Workshop Title: Android+Sphero: Teaching Mobile Computing and Robotics in a Single Course

Presenter:
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Abstract: Implications of using robotics and mobile computing in the curriculum extend far beyond motivation and engagement because skills in these areas can help students be more successful at the workplace. Our approach to teaching both subjects in one course focuses on using Sphero, a small ball-shaped wireless robot that can be controlled and programmed using an Android or iOS device via a Bluetooth link. Workshop participants will experience several hands-on projects that are offered to student in an Android+Sphero course, which culminates in a robot racing competition. Mac or Windows laptop is recommended. More information at http://www.cs.ccsu.edu/~stan/sigcse13/

Intended audience: This workshop is intended for faculty interested in teaching undergraduate mobile computing and/or robotics courses. This workshop will also benefit high school teachers and college instructors looking for ways to supplement existing courses with engaging hands-on activities that combine mobile computing and robotics.

Presenter Biography: Stan Kurkovsky is a Professor of Computer Science at Central Connecticut State University. His research interests are in the areas of mobile and pervasive computing, software engineering, and computer science education. He has written over 70 peer-reviewed conference papers and journal articles. Dr. Kurkovsky has been serving as the PI on a number of NSF grants that include an REU Site grant, STEM Scholarship grants, and a TUES/CCLI grant, with a total funding in excess of 1.3 million dollars. He is currently serving as the PI on an NSF CCLI grant “Using Mobile Game Development to Improve Student Learning and Satisfaction in Introductory Computer Science Courses,” and offered two well-attended SIGCSE workshops in 2009 and 2011 directly related to this grant project.

Materials provided: A number of free software packages will be used during the workshop. These include J2SE SDK version 1.6 or later, Eclipse IDE, Android SDK, and free software libraries (API) provided by the manufacturer of Sphero. Workshop participants will be provided with CDs containing all software, as well as with handouts describing how this software can be downloaded, installed, and used. Provided CDs will also contain the source code, data, and relevant course materials for the currently existing Android+Sphero course. Whenever possible, workshop website at http://www.cs.ccsu.edu/~stan/sigcse13/ will contain the same materials (or links to the materials) as those distributed at the workshop. A number of Sphero robots will be provided to the participants to experiment with during the workshop.

Rough Agenda:
1. Teaching mobile computing and robotics together (30 min)
   a. Benefits and advantages: student motivation, sought-after skills
   b. Prerequisites: knowledge, tools, equipment
   c. Challenges: quick evolution, costs, computing infrastructure
   d. Pros and cons of different mobile platforms
2. Curricular component: Android (60 min)
   a. Best teaching practices
   b. Android hands-on: build a “Lonely Phone” (or similar) app
   c. Discussion: what Android exercises/labs/projects are suitable for this course?
3. Curricular component: Sphero (60 min)
   a. What’s inside the robot and how it works
b. Sphero hands-on: build a simple driving app  
c. Discussion: what are the best ways of introducing Sphero features?

4. Curricular component: Large project  
a. From small labs to a large project: incrementally added features help keep students focused  
b. Android+Sphero hands-on: build an app for scripted driving competition  
c. Discussion: what is the right mix of robotics and mobile computing features in a student project?

5. Wrap-up (30 min)  
a. What labs and projects are best for illustrating how Android and Sphero work together?  
b. How to use this experience in various courses throughout the curriculum?  
c. General discussion and feedback

**Audio/Visual and Computer requirements:** This will be a hands-on workshop where every participant could follow the presenter and build their own projects. A projector will be required to connect to the presenter’s laptop. Participants will need a Mac or a Windows laptop to run Eclipse IDE for building all Android projects presented in the workshop. Additionally, participants will need a smart phone or a tablet running Android 2.2+ in order to control the Sphero robot. Attendees without an Android device will still benefit from the workshop if they can pair up with those attendees who have an Android smart phone or a tablet. Attendees may choose not to participate in the hands-on activities, but simply observe the presenter working on the same projects. A number of Sphero robots will be provided to the attendees during the workshop.

**Laptop Recommended:** all participants will benefit from having a laptop in order to participate in hands-on activities

**Space and Enrollment restrictions:** Ample floor space should be available for participants and the presenter to run their robots. The presenter will be running his own robot; therefore, the floor space in the front area of the room should be easy to observe for all workshop participants.

**Other critical information:** The presenter is not affiliated with Orbotix, Inc., the manufacturer of the Sphero robot.