# Robotic Arts Intro

Week 4: more listening
[Serial Communication and Analog input]

# Analog Signals

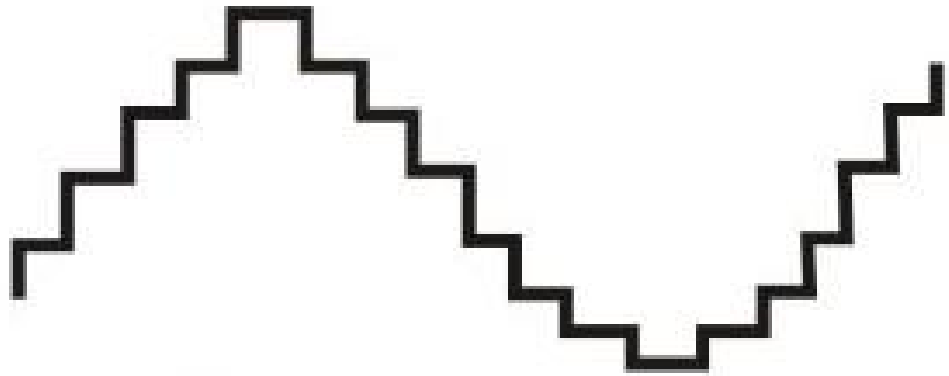Analog signals are multi-state, continuous signals which can be read by and created by* the Arduino.

*Analog output is actually digital output!

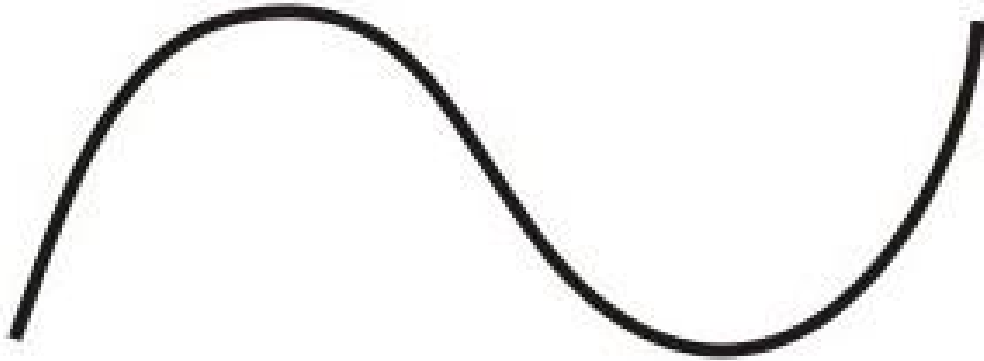Digital signals are represented as a range from:

0V ~ 5V    (actual voltage)
0 ~ 1023   (numeric representation)

Digitally represented
Analog Signal

Analog Signal

Digital → Is the light ON or OFF?

Analog → How bright is the light?

# No pinMode necessary!

Setting a pin as INPUT or OUTPUT is only necessary with digital signals.

Analog Input is handled through a set of pins which only do Analog Input.
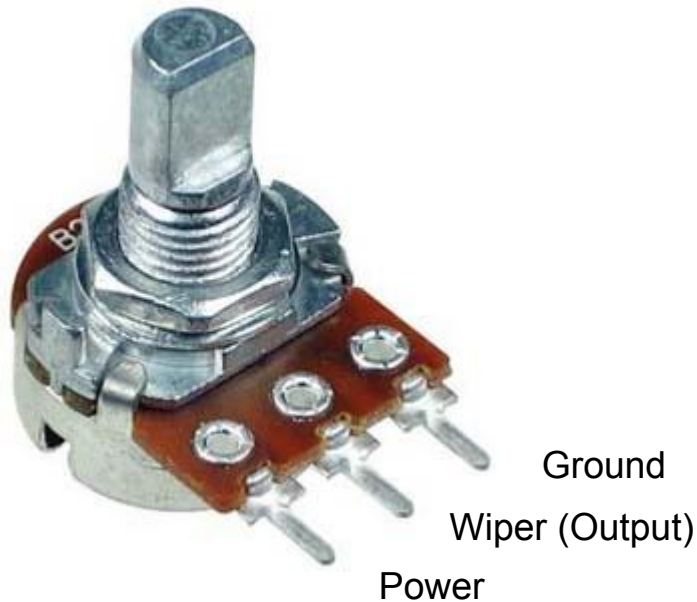
# Tonight's Code

We'll be starting with examples which come with the Arduino software tonight.

