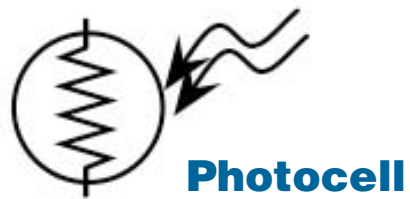# week
04

Sensor 2: Photocells and Force Sensors

Analog input and Processing

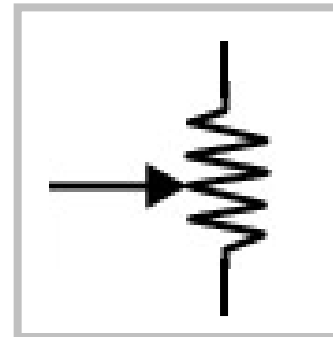# Photocell

Force Sensitive Resistor
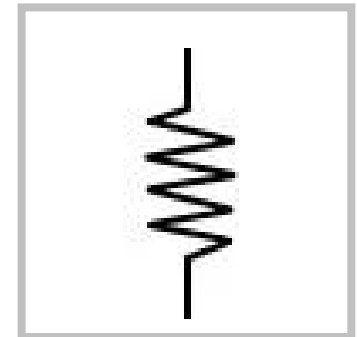
Photocell

Force Sensitive Resistor
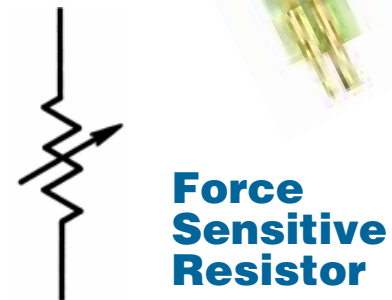
Potentiometers

- Variable resistor (a type of "resistive sensor")

- Pot for short

- When you need a "ranged" input

- Measures rotational position (knob for volume, light dimmer, etc.)
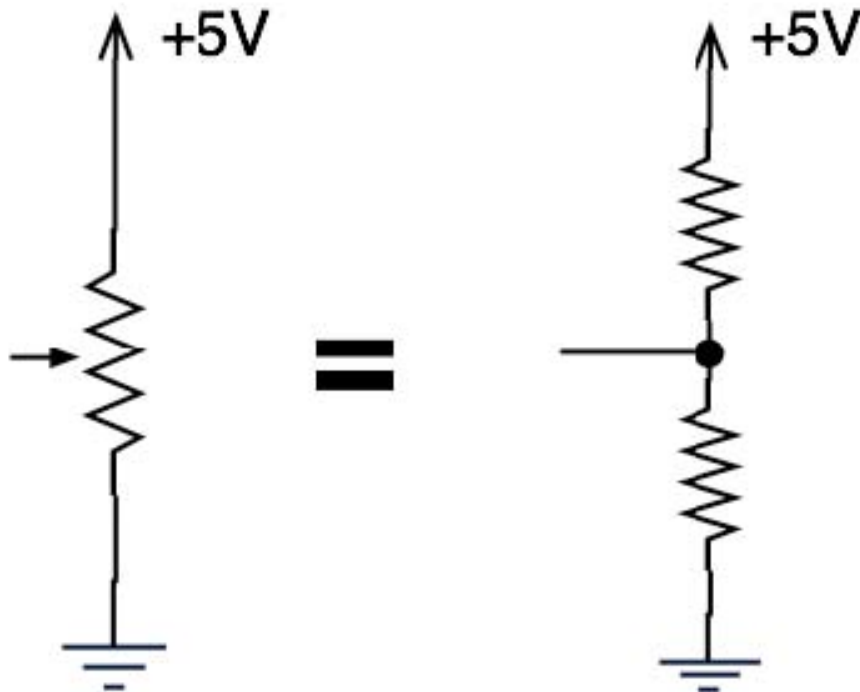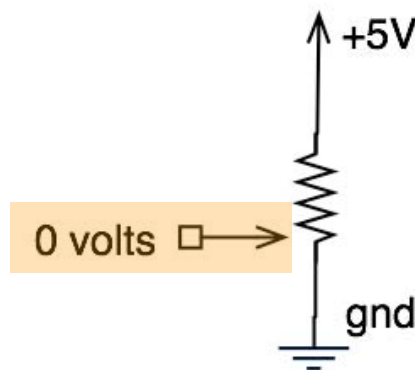
pot   **resistor**

Voltage Divider

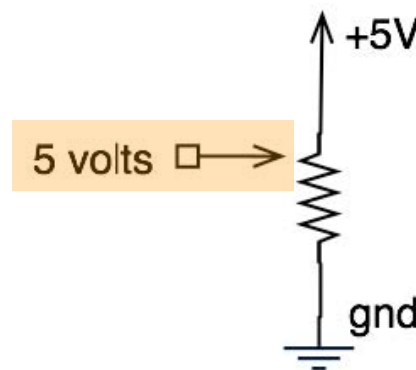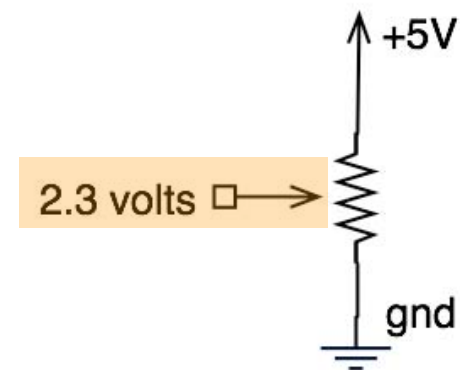Potentiometer is a type of voltage divider.

