An Introduction to prototyping with the Arduino for Computer Scientists

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Abstract

Developing electro-mechanical prototypes is a powerful skill set that allows researchers to uncover new ground by creating devices that are not commercially available. Today, powerful micro-controllers have become low cost and are very accessible to a broad audience. The goal of this workshop is to introduce the Arduino micro-controller to both beginners and those well versed with other micro-controller platforms. The Arduino micro-controller is a simple open source hardware platform with a low entry level, making hardware prototyping easily accessible to those without electronic engineering degrees.

Attendees will use a Sparkfun Inventors Kit to make their own powerful electronics circuits that are particularly well suited for building prototype devices. The Arduino Inventor kit comes will all the components to make your own hardware designs including features such as flashing LEDs, control of a DC motor, driving a servo, sounding a buzzer, detect light levels, measure bends with a flex sensor and more. All using a USB interface for both power and data communications so that no additional batteries are required.

The session will start with a short introduction to the Arduino features and capabilities, followed by an interactive workshop to set up the Arduino development environment on the attendees' own laptop. Following this you will work through projects from the Sparkfun Inventors kit with the option to begin a project of your own hardware design. Finally, a short presentation will describe Arduino add-ons available that can be employed to further expand the functionality of future prototypes.

1. Outline

Objectives
- Introduce the Arduino Micro-controller platform
- Set up the Arduino software development environment
- Complete Inventor Kit introduction projects
- Begin development on self directed project

Significance
- Arduino's are accessible and have a low entry level
- Provide a powerful, generic and modular platform
- Platform independent programming and integration
- Provided in a variety of form-factors

Target Audience
- No existing experience in micro-controller or embedded development required
- Basic computer programming knowledge is desirable
- Those familiar with other micro-controller platforms other than Arduino

Agenda
- Introduction to the Arduino presentation (.25 hours)
- Set up Software Development environment (.5 hours)
- Working through hardware tutorials (3 hours)
  - Flashing a LED light
  - Reading from a Potentiometer to Laptop
  - Measuring Light Level using a photo cell
  - Driving a DC Motor with a transistor
- Time for self directed project designs (1 hour)
- Summary of Arduino Shields (.25 hours)

2. Biography

Dr Ross Smith is the Deputy Director of the Wearable Computer Laboratory and a Research Fellow at the University of South Australia with a passion for developing electro-mechanical prototypes to support new forms of human-computer interaction. His research strengths include deformable surfaces, spatial augmented reality, input device hardware development and user interface design. His vision is for a method of computer interaction that employs deformable devices that can be squashed, twisted and manipulated to create a rich set of gestures to support new form of human-computer interaction.