Using Arduinos to Teach Engineering Concepts

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October 27, 2016

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What is an Arduino?

Arduino is a inexpensive Microcontroller CCA that interface to your PC via USB

They typically cost ~ 20 to 25 and are available many places online

Software to program them is free, open source. https://www.arduino.cc/

Arduino Uno (and other models) have daughter boards call “shields” that you can stack

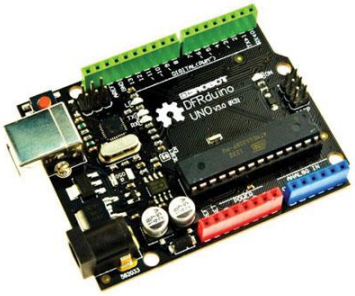
Shields include Motor Drives, Prototype boards, Displays, etc.

Arduino microcontrollers have become very popular with hobbyist, students and colleges.

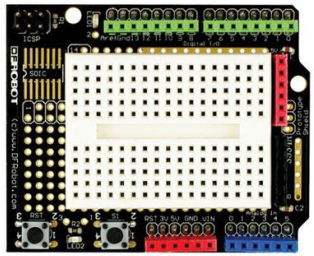
http://www.jameco.com/
https://www.adafruit.com/
http://www.elexp.com

Arduino Uno

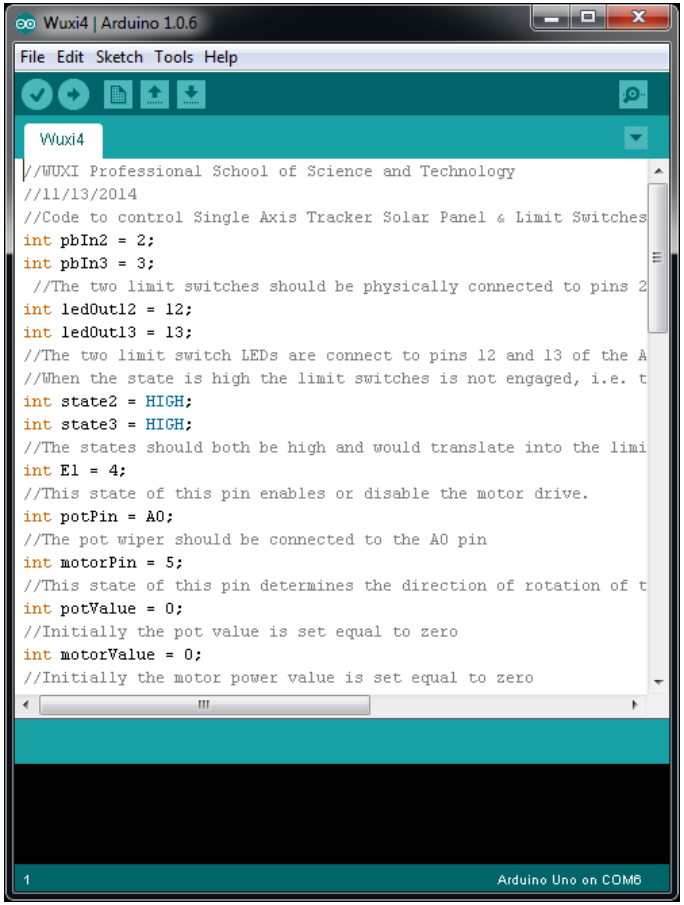
Specification	
Microcontroller	ATmega328P
Operating Voltage	5V
Input Voltage	7-12V
Digital I/O Pins	14
Analog Input Pins	6
Flash Memory	32 KB
SRAM	2 KB
EEPROM	1 KB
Clock Speed	16 MHz
PC Interface	USB