Potentiometers

- It's like a faucet (if current is analog to water flow)

- Like any other resistor, but you can vary the amount of resistance

- Generally used for making a varying voltage (remember, Arduino measures voltage differences, not resistance differences)
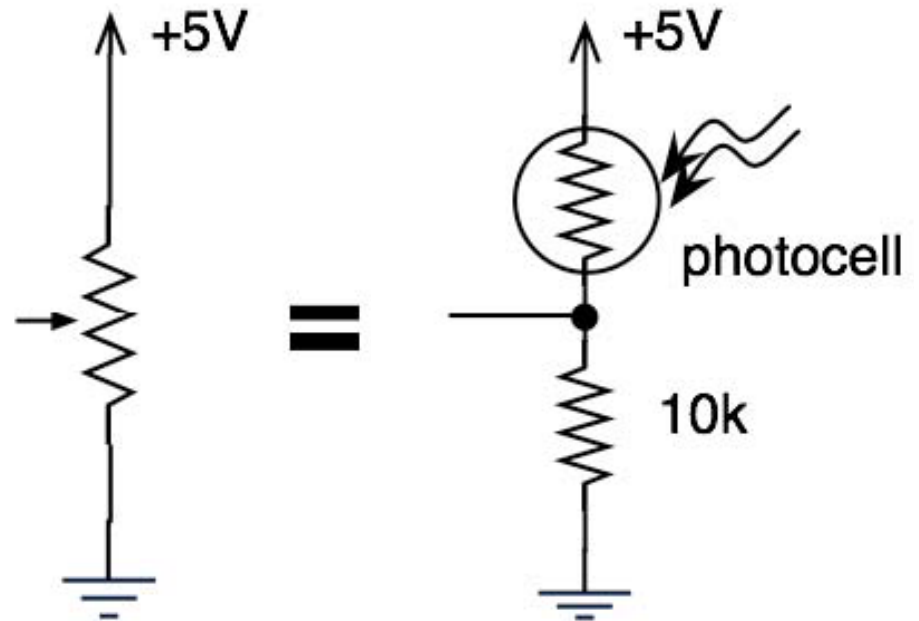

turned anti-clockwise   **turned clockwise**   **somewhere in the middle**
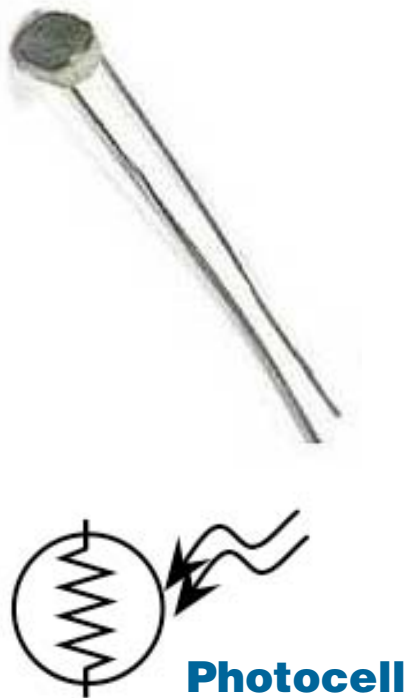
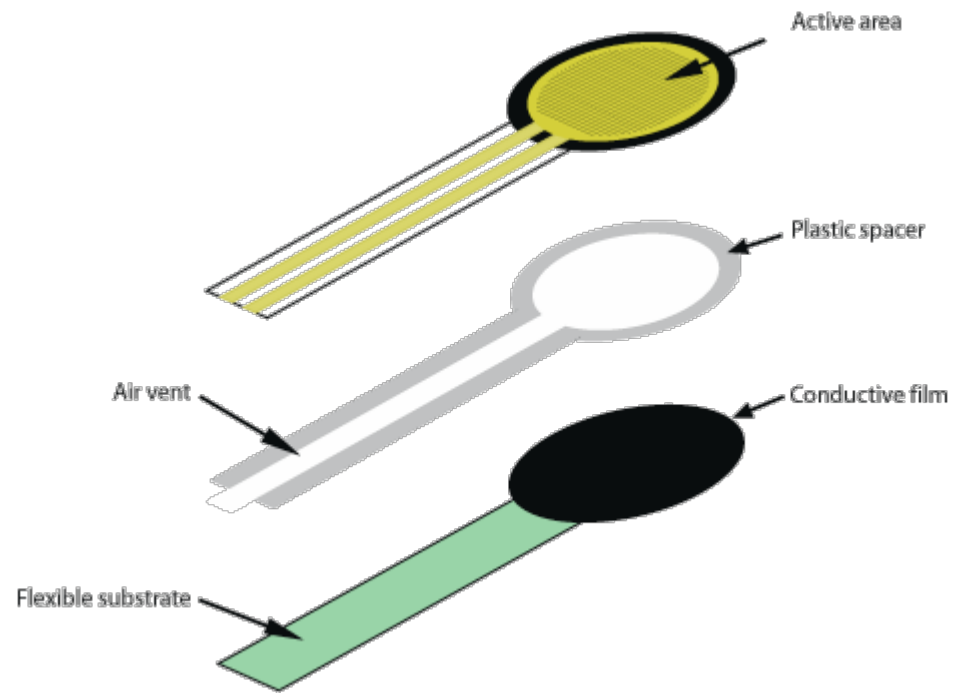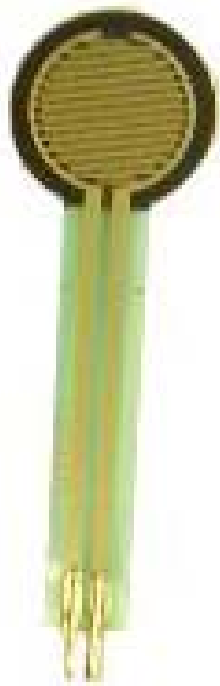# Photocells (aka photoresistor)

