

week 04



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 :

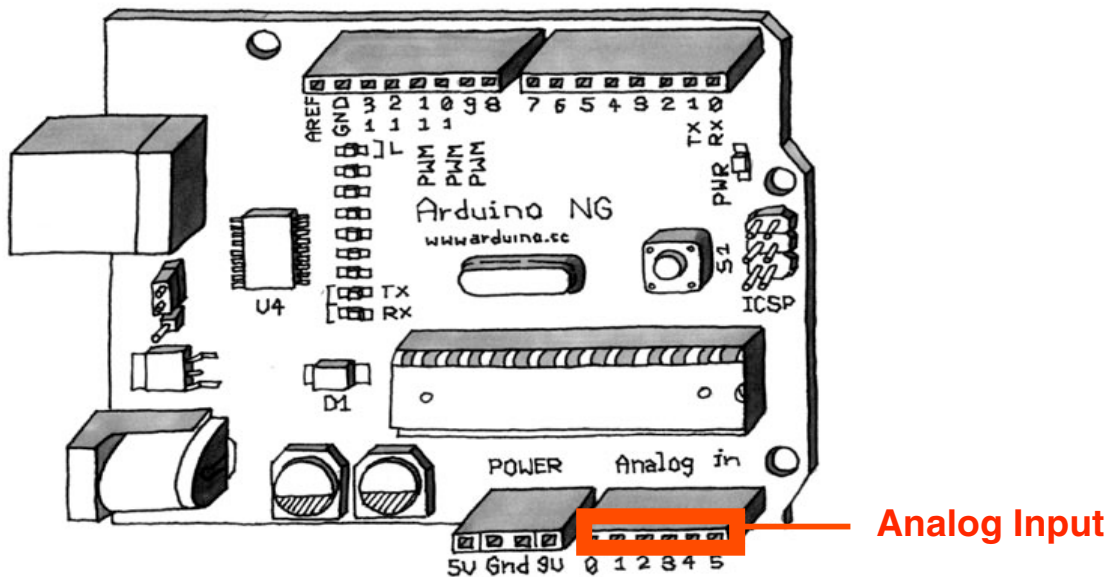
- 0V (LOW) or 5V (HIGH)

Continuous / Analog : e.g.

- 0.095V
- 1.0V
- 4.555V
- etc.