Arduino Uno



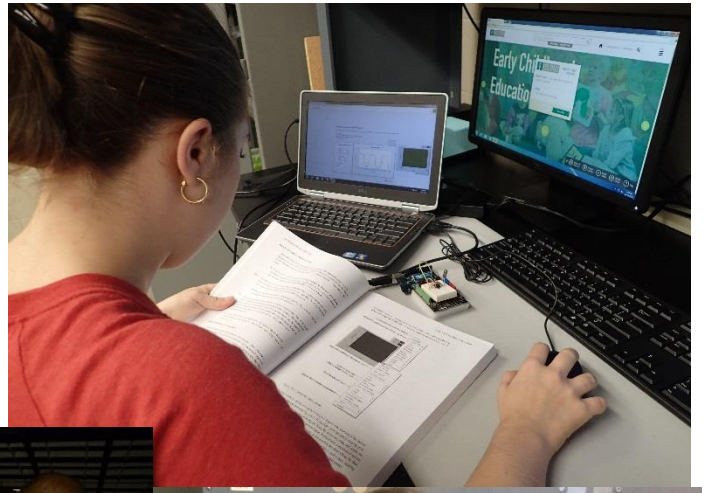
Prototype Shield

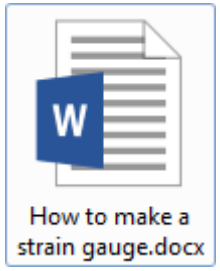


https://www.arduino.cc/en/Main/ArduinoBoardUno

Discovery Based

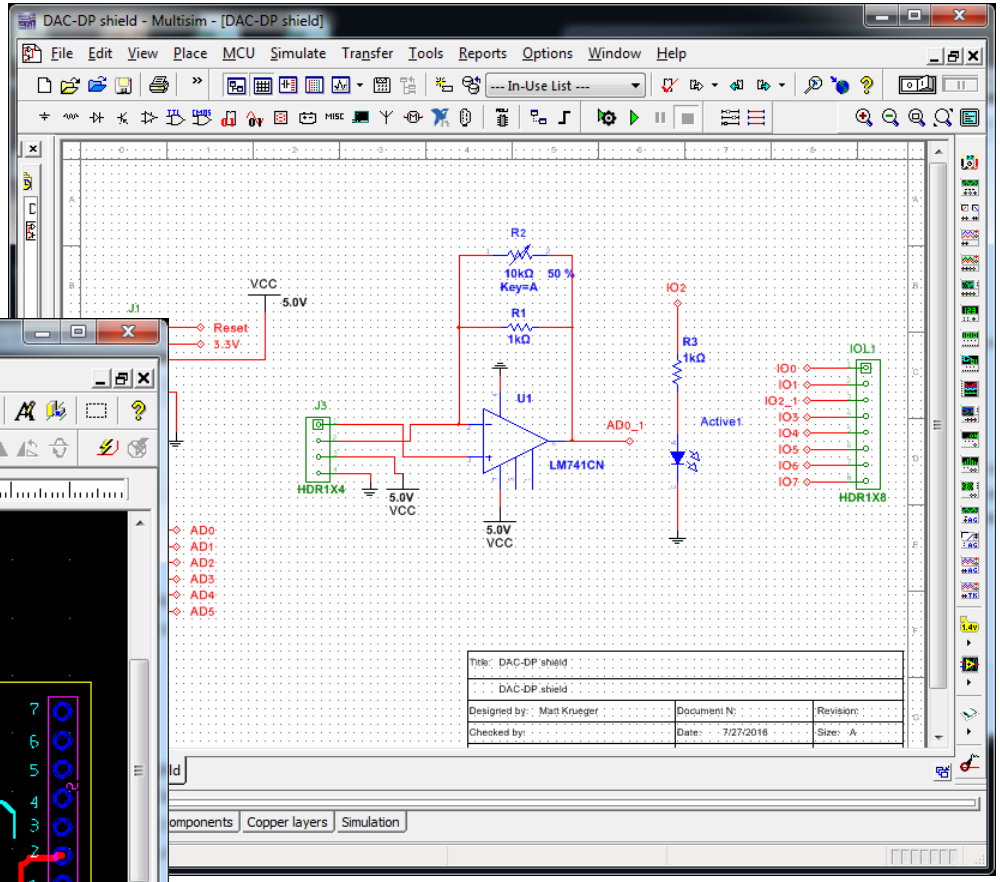
1.) Give students general idea and requirements for design
2.) Provide students with resources to design, build and test
3.) Provide feedback as needed but don't micromanage
4.) Allow students time to learn, fail and succeed
5.) Provide positive feedback and recognition
6.) Step back and let them learn …

