Sensor 1: Potentiometers

Analog input
Digital vs. Analog

Binary vs. continuous signals

- Binary / Digital = “whether or not”
- Continuous / Analog signal = “how much” or “faster,” “brighter,” etc.

Binary / Digital:

- 0V (LOW) or 5V (HIGH)

Continuous / Analog: e.g.

- 0.095V
- 1.0V
- 4.555V
- etc.
Analog Input on Arduino

- Arduino has 6 ADC (Analog to Digital Converter) inputs
- Reads voltage between 0 to 5 V
- Resolution is 10 bits: $2^{10} = 1024$ states
- $5V/1024 = 4.8$ mV smallest voltage difference Arduino can measure
Digitizing Analog Input

Microprocessor cannot deal with analog signal internally, so you digitize it. Afterwards, computer only knows the dashed line so to computer, analog input is “chunky.”
Analog Input on Arduino

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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

to GND

to Analog In

to 5V
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)

Illustration adapted from Tod Kurt’s Spooky Projects with Arduino
In Class Exercise

Controlling LEDs with potentiometers

Control your color mixer with multiple pots
In Class Exercise

1. RGB LED Fade
2. Strip wires
3. Solder wires to pot
4. Control one LED
5. Control LED(s) with multiple pots
Circuit with 3 LEDs

Plug in the three LEDs, red, green, and blue, and make different colors
In Class Exercise

1. RGB LED Fade
2. Strip wires
3. Solder wires to pot
4. Control one LED
5. Control LED(s) with multiple pots
Strip the Wires

Cut 3 wires (1 red, 1 yellow, and 1 black) and strip off about $\frac{1}{4}$" of insulation at both ends of each wire.
In Class Exercise

1. RGB LED Fade
2. Strip wires
3. Solder wires to pot
4. Control one LED
5. Control LED(s) with multiple pots
Potentiometers

Solder the wires to your pots.
Soldering

Heating the joint, not the solder. Use lead-less solder.

1. Heat the joint, not the solder
2. Melt the solder
3. Release the solder

Illustrations from http://www.chaneyelectronics.com/training/soldering.htm
Soldering: Helping Hands
Soldering: Safety

Please wear safety goggles!
In Class Exercise

1. RGB LED Fade
2. Strip wires
3. Solder wires to pot
4. Control one LED
5. Control LED(s) with multiple pots
Controlling your LED with a Potentiometer
Controlling an LED with a Pot

Make one LED to dim and blink at different rate
In Class Exercise

1. RGB LED Fade
2. Strip wires
3. Solder wires to pot
4. Control one LED
5. Control LED(s) with multiple pots
Controlling multiple LEDs with multiple Pots

Option 1: control one LED with two pots

Option 2: control three LEDs with three pots
Soldering

Be careful:
It could be 1000 degrees!
Next Thursday

Sensor 2: Force sensitive resistors and photocells
Arduino as an interface board: Processing
Read Intro to Processing at processing.org
Thanks!