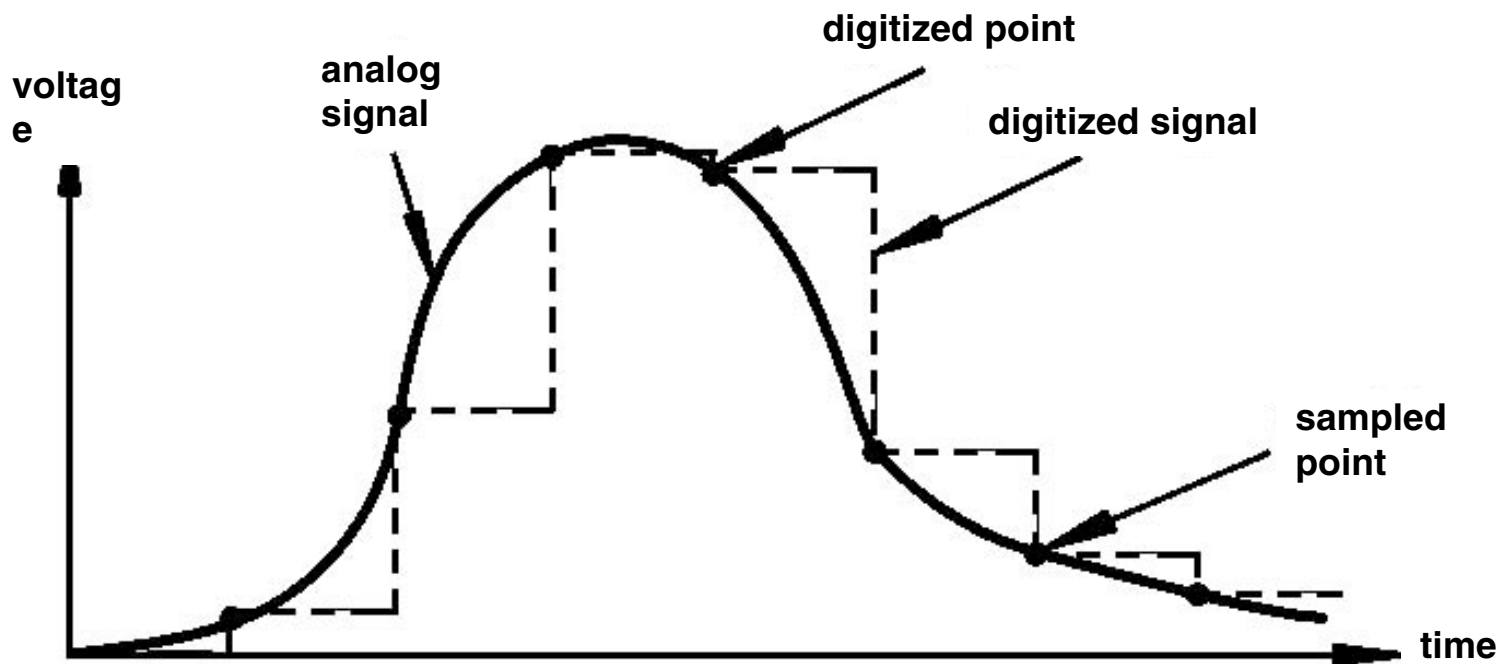
Analog Input on Arduino

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



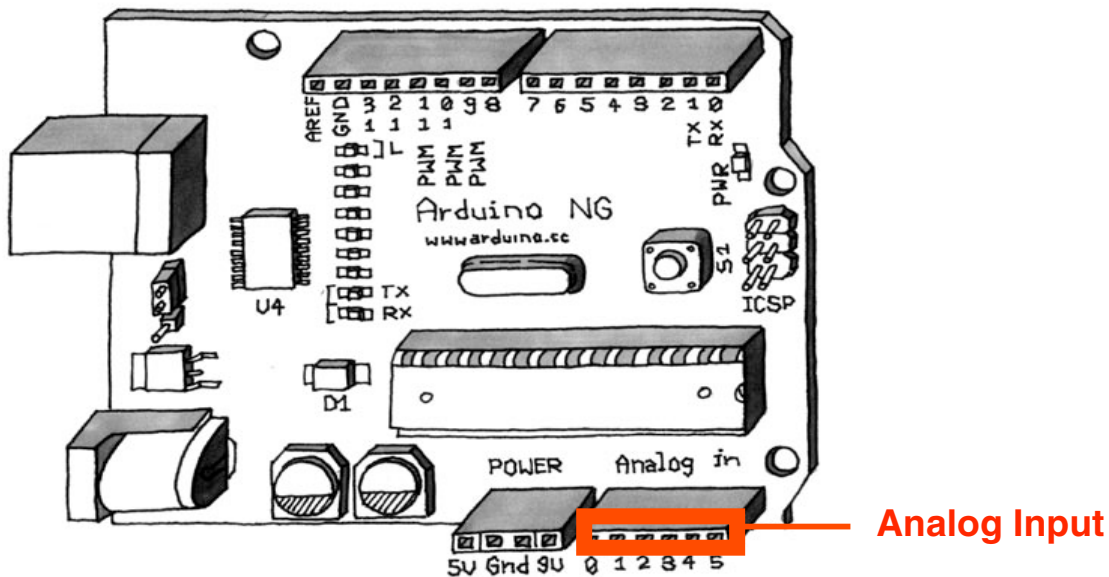
Digitizing Analog Input

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.”



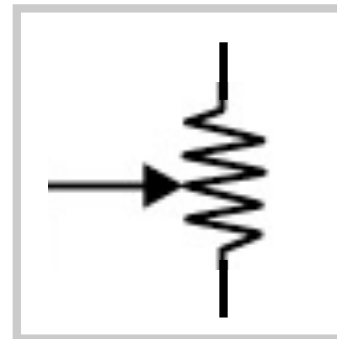
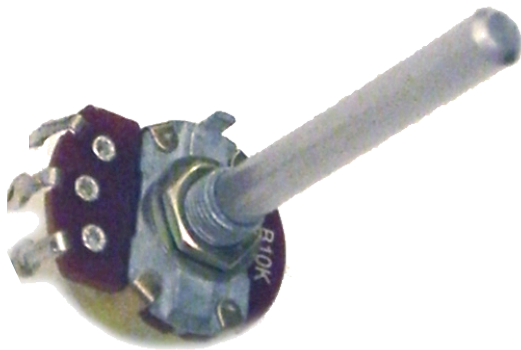
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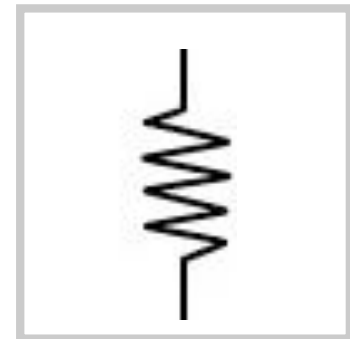


Potentiometers

- 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.)

