NEWS

Harry M. Schindehette Jr. (B.S. EE 1966) has retired from the electric utility industry after 42 years of service.

Lesa Roe (B.S. EE 1986) has been named director of NASA's Langley Research Center in Hampton, Va.

John Lorbeer (B.S. EE 1987), employed by Convergys in Jacksonville, Fla., has earned the designation of Project Management Professional by the Project Management Institute.

Carlos Ramos (B.S. EE 1989) is an OB-GYN with the Houston Medical Center.

R. Chris Fore (B.S. EE 1990, M.S. 1992) is Principal Engineer with Adaptec Inc., in Durham, N.C.

Craig Largent (Ph.D. 1996), graduated from Stanford Law School and is now an associate with Townsend and Townsend and Crew in Palo Alto, Calif., specializing in patent and intellectual property law.

In Memoriam

It is with sadness that we report on the deaths of the following alumni:

Wilbur Gene Moore (B.S. EE 1960) died Feb. 26, 2005.

Misty Northridge Carroll (B.S. EE 2000, B.S. CEN 2000) died May 21, 2005.

List of Donors in 2005

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New Faculty Member

David Arnold
B.S.E.E. & B.S.C.E.N., Univ. of Florida, 1999
M.S., Univ. of Florida, 2001
Ph.D., Georgia Institute of Technology, 2004

"Coming home" and "once a Gator, always a Gator" are two phrases that best describe David Arnold's feelings about becoming the newest ECE faculty member.

As a native Floridian who grew up in a Gator family and earned two degrees from UF, it was only natural for Arnold to return to UF after earning his Ph.D. from Georgia Tech.

Currently, Arnold's research interests include design, fabrication and characterization of magnetic and electromechanical microsensors/microactuators, as well as miniaturized power and energy systems.

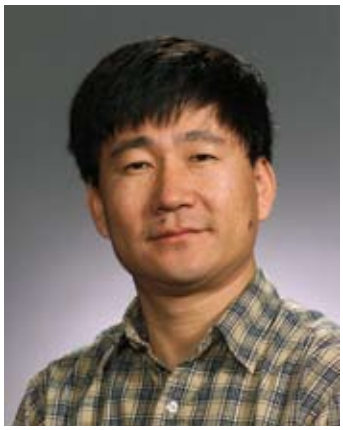
As a teenager, Arnold and a friend built circuits from Radio Shack kits. His interest in electrical engineering grew, and his passion for learning and hands-on experimentation continues to this day. He's looking forward to mentoring students in the classroom and starting his research group. Also, Arnold is the new HKN Student Chapter Faculty Adviser.

In his free time, Arnold enjoys flying. He earned his pilot's license as an undergraduate, thanks to the influence of David Bloomquist, a member of the Civil & Coastal Engineering faculty.

However, Arnold doesn't spend all his spare time in the clouds. He also enjoys landscaping, home improvement, golfing and traveling. He and his wife, Jennifer, also a UF ECE alumnus, toured Ireland, Spain, France and Italy for three weeks this summer.

"A truly amazing history lesson," Arnold said.

Promotions



Yuguang "Michael" Fang was promoted to full professor. Fang is currently chair of the IEEE Gainesville Section. In addition to the various technical program committees, Fang is also an editor of the following journals: *IEEE Transactions on Communications, IEEE Transactions on Wireless Communications, IEEE Transactions on Mobile Computing, Wireless Networks Magazine, and IEEE Wireless Communications and Mobile Computing.* Among his awards are the National Science Foundation Faculty Early Career Development Award and the Office of Naval Research Young Investigator Award. Fang teaches courses in Computer Networks, Computer Communications, Wireless Networks, Performance Evaluation of Communications Networks, High-Speed Networks, Queueing Theory, and Network Security.

Eric Schwartz was promoted to senior lecturer. Schwartz is currently associate director of the Machine Intelligence Laboratory (MIL), faculty coordinator and adviser of Team SubjuGator, Vice Chair of the 2005 Florida Conference on Recent Advances in Robotics, Treasurer of the IEEE Gainesville Section, and adviser of UF's IEEE Student Chapter. Also, Schwartz has been designated the Anderson/CLAS Scholar Faculty Honoree each year since 2000.

Faculty Awards

José Príncipe received the laurea ad Honoris Causa in Ingegneria Elettronica from the Università degli Studi Mediterranea di Reggio Calabria on June 24. Príncipe also received the 2005 IEEE Engineering in Medicine and Biology Society's Career Service Award at the 27th International Conference of the EMBS on Sept. 2 in Shanghai, China, for his "outstanding contribution and achievement in the field of Biomedical Engineering."

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ECE food drive nets almost 2,000 cans

By Megan Gales

The Department of Electrical & Computer Engineering collected nearly 2,000 cans of food in two weeks. More than half of the cans came in on the last official day of the drive.

Theresa Permann and Shannon Chillingworth, who both work in ECE's Student Services Office, organized the effort. They originally hoped to gather at least a few hundred cans. They raised their goal several times, though, as donations began to arrive.

Permann said the drive began as a way to get to know their students while helping the poor, but became much more.

"It kind of turned into a competition," she said.

A competition and a tradition.

They even had a plaque made to present to the person who donated the most cans. It will spend the year with the winner, then be passed to next year's biggest giver.

Permann, who began working at UF in September, said the generosity of the University's faculty, staff and students amazed her.

"These people are such givers," she said. "I can't believe the hearts these people have."

ECE arranged to give the food to the Bread of the Mighty food bank in Gainesville. Operations Manager Tom Orndorf came to campus Friday to pick everything up and take it back to the food bank.

With the cans gone, Permann and Chillingworth are thinking about next year.

"We're hoping for more," Chillingworth said. "We really hope it will continue as a tradition. We'll raise the goal every year."