Brighter light == lower resistance

Photocell

Force Sensitive Resistors

More pressure == lower resistance

Force Sensitive Resistors

Experiment with different pressure objects, sponge, plates, etc.
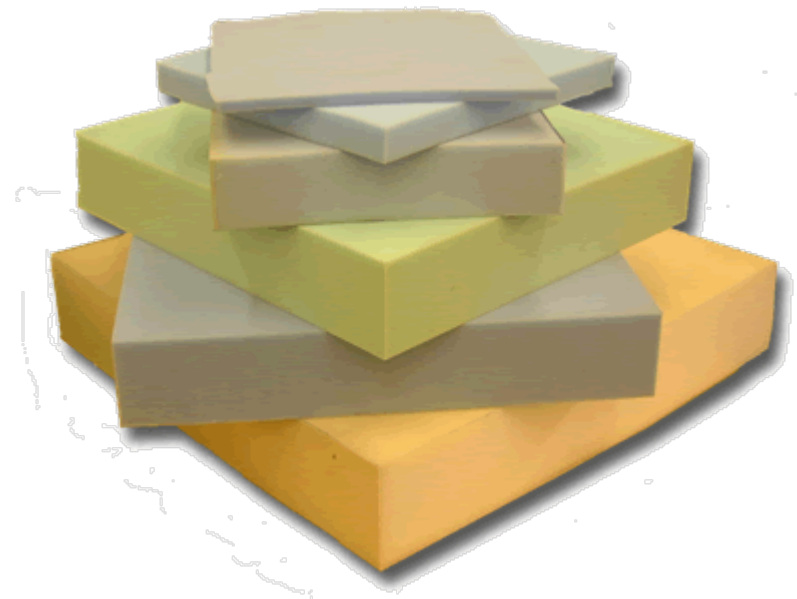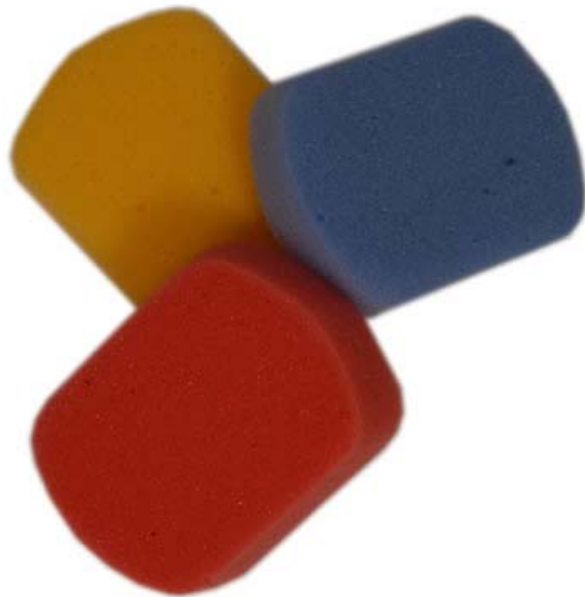
Working with Processing