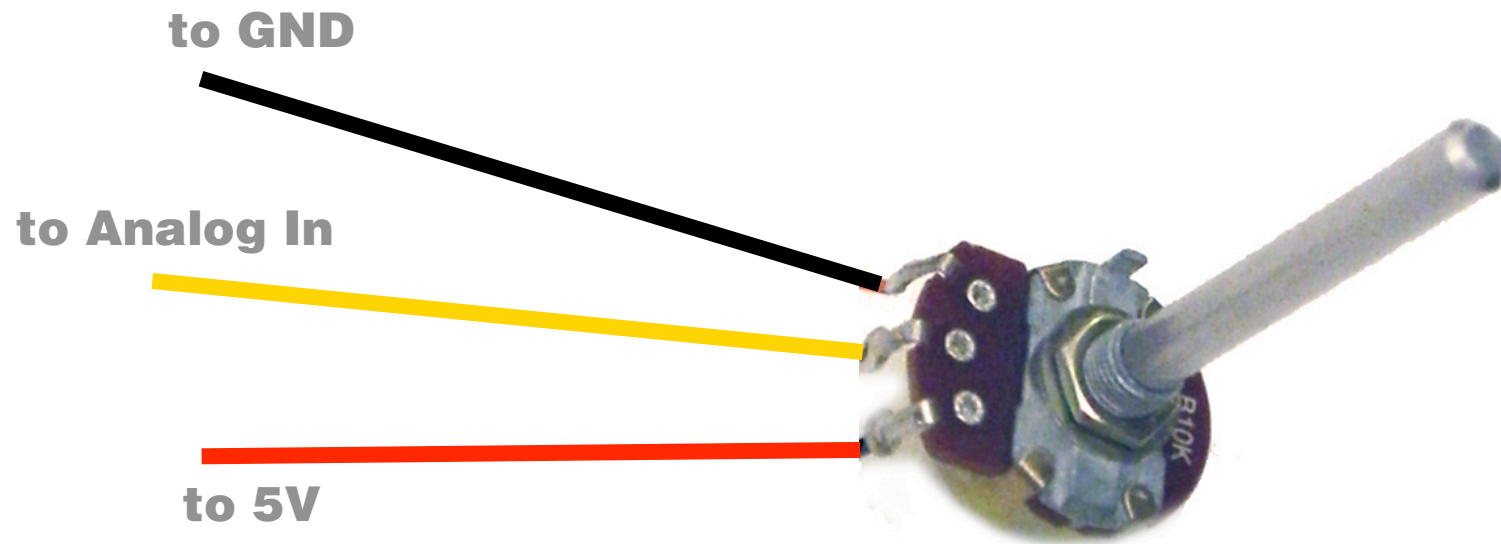


pot



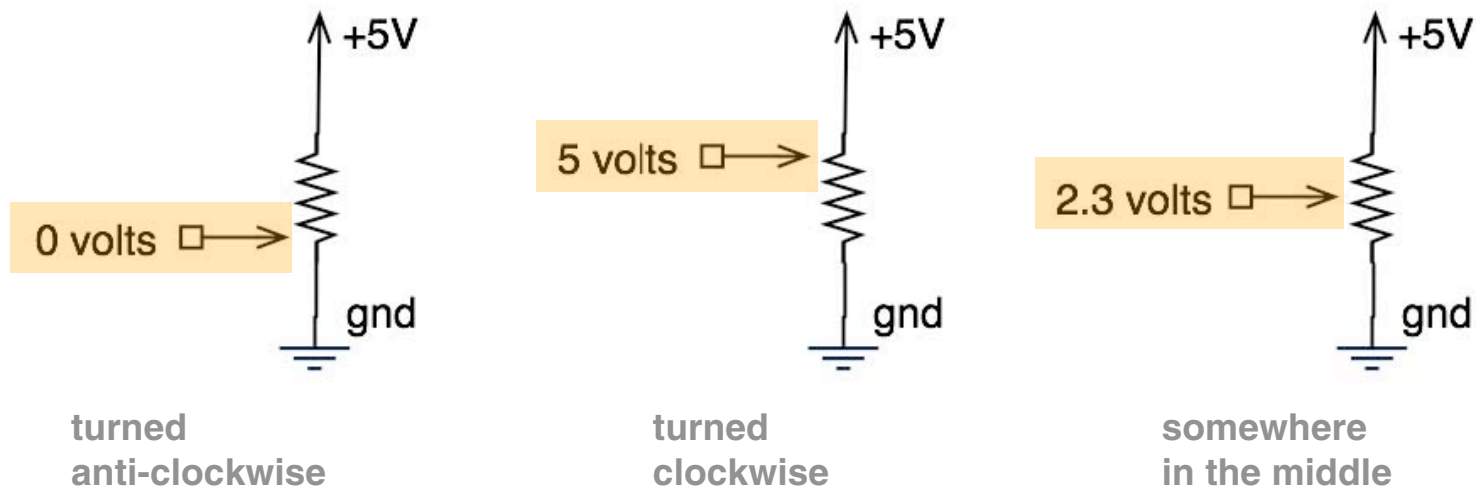
resistor

Potentiometers



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)