These can be found in:

File > Examples > 01.Basics > AnalogReadSerial

File > Examples > 03.Analog > AnalogInput
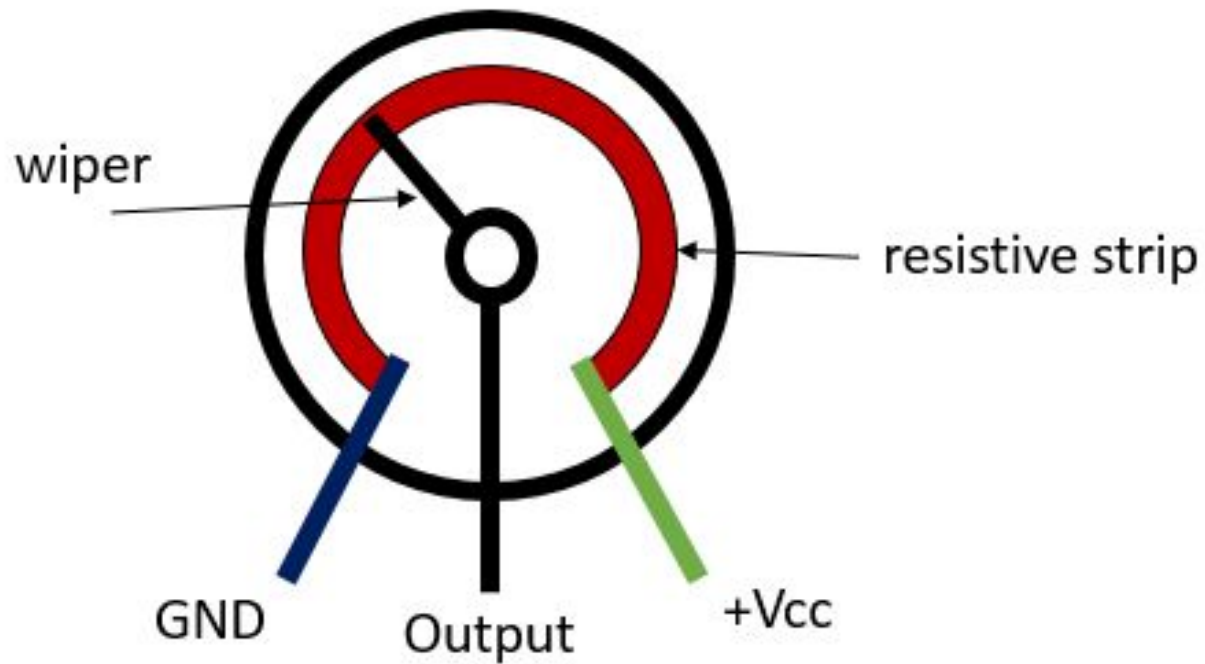
# Potentiometer ("pot")

A potentiometer is a type of variable resistor.