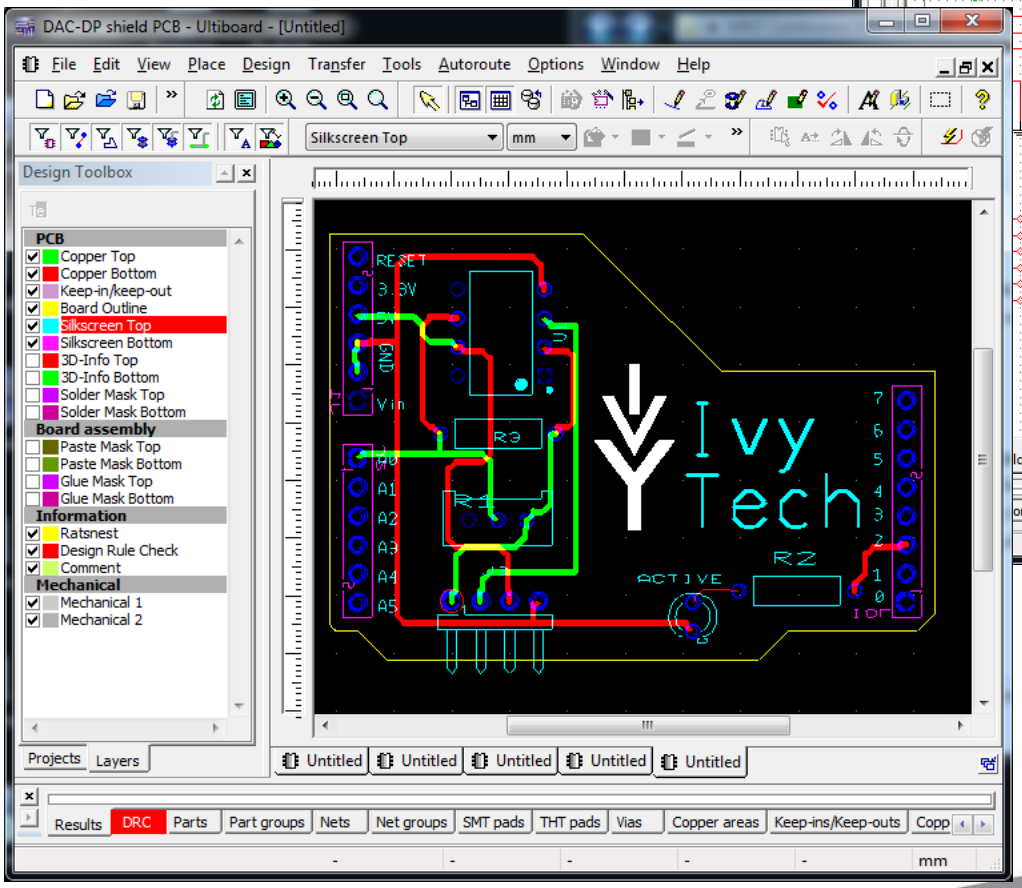




NI Tools

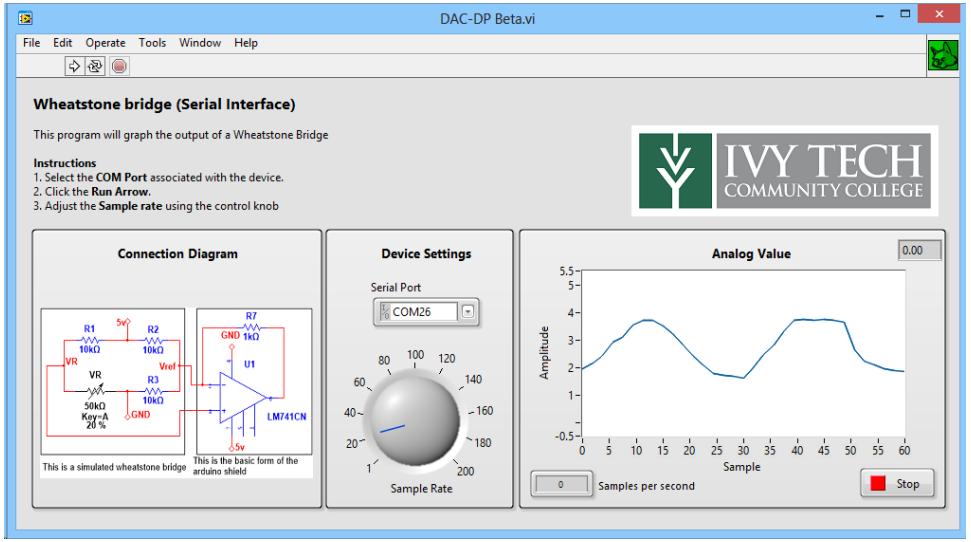
Multisim schematic
Utliboard PWB

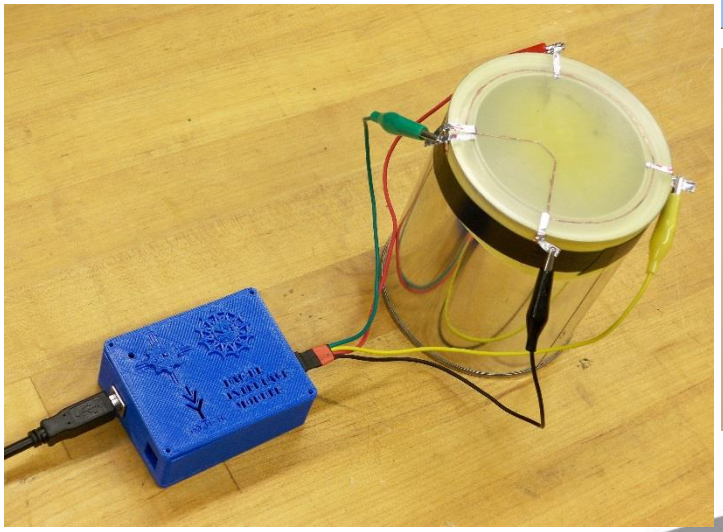


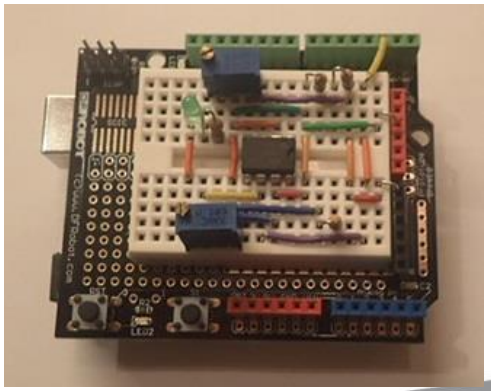


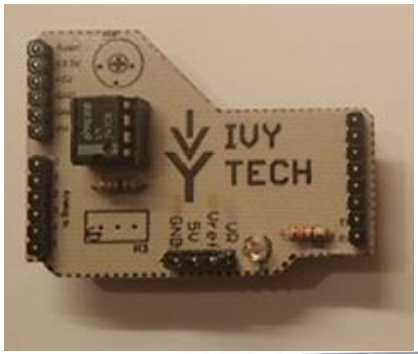
DAK for MEMS

SCME Pressure Sensor Kit Includes – Arduino Uno based DAK interface module, instruction manual, Executable LabView Data acquisition software, USB cable, and pressure sensor interface cable.