In Class Exercise

Controlling LEDs with potentiometers

Control your color mixer with multiple pots

In Class Exercise

1. RGB LED Fade

2. Strip wires

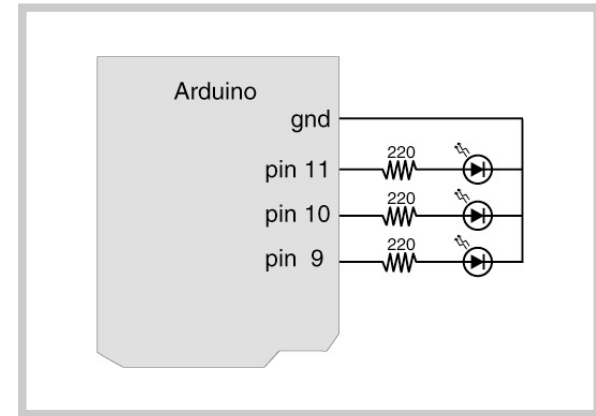
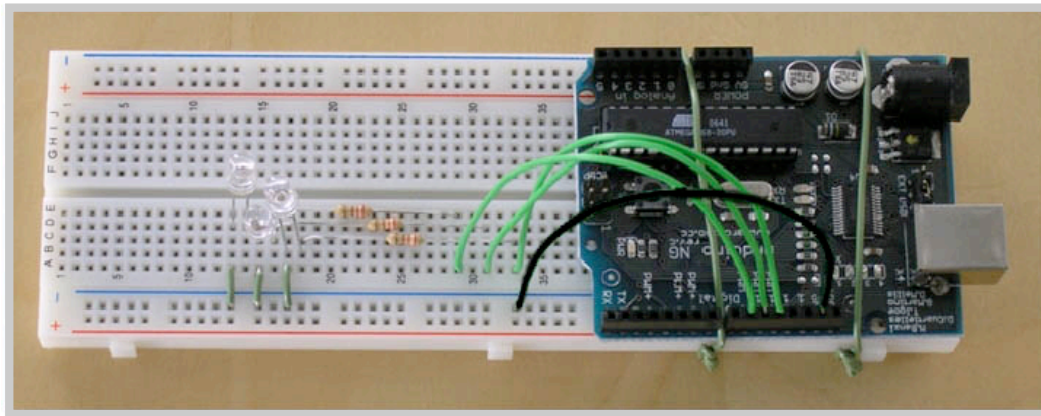
3. Solder wires to pot

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

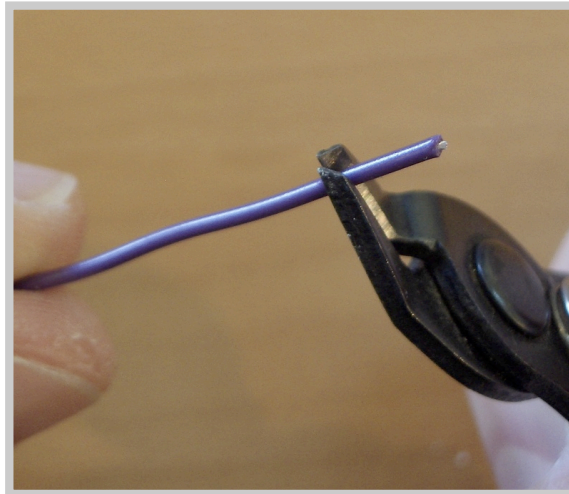
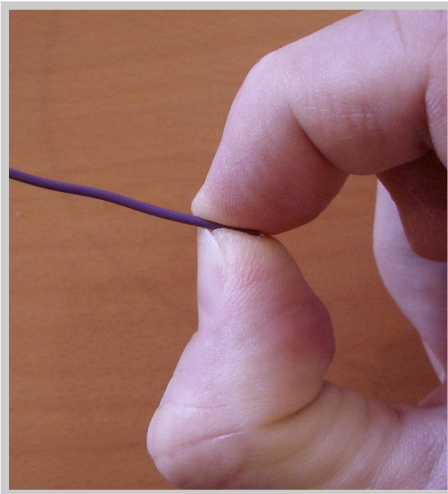


In Class Exercise

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 ¼” of insulation at both ends of each wire.