Arduino as an interface board

Arduino to Computer

USB to serial chip

Arduino microcontroller

Arduino to Computer

Laptop

Arduino board

| Arduino programmer | **RX** → ← **TX** | USB to serial driver |

or

Processing sketch

or

Java program

or

Program of your choice!

| USB to serial chip | **RX** → ← **TX** | Arduino microcontroller |

USB
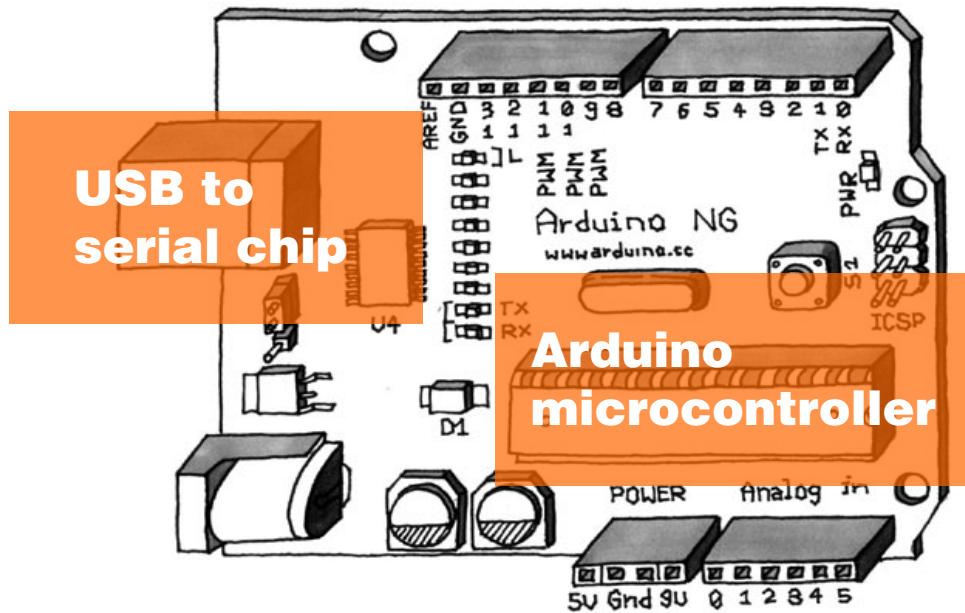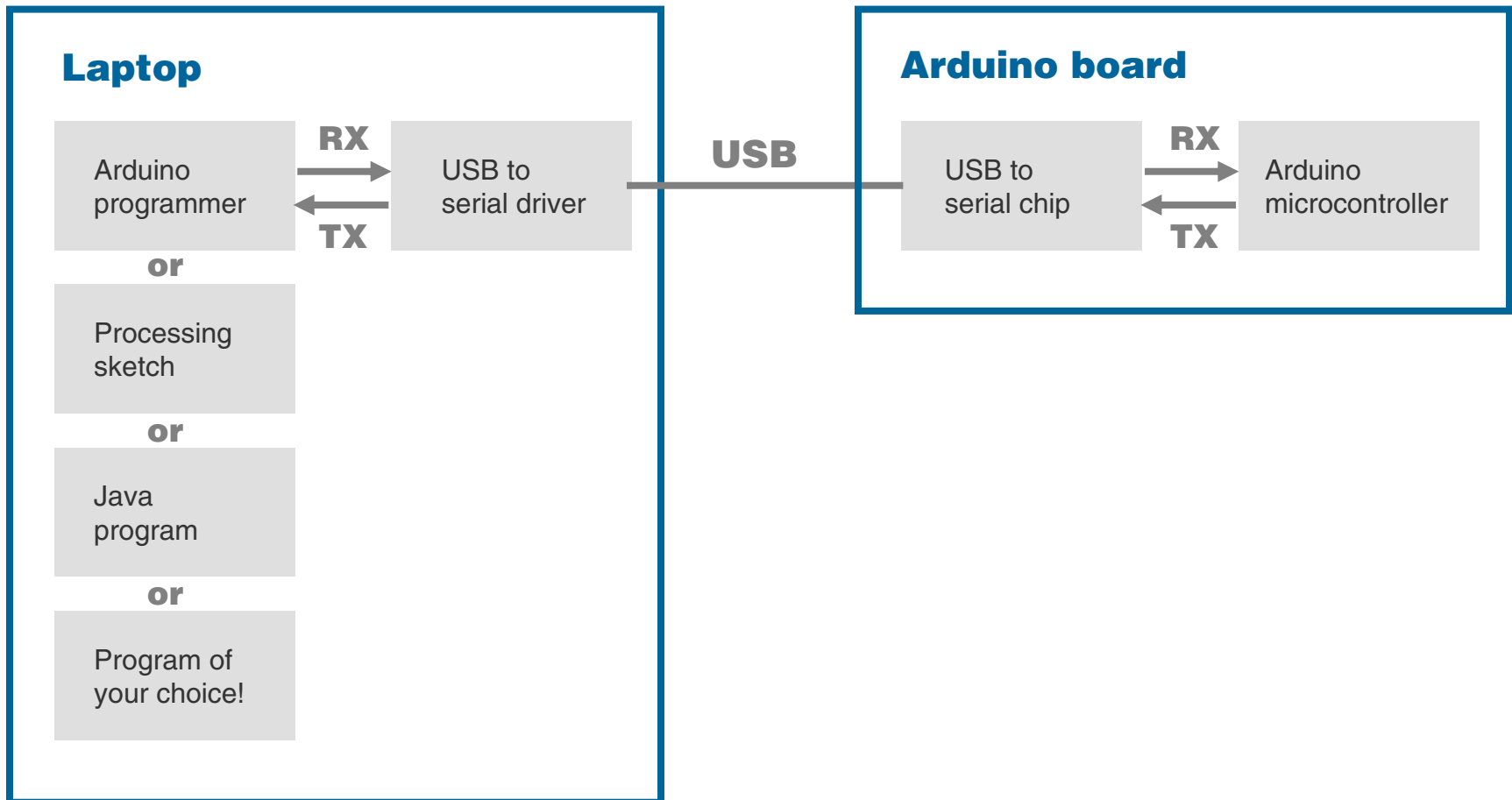
Processing

