Introducing Students Grades 6-12 to Expressive Robotics

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Every year, tens of thousands of middle school and high school students participate in robotics competitions, such as Botball, FIRST, and VEX. This provides them with an excellent introduction to the ins and outs of building robots and programming them to autonomously accomplish specific tasks. However, the rules of many of these competitions often limit or prohibit human interaction with the robots. As a result, students are not exposed to and are, thus, not encouraged to think about human-robot interaction (HRI) and its potential impacts on society.

To start getting a new generation of students thinking about HRI, we held a workshop entitled "Expressive Robotics: Motion and Emotion" at the 2011 Global Conference on Educational Robotics. The focus of the workshop was to teach the students how to program robots to express emotion and intent just through the robot's physical actions. The robot used by each participating group was not unlike the ones they used in competitions: an iRobot Create base provided a mobile platform, upon which stood a three degree-of-freedom arm, serving as an articulated spine and head.

Each group was first asked to program the robot in a way that expressed one of Eckman's six basic emotions. They were then tasked with implementing a simple keyframe animation system to control the robot's limited degrees of freedom, which they could then modify to illustrate certain principles from theatre and animation. They used their animation system to tell a story purely through robot motion and interactions with props, as seen in Figure 1. Students were encouraged to focus on making the robot's emotion and intent apparent to a human audience.

Ultimately, the workshop proved to be a great success; it was very well-received by all involved, who encouraged us to make this an annual event at the conference. We felt that this type of workshop served as a fine proof-of-concept for introducing students grades 6-12 to human factors in robotics, and could be extended throughout the entire K-12 education pipeline. Furthermore, we believe that exposure to sociable robotics has the potential to increase interest and self-efficacy of underrepresented student populations, particularly girls, in STEM-related activities.¹

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Figure 1: Frame from the student film 'Stranded'

Table 1: Workshop Schedule

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9:00	Lecture: Introduction and Emotion
9:30	Activity 1: Emotion Motion
10:00	Activity 2: Evaluating Emotion
10:15	Lecture: Keyframing
10:45	Activity 3: Keyframe Animator
11:15	Lecture: Telling a Story and Storyboarding
11:30	Activity 4: Lunch and Brainstorming
12:30	Activity 5: Storyboarding
13:00	Activity 6: Take 1
14:00	Lecture: Principles of Animation
14:30	Activity 7: Polishing and Filming
16:30	Activity 8: Robots Go To Hollywood
17:00	Lecture: Closing Remarks

Categories and Subject Descriptors

I.2.9 [Artificial Intelligence]: Robotics

Keywords

expressive robotics; HRI; educational robotics

¹The video accompanying this abstract can be viewed on YouTube at http://tinyurl.com/hri2012vid101. To view all http://tinyurl.com/expressiverobotics.