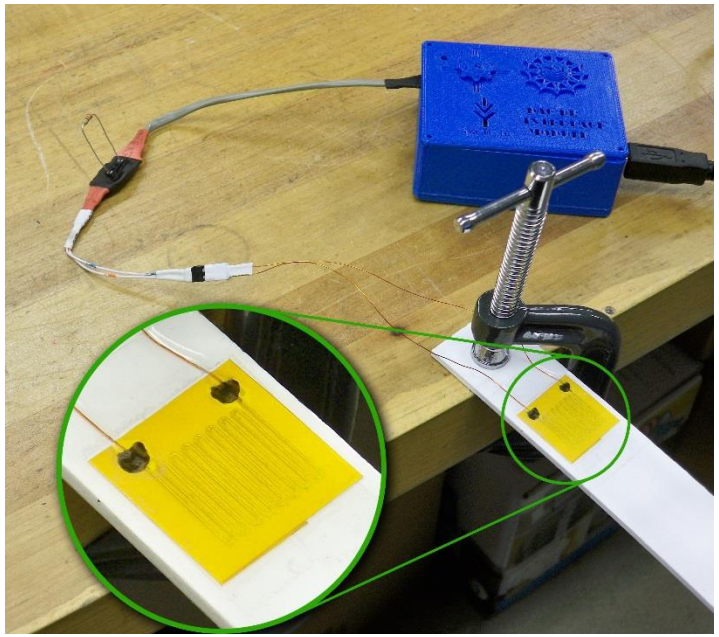


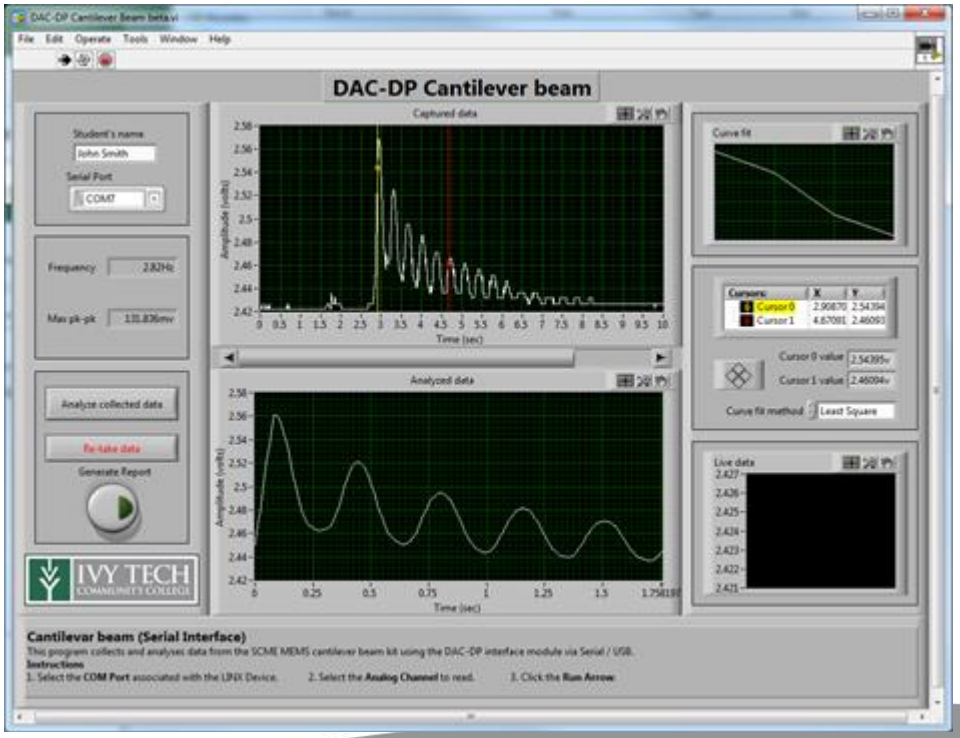




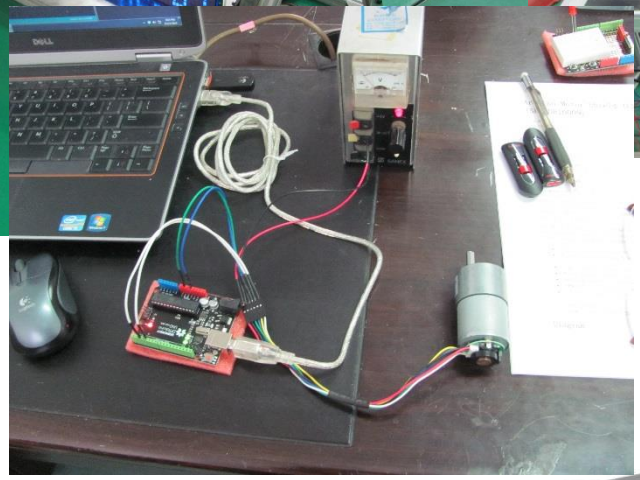
DAK for MEMS

SCME Cantilever Kit
Includes - Arduino Uno based DAK interface module, instruction manual, executable LabView Data acquisition software, USB cable, and Cantilever beam
Strain gauge interface – Discovered “How to make a Strain Gauge”

