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Bots in the Belfry

Universities hope that personal robots will "ring students' bells" to get them interested in computer science.

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by Jane M. Sanders

COLLEGE STUDENTS NOW have a chance to learn fundamental, often-abstract computer science concepts in a hands-on way using small, two-wheeled personal robots that move and interact with each other.

The pilot program began in January 2007 with about 30 students at the Georgia Institute of Technology and another 30 at its partner, Bryn Mawr College, an all-women's school in Pennsylvania. The goal is to spark student interest in computer science as a career amid declining enrollment nationwide.

"Classic introductory computer science courses are dry," says Tucker Balch, director of the new Institute for Personal Robots in Education (IPRE) based at Georgia Tech. "The most exciting thing students do is print out a prime number. But if you have robots you can drive around and that makes computer science exciting and fun."

As early as this fall, the \$150 robot and a related textbook packaged together will be available in student bookstores at more than 50 U.S. universities, including Georgia State University and the University of Georgia. The program is being funded for three years with \$1 million from Microsoft and another \$1 million from the Georgia Tech College of Computing and Bryn Mawr.

Students taking the introductory computer science class first learn how to drive their robots in a straight line for 12 inches before making a right turn. That means they have learned how to write two lines of code. Then they discover that by executing these two lines of code three times, the robot moves along the path of a square.

photo by Gary Meek



Tucker Balch, left, director of the new Institute for Personal Robots in Education (IPRE) based at Georgia Tech, says robots can make introductory computer science courses exciting and fun. [Download 300 dpi version.](#)

“So now they have learned the first important thing in computer science: A program is a set of instructions that are executed in a certain order,” explains Balch, an associate professor in the College of Computing. “You don’t have to write the code four times; you do a loop to make it do this thing four times. Now, they have learned the second most fundamental thing. The whole time this learning is embedded in this interesting physical thing that moves around.”

Other universities are using robots teach computer science, Balch notes, but he believes Georgia Tech’s approach is better for two primary reasons. Elsewhere, students typically write a program on their computers, download it and run it on a robot. But if the robot fails to do what it’s supposed to do, the student has no idea where the program failed.

“With our concept, the program runs on a laptop, and the robot is the peripheral,” Balch explains. “The robot sends information to the laptop from its sensors. We had to create our own robots to work this way.”

The other big difference between Georgia Tech’s class and others using robots is that every Tech student gets his or her own personal robot. Elsewhere, students use expensive robots in a lab.

Georgia Tech and Bryn Mawr are able to give students their own robot by using an existing commercial robot called Scribbler™, which is sold to the universities at a discounted rate of about \$55 each by Parallax. Researchers have added wireless connectivity to it, bumping the cost to \$150 each. Balch believes that cost will eventually drop.

“It’s a robust robot,” Balch says. “Students have dropped them on the ground and run them off desks, but it doesn’t stop them.”

As more students at Georgia Tech and elsewhere use the Scribbler and textbook in introductory computer science classes, Balch and his colleagues will gather feedback and use it to improve the curriculum, he says. Eventually, they want to make the robots available for use in middle and high schools to spur interest in computer science at that level.

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