Open source programming language and environment for images, animation, and interactions.

Processing

Processing and Serial

Processing has a "Serial" library to talk to Arduino.

1. load library
2. set portname
3. open port
4. read/write port

```
import processing.serial.*;

// Change this to the portname your Arduino board
String portname = "/dev/tty.usbserial-A3000Xv0"; // or "COM5"

void setup() {
    port = new Serial(this, portname, 9600);
}

void draw() {
  // draw something
}

// called whenever serial data arrives
void serialEvent(Serial p) {
  char c = port.readChar();
  if( c == '!' ) {
    // do something
  }
}
```
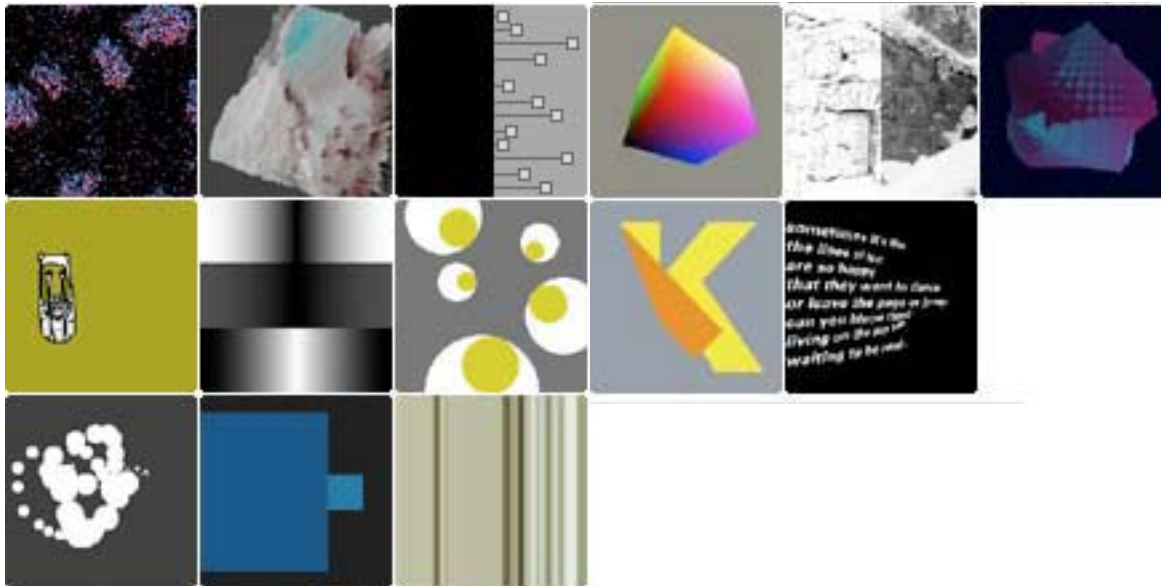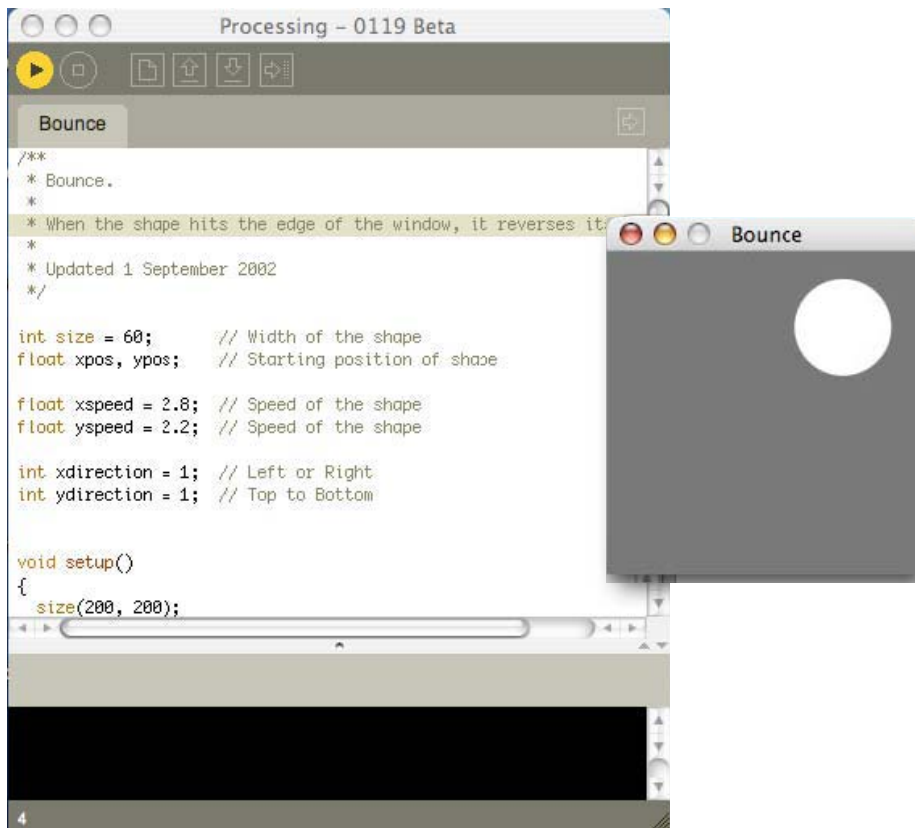
adapted from Tod Kurt's Spooky Projects with Arduino