As we turn the shaft, we are adjusting the balance of resistance inside. This changes the level of voltage exiting through the wiper.
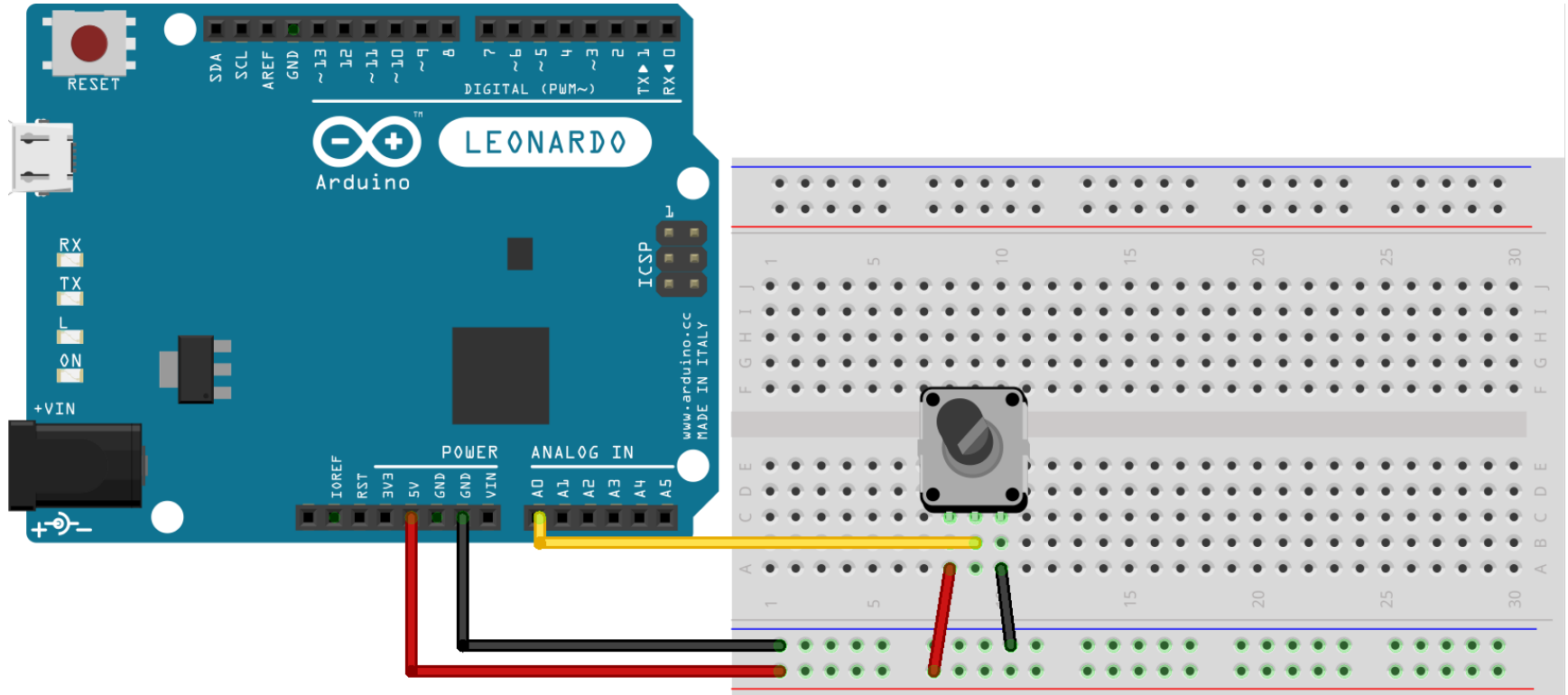
Always use a linear potentiometer with the Arduino.

Ground

Wiper (Output)

Power

# Potentiometer
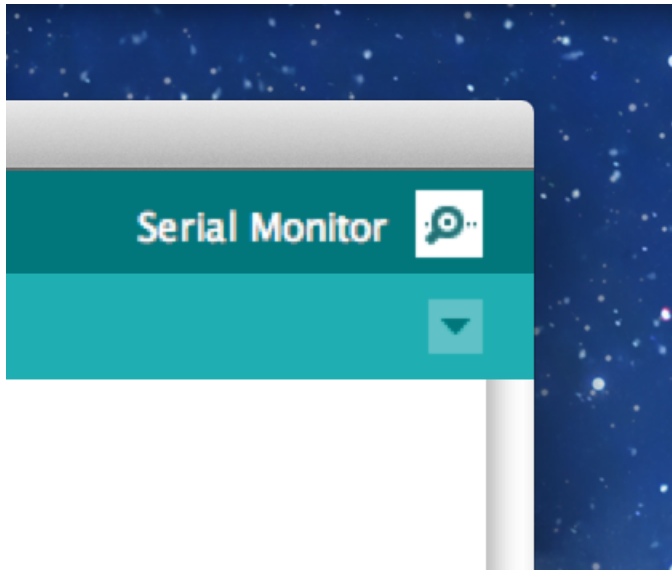


wiper

resistive strip

GND    Output    +Vcc

# Connecting a Potentiometer



Outer legs need to be connected to 5V/GND, but the order is not too important.

