Potentiometers

Showcase your project!
Sensor 2: Photocells and Force Sensors

Analog input and Processing
Photocell

Force Sensitive Resistor
Photocell

$0.01

Force Sensitive Resistor

$5.50
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.)
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)
Voltage Divider

Potentiometer is a type of voltage divider.

Illustration adapted from Tod Kurt's Spooky Projects with Arduino
Photocells (aka photoresistor)

Brighter light == lower resistance
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 programmer

or

Processing sketch

or

Java program

or

Program of your choice!

Arduino board

USB to serial driver

USB

USB to serial chip

RX

TX

RX

TX

Arduino microcontroller

Illustration adapted from Tod Kurt’s Spooky Projects with Arduino
Processing

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

```java
/*
 * Bounce.
 * When the shape hits the edge of the window, it reverses its
 * Updated 1 September 2002
 */

int size = 60;  // Width of the shape
float xpos, ypos;  // Starting position of shape
float xspeed = 2.8;  // Speed of the shape
float yspeed = 2.2;  // Speed of the shape
int xdirection = 1;  // Left or Right
int ydirection = 1;  // Top to Bottom

void setup()
{
    size(200, 200);
}
```
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

```java
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

```java
// Bounce
*
* When the shape hits the edge of the window, it reverses its
* * Updated 1 September 2002
* /
int size = 60;    // Width of the shape
float xpos, ypos; // Starting position of shape
float xspeed = 2.8; // Speed of the shape
float yspeed = 2.2; // Speed of the shape
int xdirection = 1; // Left or Right
int ydirection = 1; // Top to Bottom

void setup()
{
   size(200, 200);
}
```
Processing and Arduino

arduino_ball_paint

```cpp
// called whenever serial data arrives
void serialEvent(Serial p) {
  int c = port.read();
  if (c != 13 || c != 10) {
    buf += c;
  }
  if (c == 13) {
    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
  }
}
```

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
Assignment this week

**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
Photocell and LED

SinglePotControlsBrightness.txt
SinglePotControlsBlinking.txt
LumiTouch
[Chang, Resner et al., 2001]
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.
Thanks!