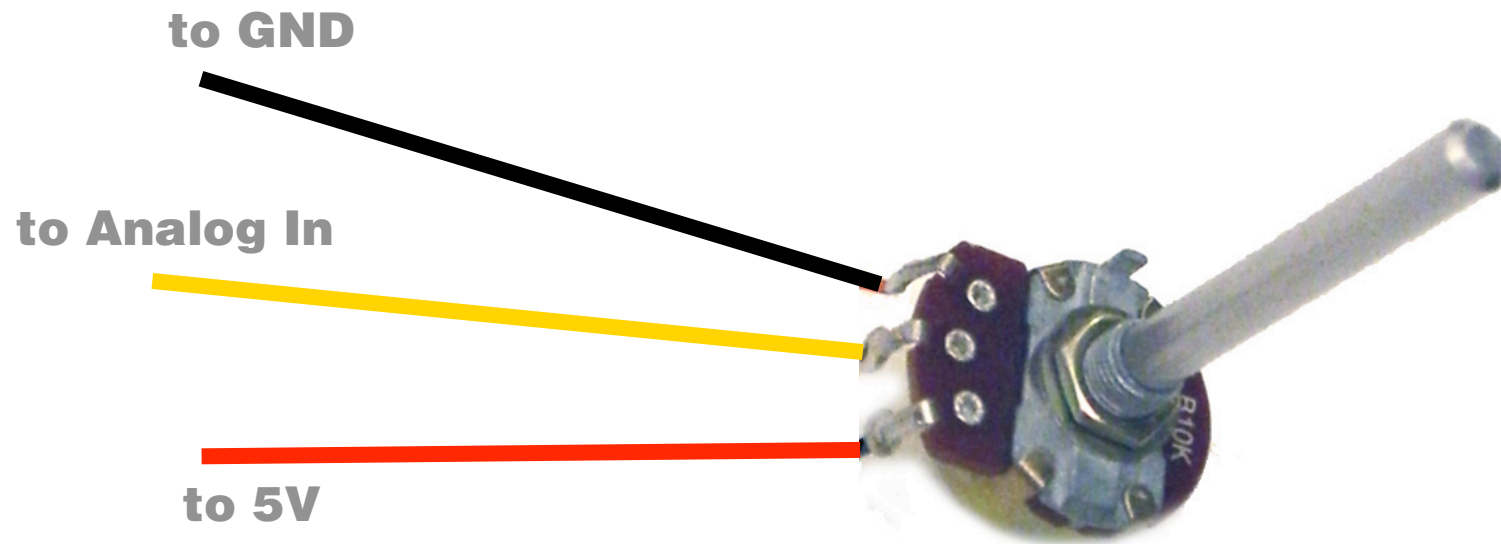


In Class Exercise

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

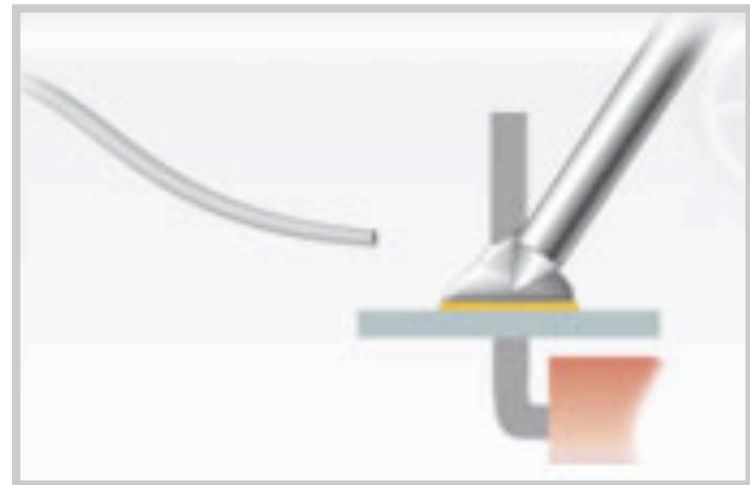
Heating the joint, not the solder. Use lead-less solder.



