Workshop on Research in Robots for Education

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Introduction

The landscape of robots in education has continued to change since the 2005 RSS Robotics Education Workshop[1]. Over the last two years, there has been a noticeable spike of interest in the use of robots in education. The focus of this workshop was to provide a venue for presentation of the research exploring the effectiveness of robots in education, and help shape future research in this area.

The workshop explored how robots are used as educational tools, in terms of platforms (hardware and software) and pedagogy in various disciplines and why certain types of robots may be more effective for different purposes. The workshop also explored how robots can be used as a platform to broaden participation, hoping to attract and retain students to science, technology, engineering, and mathematics (STEM) disciplines.

The workshop was organized into three sessions. Each session was composed of a series of 5-6 ten minute talks, followed by a twenty minute discussion period. The sessions were organized by the following themes: Pedagogy, Participation, and Platforms. In addition, other cross-cutting themes considered were the educational discipline being taught (e,g. Electrical Engineering, Computer Science, Mathematics, Art), the age of the students (e.g. K-5, 6-8, 9-12, Undergraduate, Graduate, General Education), and the educational environment (e.g. Contest, Classroom, Club, Gallery).

Participation

The participation session investigated how robots can be used to attract and retain new students STEM disciplines. We had a wide variety of presenters. For instance, we had middle and high school teachers (Fred Stillwell and Susan Crowe), who use robots in the classroom and in extracurricular clubs, discuss how they use robots to engage students. Michael Dumont discussed the work with his colleagues on using robots and video games to attract and retain computer science students. Fred Martin presented his iCode System which uses online community technology to help students program robots. Jerry Weinberg presented his work on assessing how robots (in a competition setting) impact females' attitudes toward science and engineering. Finally, Joel Weingarten discussed his work on using a legged robot to teach electrical engineering.

Platforms

The platforms session explored the hardware and software platforms available for using as robots as educational tools. Monica Anderson presented her work on using the Player/Stage robot software package for both simulation and real robot assignments. Kristie Brown, from LEGO education, spoke about the new LEGO NXT robot and its use by educators. Marco Morales presented a graphical tool for exploring motion planning. Eric Schweikardt discussed his work on using their reconfigurable robot platform, roBlocks, to teach students about emergent complexity. Finally, Stewart Tansley spoke about using Microsoft Robotics Studio as a robot education platform.

Pedagogy

The last session centered on the pedagogical needs in robot education and using robots as a tool for other educational goals. Doug Blank spoke about the Institute for Personal Robots, and their project concerning introductory computer science with robots. Michael Gennert spoke about creating the first undergraduate degree in robotics at the Worcester Polytechnic Institute. Aaron Dollar led a discussion on the Robotics OpenCourseWare Project. Wen-Jung Hsin presented her work on teaching assembly programming with simple robots. Fred Martin spoke about a course combining art and robotics. Finally, Marco Morales (in place of Jesus Savage Carmona) presented a system for teaching robot programming using both virtual and real robots.

Discussion

Many topics were discussed, but a few topics kept re-emerging. First, service learning and community outreach, and the need for more cooperation between universities and middle and high schools. Second, the need for clear scientific evidence of the utility of using robots for education. In particular, to ease and accelerate adoption, many administrators will need convincing evidence that introducing robots into the curriculum adds academic value. Third, the need for a repository of educational robotics materials, and a stronger community. The papers, presentations, and pointers to additional material can be found on the workshop's website[2].

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[1]http://projects.csail.mit.edu/rss/RobotEd/

[2]http://www.roboteducation.org/rss-2007/