In Class Exercise

Photocell and LED

SinglePotControlsBrightness.txt

SinglePotControlsBlinking.txt
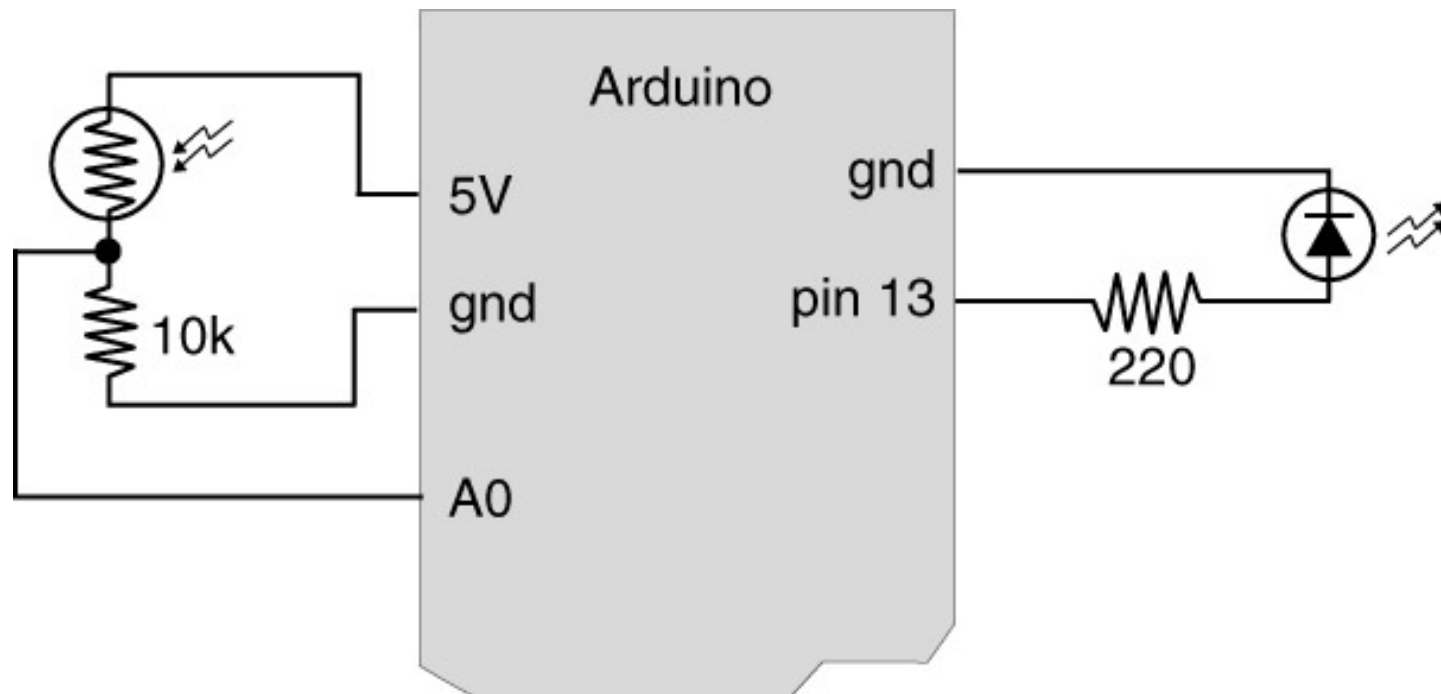
FSR and LED