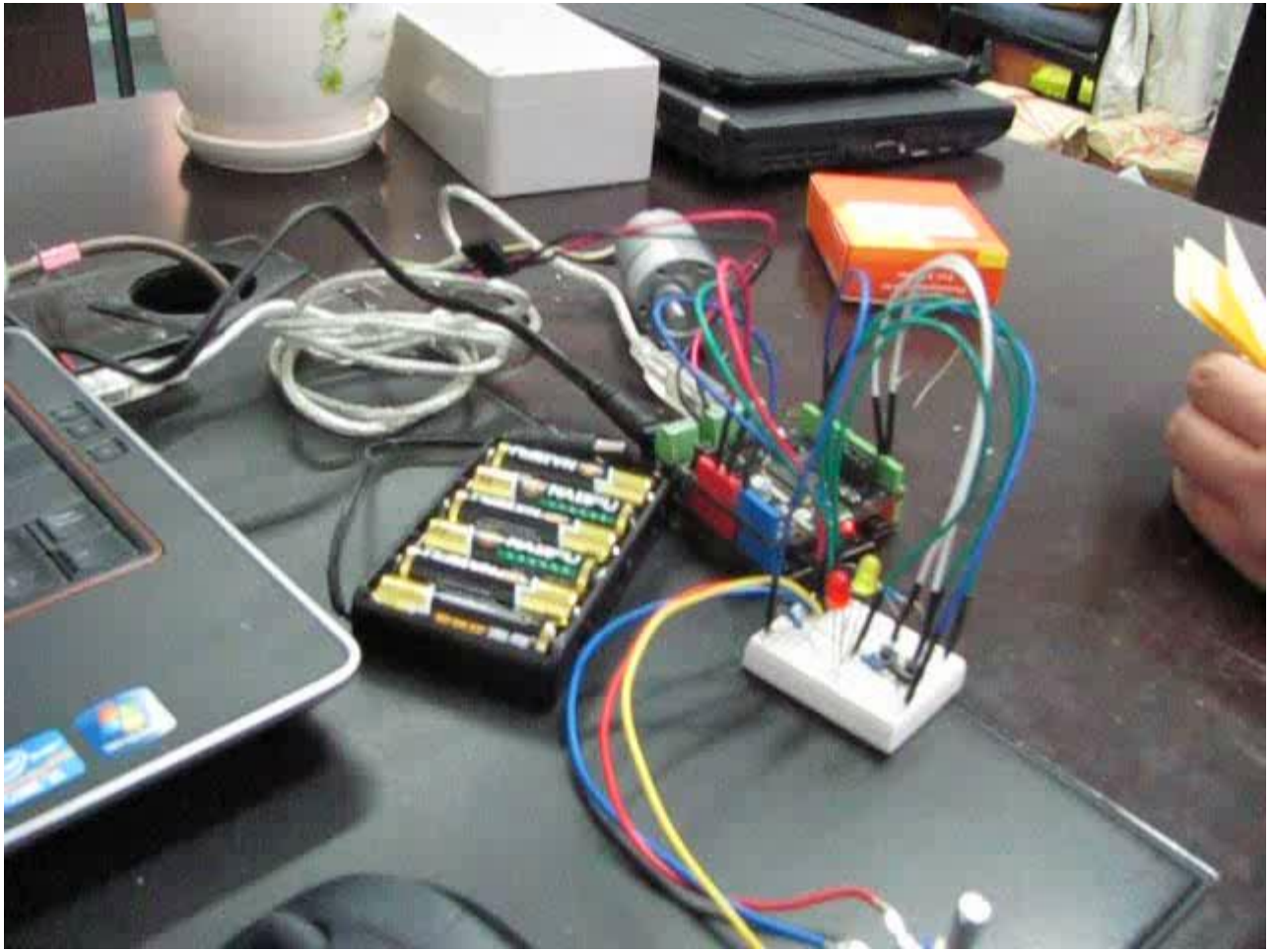




Wuxi – 100W Single Axis Solar Panel Tracker



video



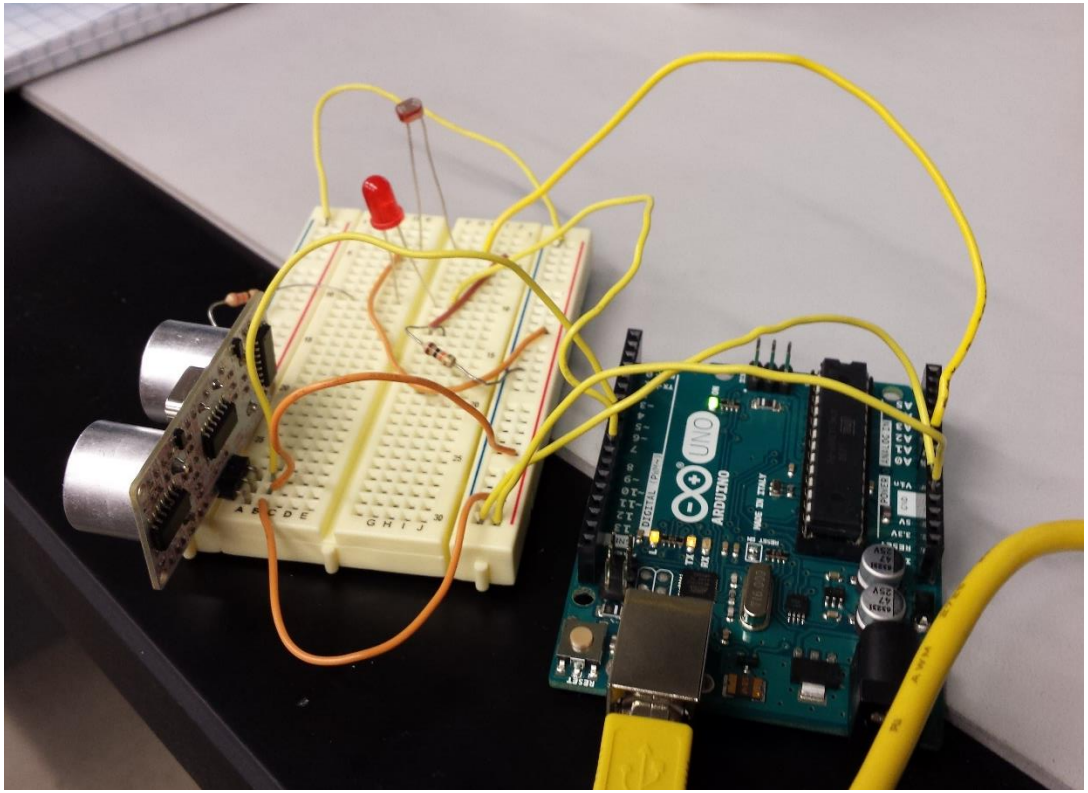
https://www.youtube.com/watch?v=ibURmCctnWk

Student Lab Notebook examples

- Ultrasonic Sensor (Adam Beauchot)
- Photo Diode (Adam Beauchot)
- LCD Examples (Ryan Noyes)
- Two direction Solar Tracker (Ryan Noyes)

Using Sensors:

This project used two sensors together, a light sensing diode and a range finding sonic eye. The objective was to get the sonic eye to determine the range of an object and or determine if their was movement in a room only at night time, similar to a type of burglar alarm.