The inner leg connects to the Arduino.

Made with Fritzing.org
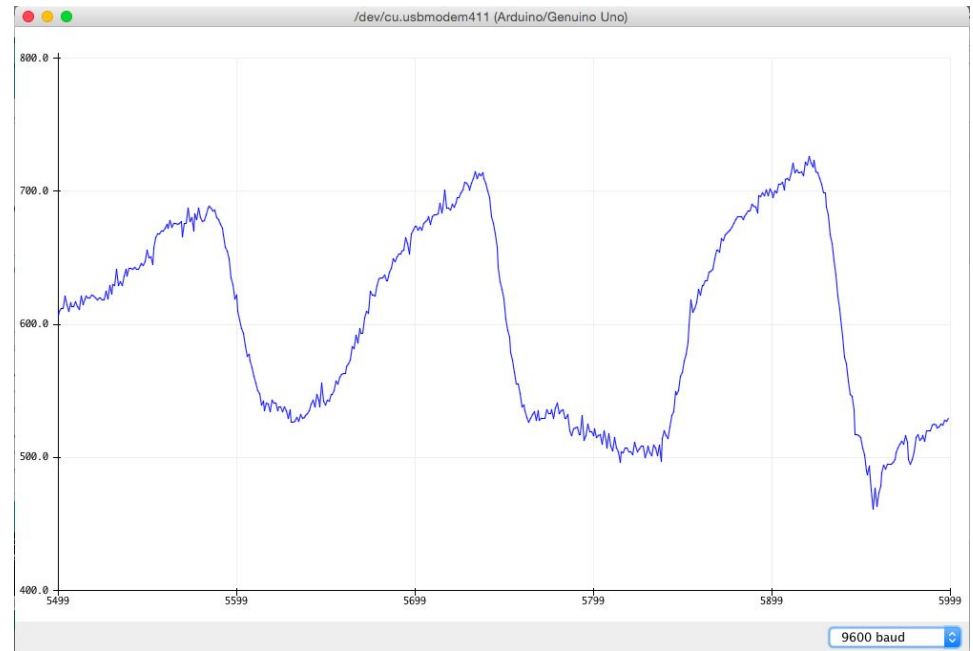
# Serial Monitor



The Serial Monitor is used to display messages sent from the Arduino using Serial.print(); or Serial.println();
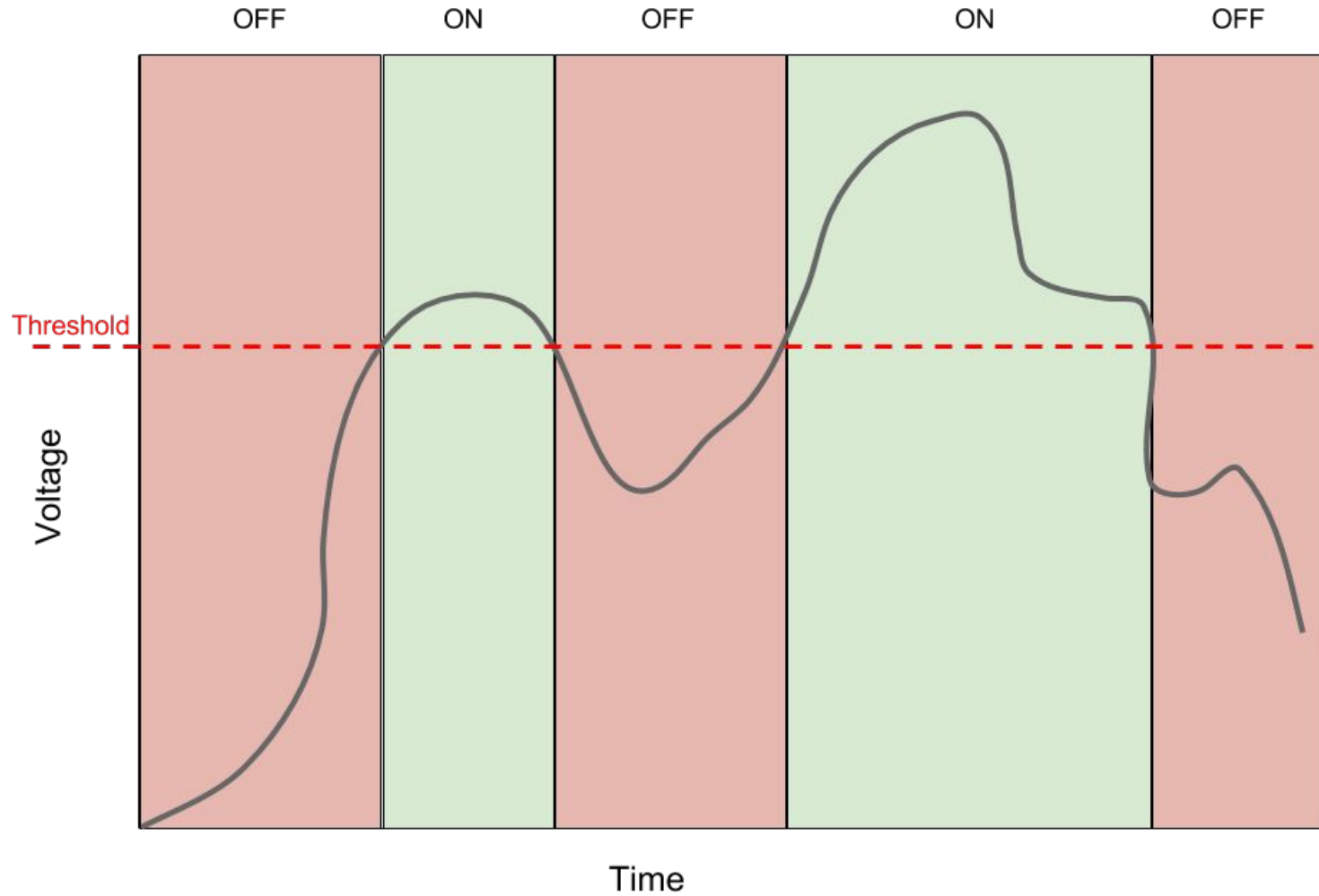
# **Serial Plotter**

Serial Plotter can be accessed from  Tools > Serial Plotter

Same function as Serial Monitor but value is put on a graph in real time

Good tool for troubleshooting

# Threshold

# Exercise

1. Put different values for the threshold and see how they affect your output
2. Make the LED turn on when sensorValue is lower than 100 and turn off otherwise
3. Make 2 thresholds. Turn a LED on when sensorValue is higher than 900, and also on when sensorValue is lower than 100
4. Make LED Blink when the sensorValue is lower or higher than the number you specify

