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UNIVERSITY OF FLORIDA

Robotics Labs Join Forces

They have similar missions but different backgrounds. They've worked together in the past, but were never this close. Now in the same building, they hope to create a more complete, better funded robotics program at UF.

After years of being housed separately in the Mechanical and Aerospace building and in Benton Hall, the Center for Intelligent Machines and Robots (CIMAR) and the Machine Intelligence Lab (MIL) are now just a few steps from each other.

"This is something we started talking about three or four years ago. When it became possible again and Carl Crane, the director of CIMAR, still wanted it, it was a no-brainer," said Eric Schwartz, associate director of MIL. "We definitely said it would be a great thing."

MIL is a part of the Electrical & Computer Engineering department, while CIMAR is part of the Mechanical & Aerospace Engineering department. That difference has kept them apart, but it is now what they hope will enable them to build better machines.

"I think the main reason we wanted to do it was because they have certain expertise that really we don't," said Crane, referring to MIL. "It's not just duplicate, where they do the same things we do, but they've got different strengths."

The move will give experts more time to work on what they know best, Schwartz said. Doctorate students in electrical engineering shouldn't have to spend their time doing mechanical design when a master's student in mechanical engineering could easily do it faster. Similarly, mechanical engineering doctorate students shouldn't be doing what a master's student in electrical engineering could do.

It will also allow students in electrical engineering to freely mingle with those in mechanical engineering, Crane said.

"If one of their students needs help from us, it's a snap, and vice versa," Schwartz said.

Before the move, there were a few students who would cross over from other departments to work in MIL or CIMAR, but the move makes it even easier for students who wish to explore all the aspects of the world of robotics.

The result, Schwartz said, will hopefully be better robots, with better mechanical designs and better electronics.

"We can put it all together," Schwartz said. "What's necessary to build a robot, a real robot, a good robot, a robust robot, is theory and practice of electrical, mechanical, and computer engineering, and that's what we bring together that was never together in one place on this campus before."

They hope to combine their knowledge not just in the actual building of robots, but also in getting the funding for those robots.

"The biggest reason to come here is to help both of our funding," Schwartz said.

According to Schwartz, both labs will have input into most, if not all, grant proposals, research proposals, and papers. He said he believes that this will bring in more funding for both labs.

"I don't see any downside," Crane said. "There's no way that the labs are going to come together and things be worse than they were, so I think there's only a good side to it."

The move was just the first step. Long-term goals of the labs include a degree in robotics and a robotics institute, something few universities in the world have, Schwartz said.

"I feel that the move is going to give us a chance to be more than we or CIMAR could have ever been before, to be a robotic institute at least in ideas," he said.

Reshelle Smith

http://cimar.mae.ufl.edu/

http://www.mil.ufl.edu

Robot Submarine SubjuGator Hints at the Future

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

SubjuGator, built by eight students in the Machine Intelligence Laboratory, placed first in a national competition of 21 student-built robotic submarines in August. 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 US military vehicles should be capable of autonomous navigation," said Eric Schwartz, the Electrical & 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, 2005, 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 entered the first Autonomous Underwater Vehicle Competition. Although the UF team placed among the top three in four previous competitions, the Aug. 3-7 competition at the Space and Naval Warfare Systems Center near San Diego was 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. UF took first place because SubjuGator at 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 team leader Jim Greco, who earned his BS degree in 2005 and began his doctoral program this fall, both in 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 SubjuGator has five thrusters that give the computer complete three-dimensional control, said 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.

Greco 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 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.

Aaron Hoover

www.mil.ufl.edu/