CSAIL team honored for printable robot

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This past summer, the African Robotics Network (AFRON) challenged roboticists around the world to design a new class of robot, one that could be easily integrated into classrooms around the world. SEG, a robot designed by Computer Science and Artificial Intelligence Laboratory (CSAIL) Director Daniela Rus' Distributed Robotics Lab, took third prize in the traditional (roaming) category of the competition.

SEG [1], an origami-inspired Segway robot, is a small robot made of polyester. The robot roams on two large wheels, and is able to avoid obstacles and collisions thanks to an onboard sensing and navigation system. What is perhaps most noteworthy about SEG, though, is that the robot was printed on a sheet of polyester and takes less than one day and $15 to produce.

SEG is one of the first robots designed under Rus' new project aimed at reinventing how robots are designed and produced. Funded by a $10 million grant from the National Science Foundation (NSF), the project aims to develop a desktop technology that would make it possible for the average person to design, customize and print a specialized robot in a matter of hours.

"This research envisions a whole new way of thinking about the design and manufacturing of robots," Rus says. "We believe that it has the potential to transform manufacturing and to one day enable one robot per child in schools."

With SEG and other printable robots the Distributed Robotics Lab is currently designing, researchers are hopeful that by breaking down the barriers that have traditionally made robots inaccessible to the general public, they will help to usher in a new era of robotic usage. In order to create more affordable and accessible robots, the group has been working on redesigning the production process for building robots to rely more on accessible tools.

"The basic principle behind our work with printable robots is accessibility; we want everyone to have access to robots. The three main problems blocking the general population from accessing robots are the cost, the time it takes to develop a robot, and the difficulty associated with making and controlling robots," says Cagdas Onal, a postdoctoral associate in Rus' lab. "These robots we are making are inexpensive, they can be produced in hours as opposed to months, and they are easy to deal with."

While a conventional robot can typically take weeks to assemble, and thousands of dollars to design and program, SEG was printed on a sheet of polyester using a laser cutter, which is used to etch creases into the material. Once printed the surface is folded, following the pre-determined creases, into the desired shape, which in the case of SEG is a small platform connected by two large wheels. Even the circuit board, which contains all of the sensing and basic programming necessary for the machine to navigate, is printed using a conventional printer to

further reduce costs.

According to Onal, the robot can be assembled in well under 24 hours, making it an especially applicable tool for teaching young children about robotics. Onal and his colleagues envision sending robotic kits to classrooms around the world so that students could print, assemble and then program their own robots. In fact, the team is already planning to send printable robot kits to classrooms in Africa in the near future.

“This is a great starting point to teach kids basic programming and robotics,” Onal says. “They will be able to see the results of their labor in a concrete fashion, and will be able to learn and experiment with the robot in a hands-on manner.”

Links:
[1] http://people.csail.mit.edu/cagdas/SEG