1 Heat the joint, not the solder

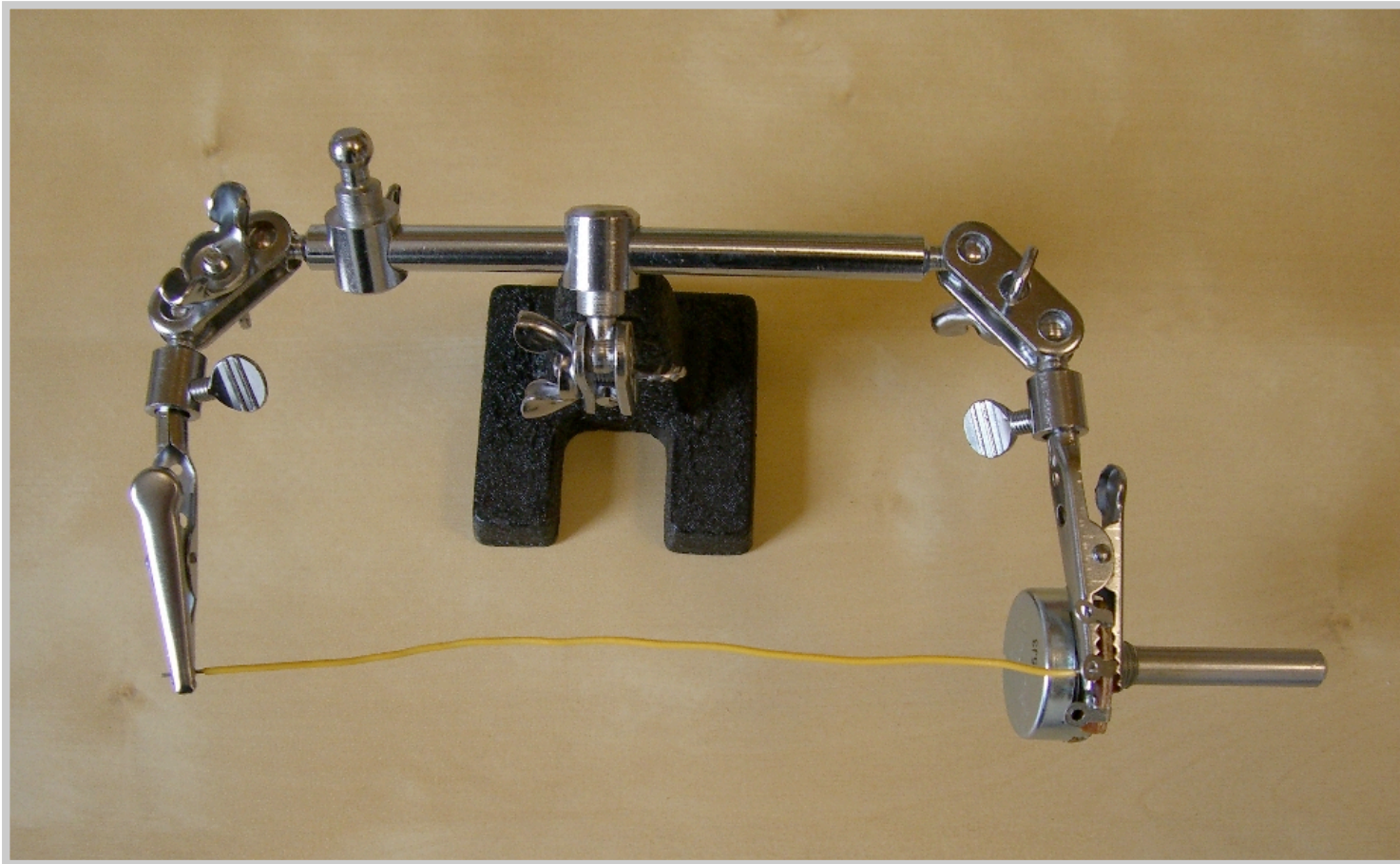


2 Melt the solder



3 Release the solder

Soldering: Helping Hands



Soldering: Safety

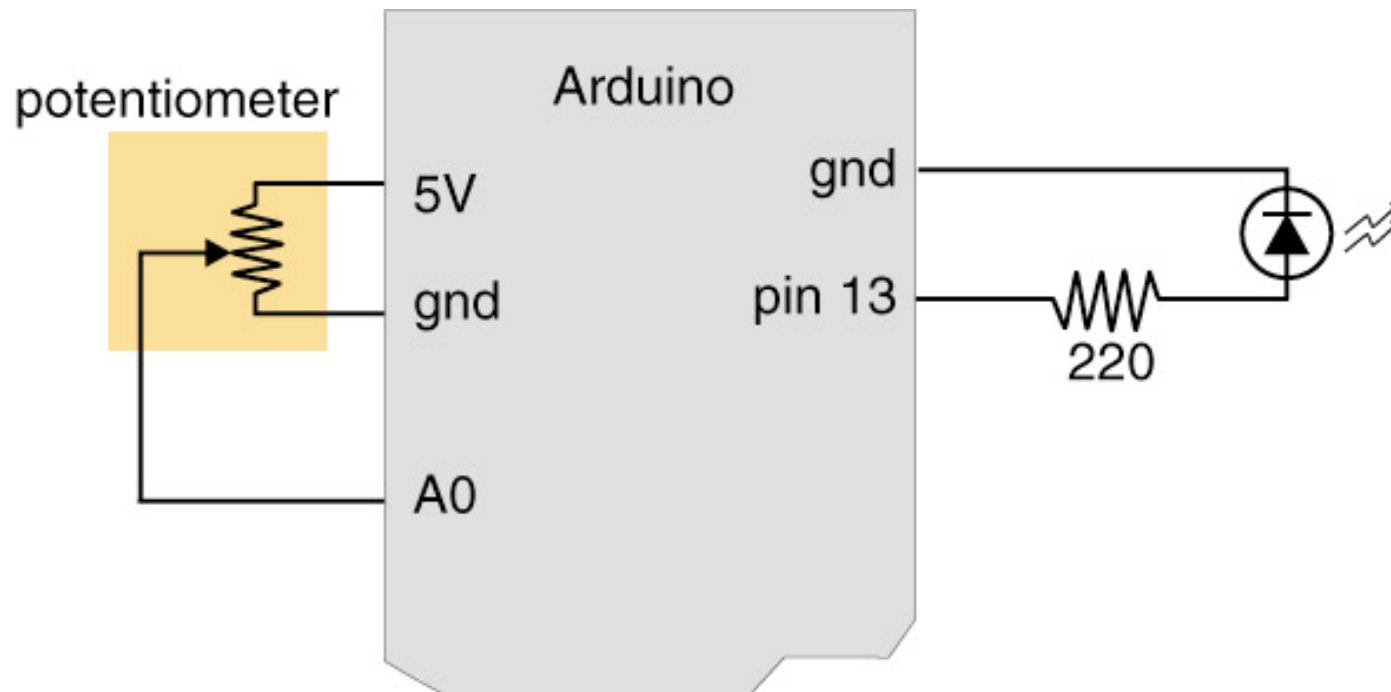