SinglePotControlsBrightness.txt

SinglePotControlsBlinking.txt

Processing

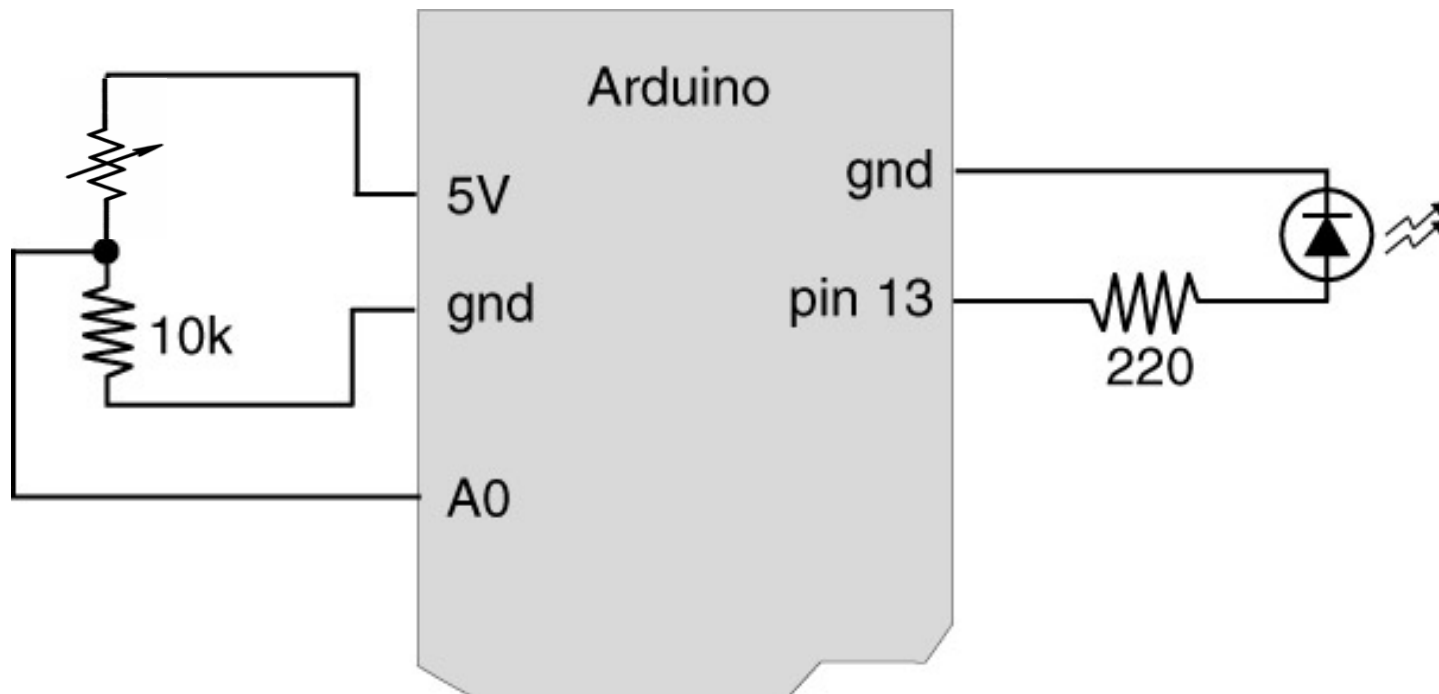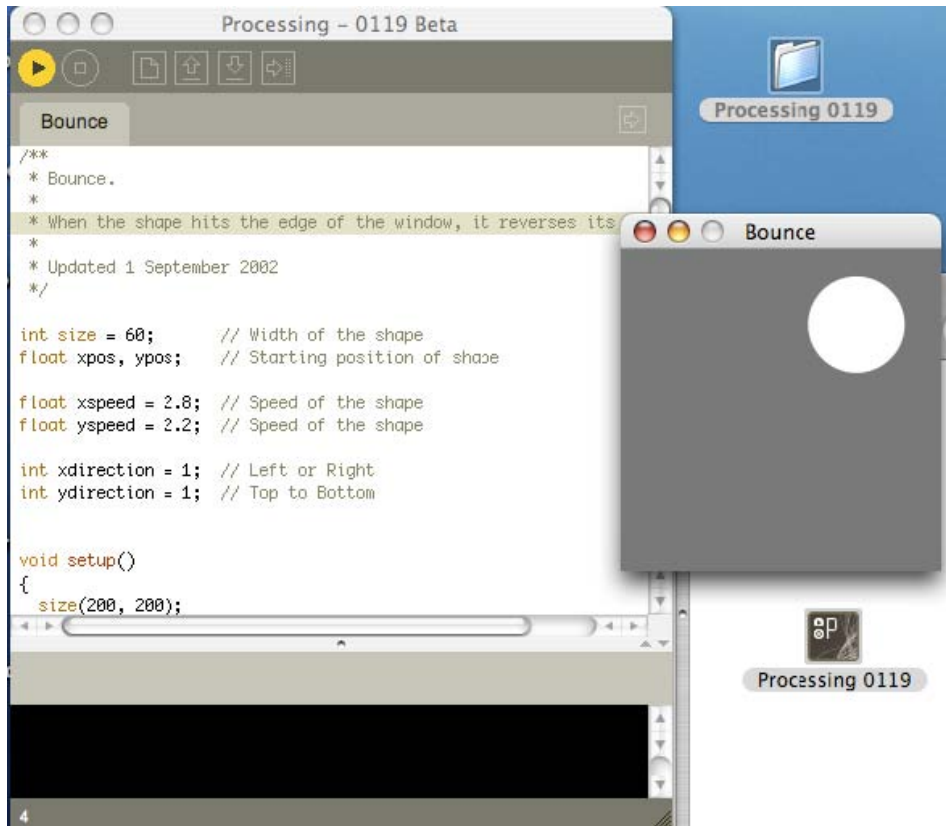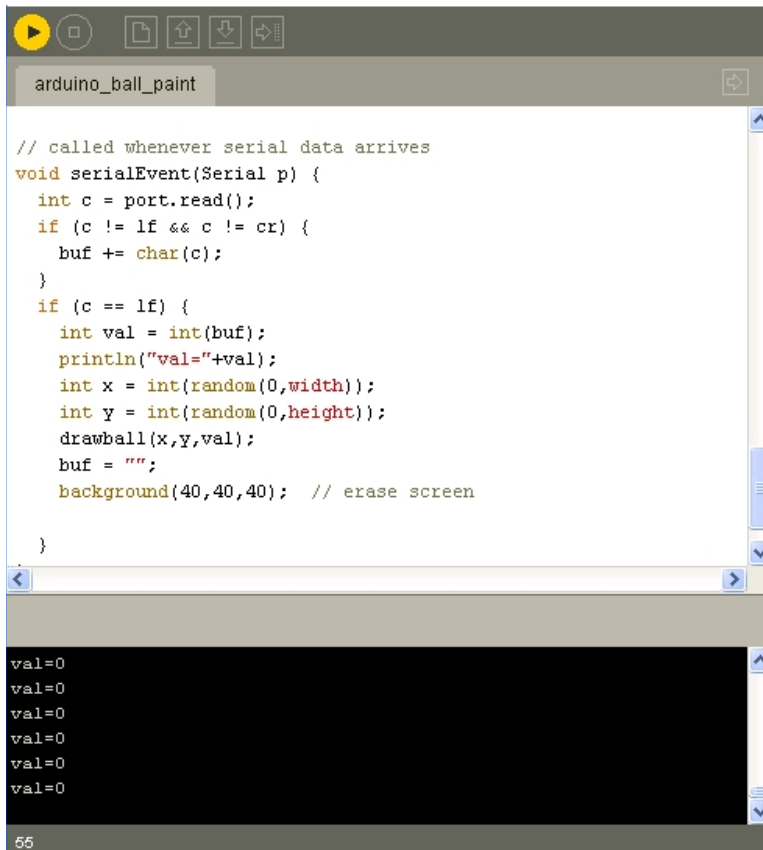Download and install Processing from processing.org

Processing and Arduino

arduino_ball_paint


```
// called whenever serial data arrives
void serialEvent(Serial p) {
  int c = port.read();
  if (c != lf && c != cr) {
    buf += char(c);
  }
  if (c == lf) {
    int val = int(buf);
    println("val="+val);
    int x = int(random(0,width));
    int y = int(random(0,height));
    drawball(x,y,val);
    buf = "";
    background(40,40,40);  // erase screen
  }
}
```

```
val=0
val=0
val=0
val=0
val=0
val=0
```

55

Every time a number is received via the serial port, it draws a ball that size.

Project adapted from Tod Kurt's Spooky Projects with Arduino

Homework

Programming

Create an interesting visualization on your computer that could be influenced by the input from the sensors you have (pot, photocell, FSR, or combination of them). You can use Processing (or any other language you like) in writing the program. Post your results on the course website.

Mechanical

Create a mechanical construction for your FSR that distributes or focuses physical force that is applied. Think about everyday objects (toothpaste tube, entrance mat, paintbrush, pipette, etc.) and how you measure the pressure or force applied to them.

Supplement Readings

Force sensitive resistors: Chapter 11 of Physical Computing

Voltage divider: Chapter 6, pp. 102-108 of Physical Computing

Thanks!