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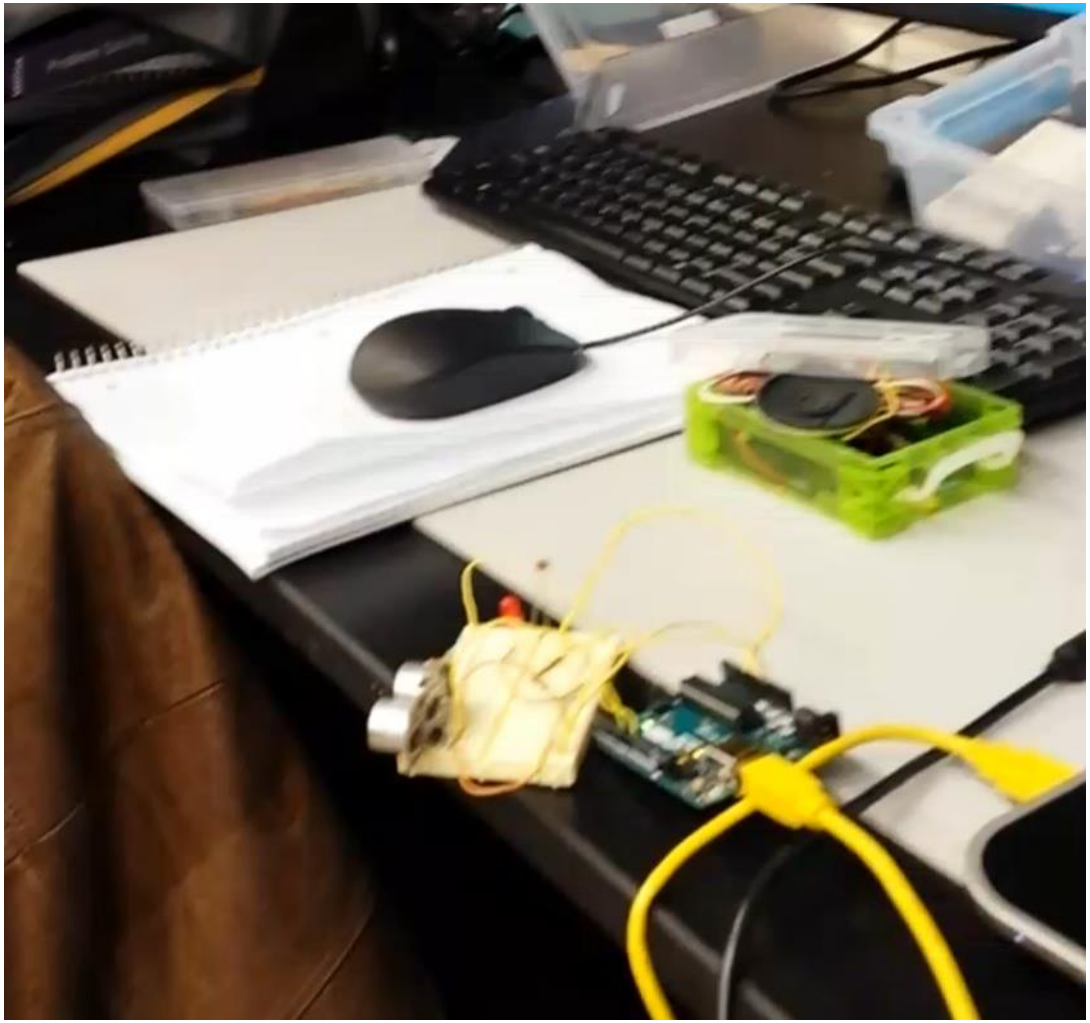