Please wear safety goggles!



In Class Exercise

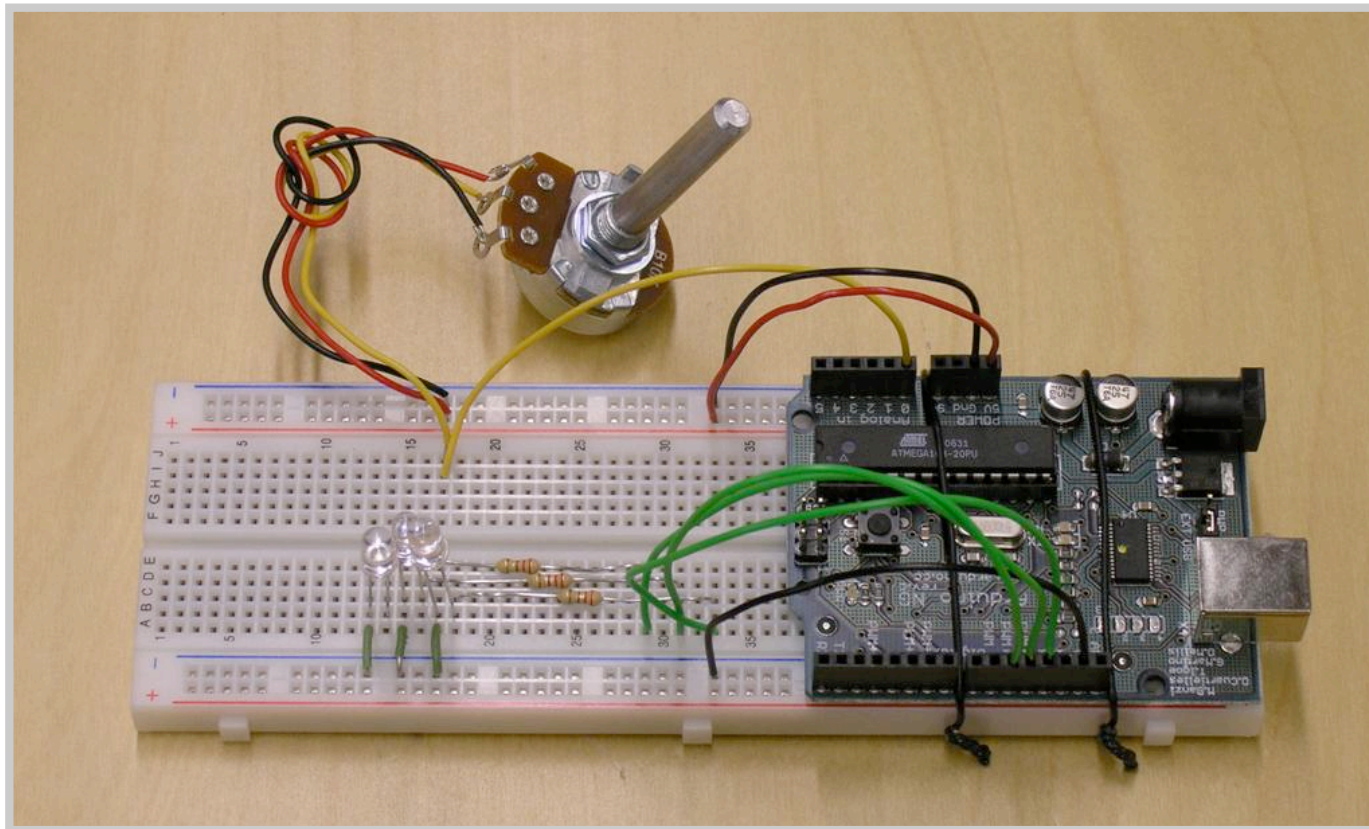
1. RGB LED Fade
2. Strip wires
3. Solder wires to pot
- 4. Control one LED**
5. Control LED(s) with multiple pots

Controlling your LED with a Potentiometer



Controlling an LED with a Pot

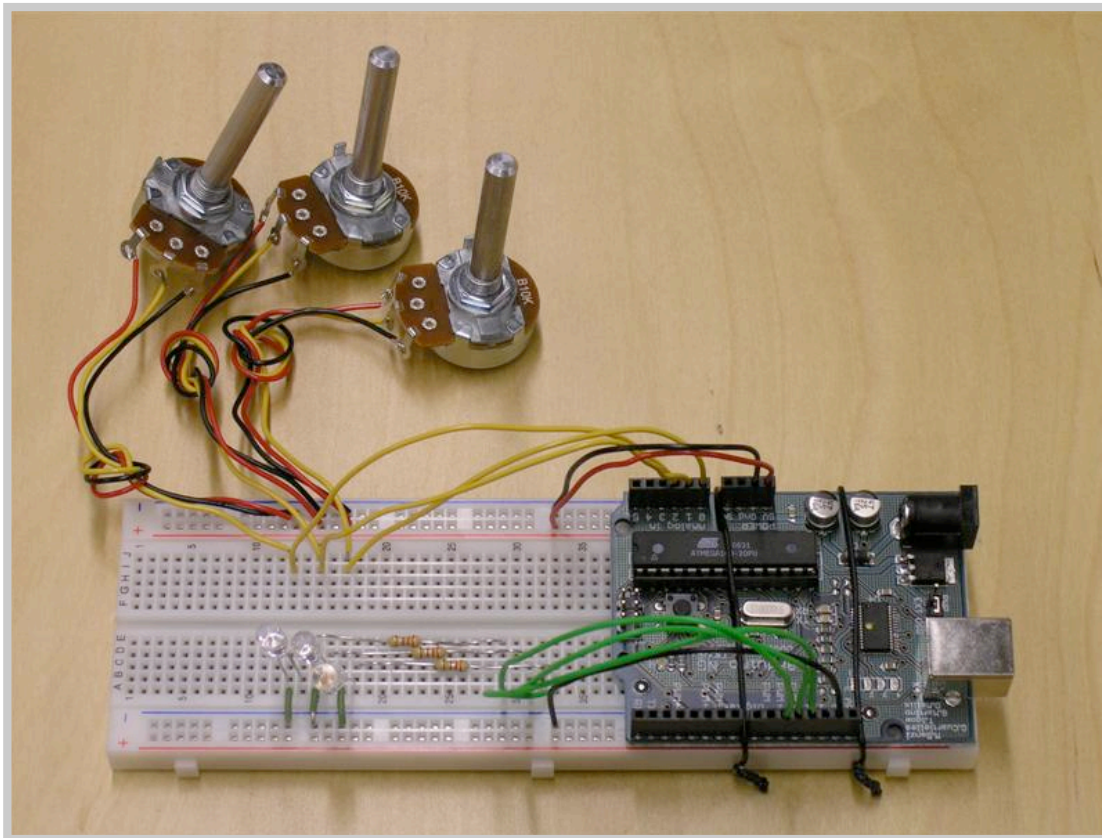
Make one LED to dim and blink at different rate



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!