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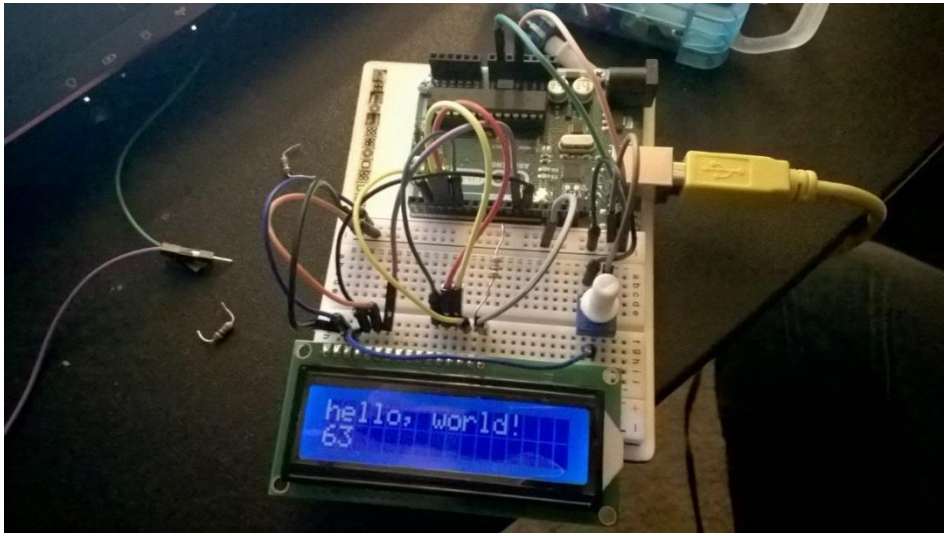
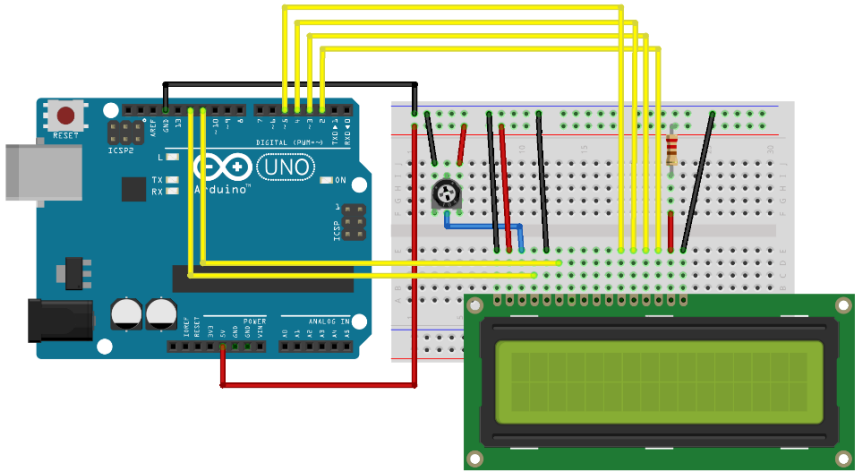
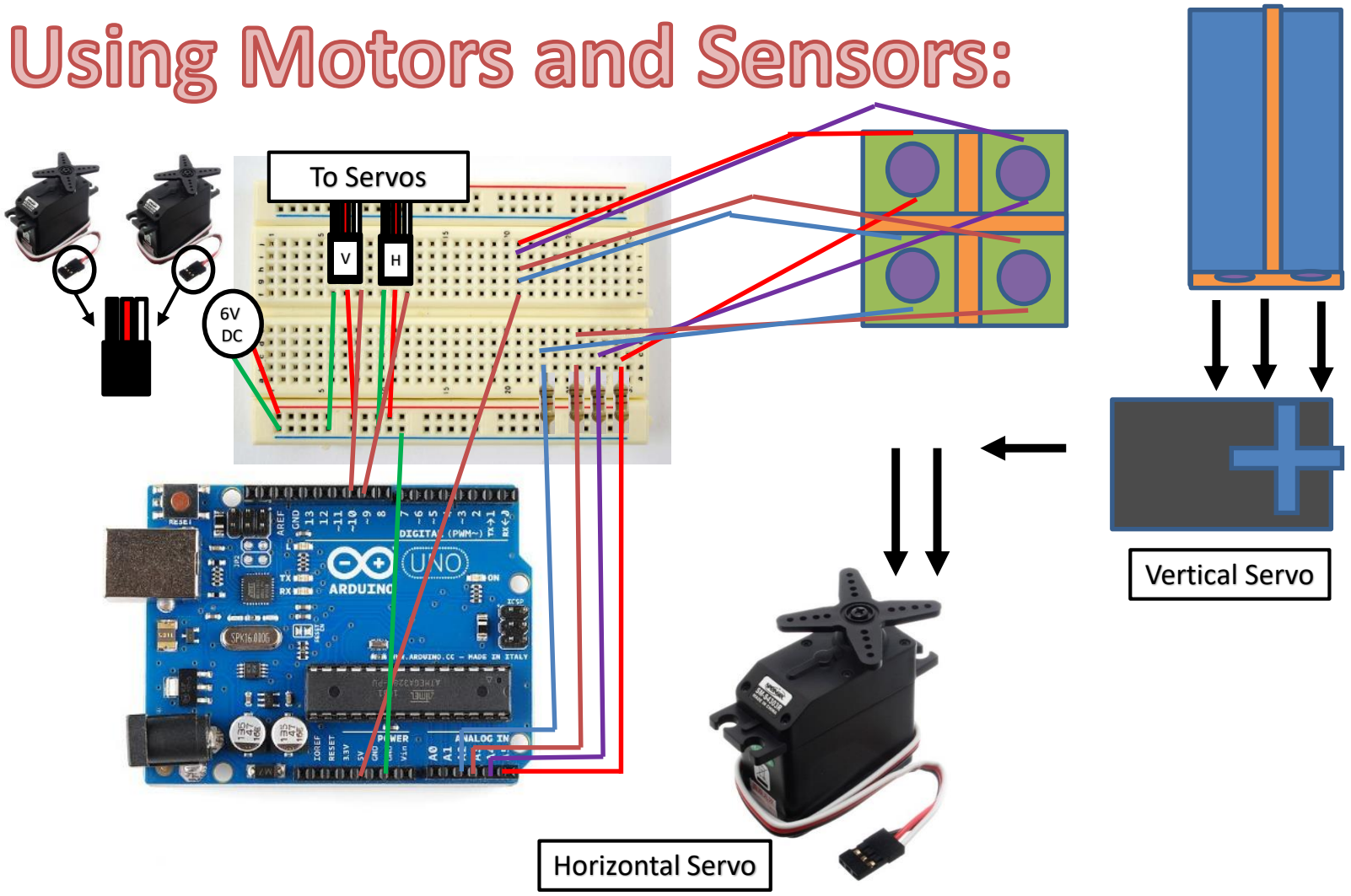
Using LCD Display:




```
// include the library code:
#include <LiquidCrystal.h>

// initialize the library with the numbers of the interface pins
LiquidCrystal lcd(12, 11, 5, 4, 3, 2);

void setup() {
  // set up the LCD's number of columns and rows:
  lcd.begin(16, 2);
  // Print a message to the LCD.
  lcd.print("hello, world!");
}

void loop() {
  // set the cursor to column 0, line 1
  // (note: line 1 is the second row, since counting begins with 0):
  lcd.setCursor(0, 1);
  // print the number of seconds since reset:
  lcd.print(millis() / 1000);
}
```



Using Motors and Sensors:



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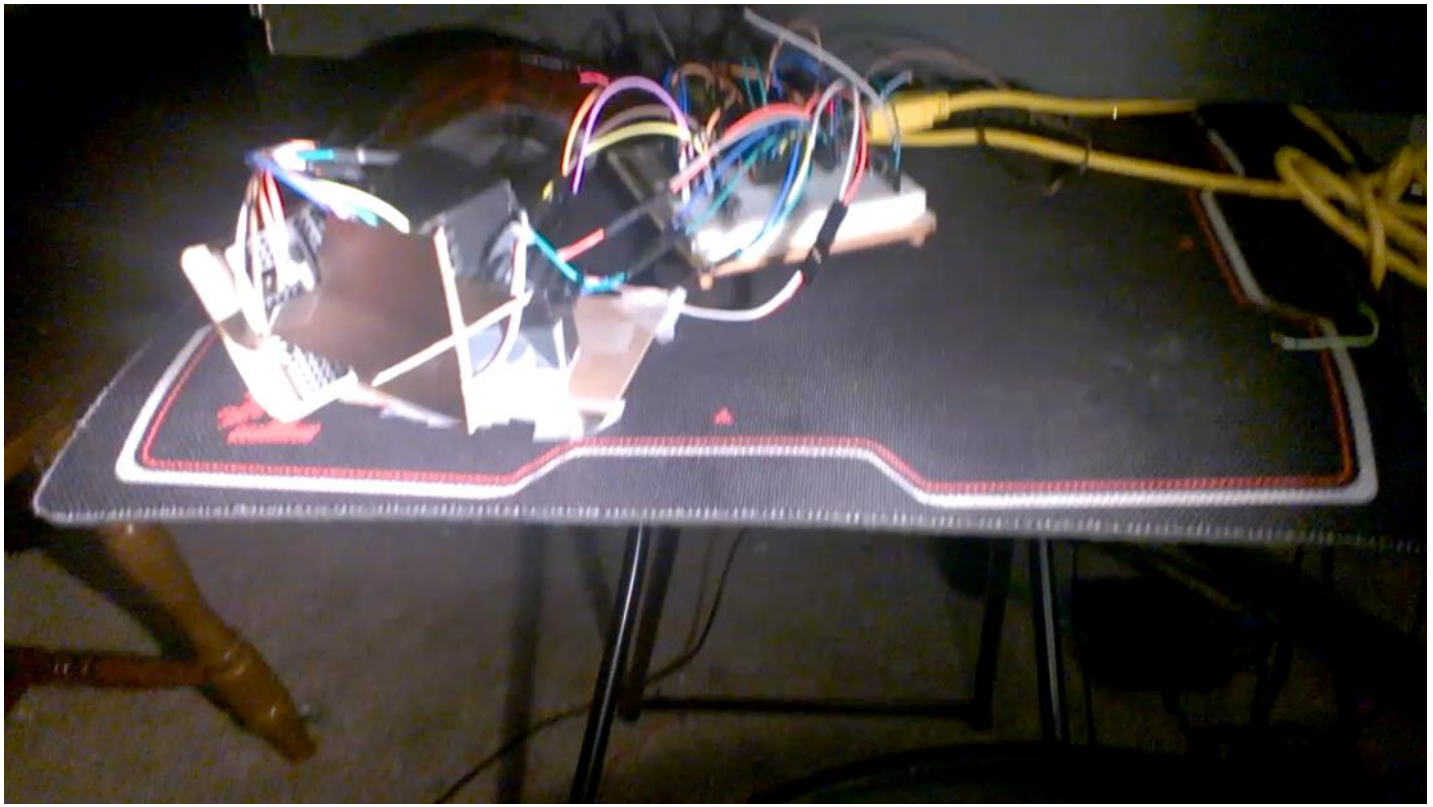

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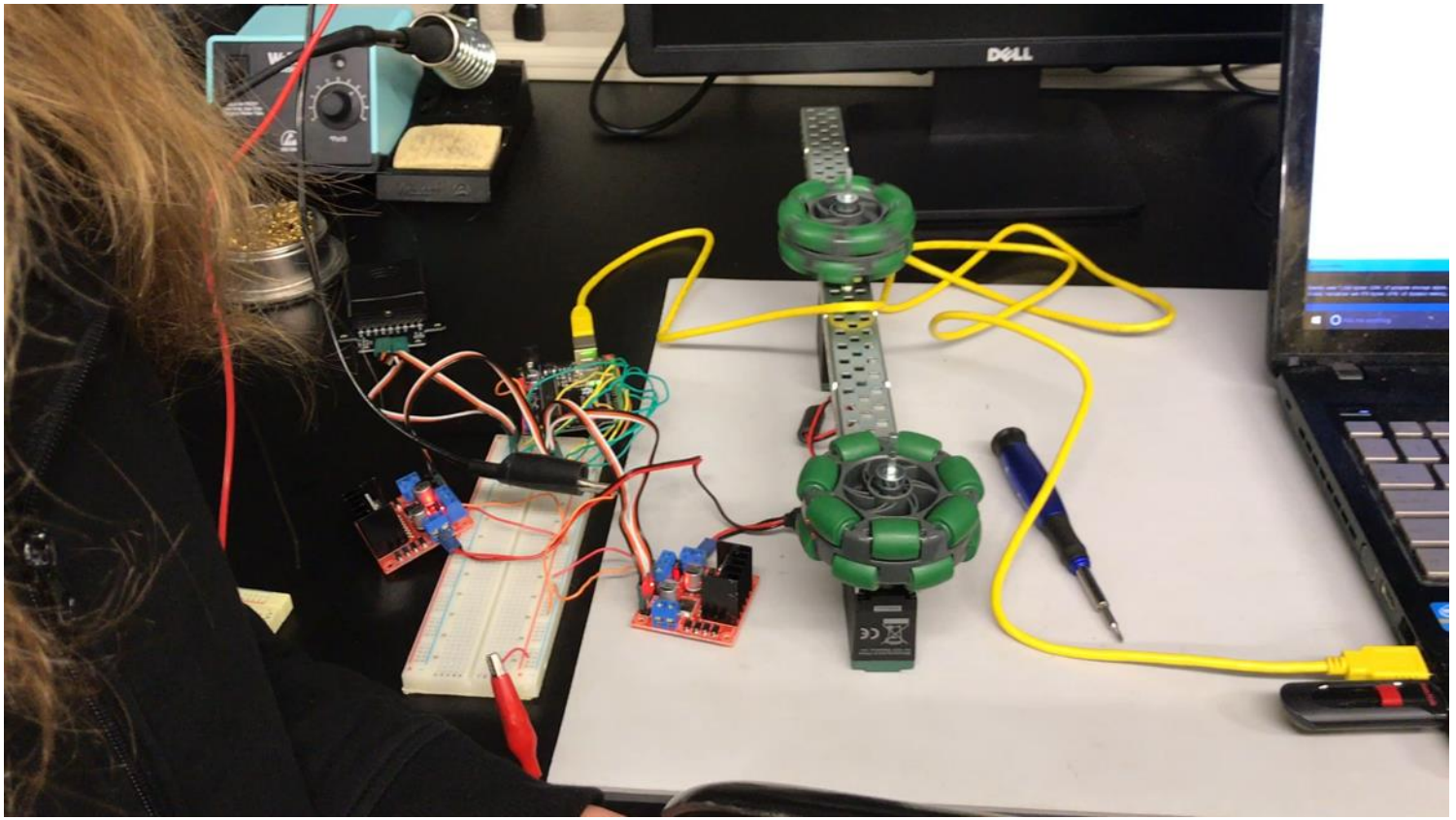
BB8 using Arduino



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