# Connecting a CdS Photocell

Cadmium Sulfide
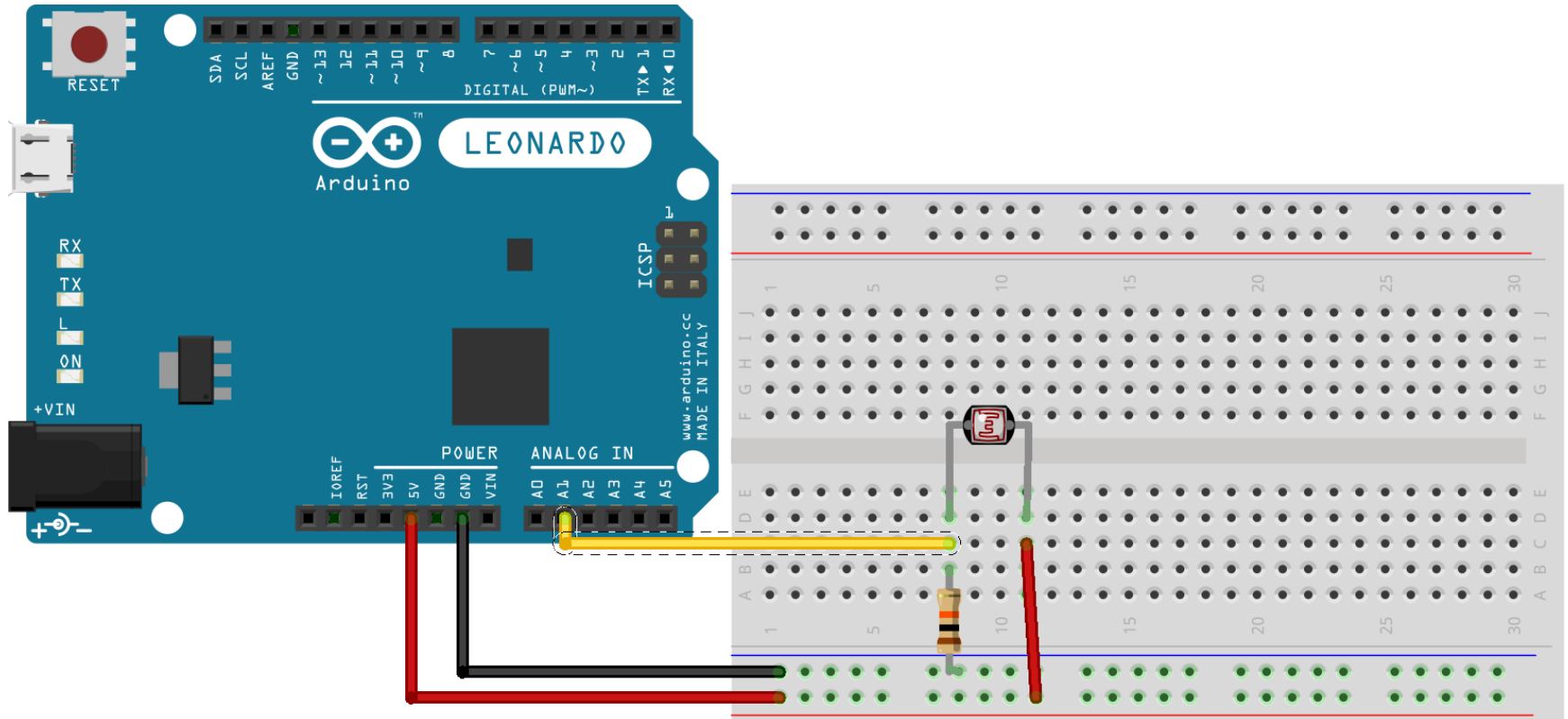


Be sure to also connect the leg going to Arduino to GND with a 10KΩ resistor.

Made with Fritzing.org

# Conductive Foam

Replace photocell with conductive foam

Notice the difference in the range of sensor values

# Better conditional logic (else if)

```
potValue1 = analogRead(potPin1);

if (potValue1 > 1000){
    digitalWrite(ledPin1, HIGH);
}
else if (potValue < 100){
    digitalWrite(ledPin1, HIGH);
    delay(1000);
    digitalWrite(ledPin1, LOW);
    delay(1000);
}
else {
    digitalWrite(ledPin1, LOW);
}
```

# Combining conditional logic (&& ||)

```
potValue1 = analogRead(potPin1);

OR (||):
if (potValue1 > 1000 || potValue1 < 100){
    digitalWrite(ledPin1, HIGH);
}
else{
    digitalWrite(ledPin1, HIGH);
}

AND (&&):
if (potValue1 < 1000 && potValue1 > 500){
    digitalWrite(ledPin1, HIGH);
}
else{
    digitalWrite(ledPin1, HIGH);
```
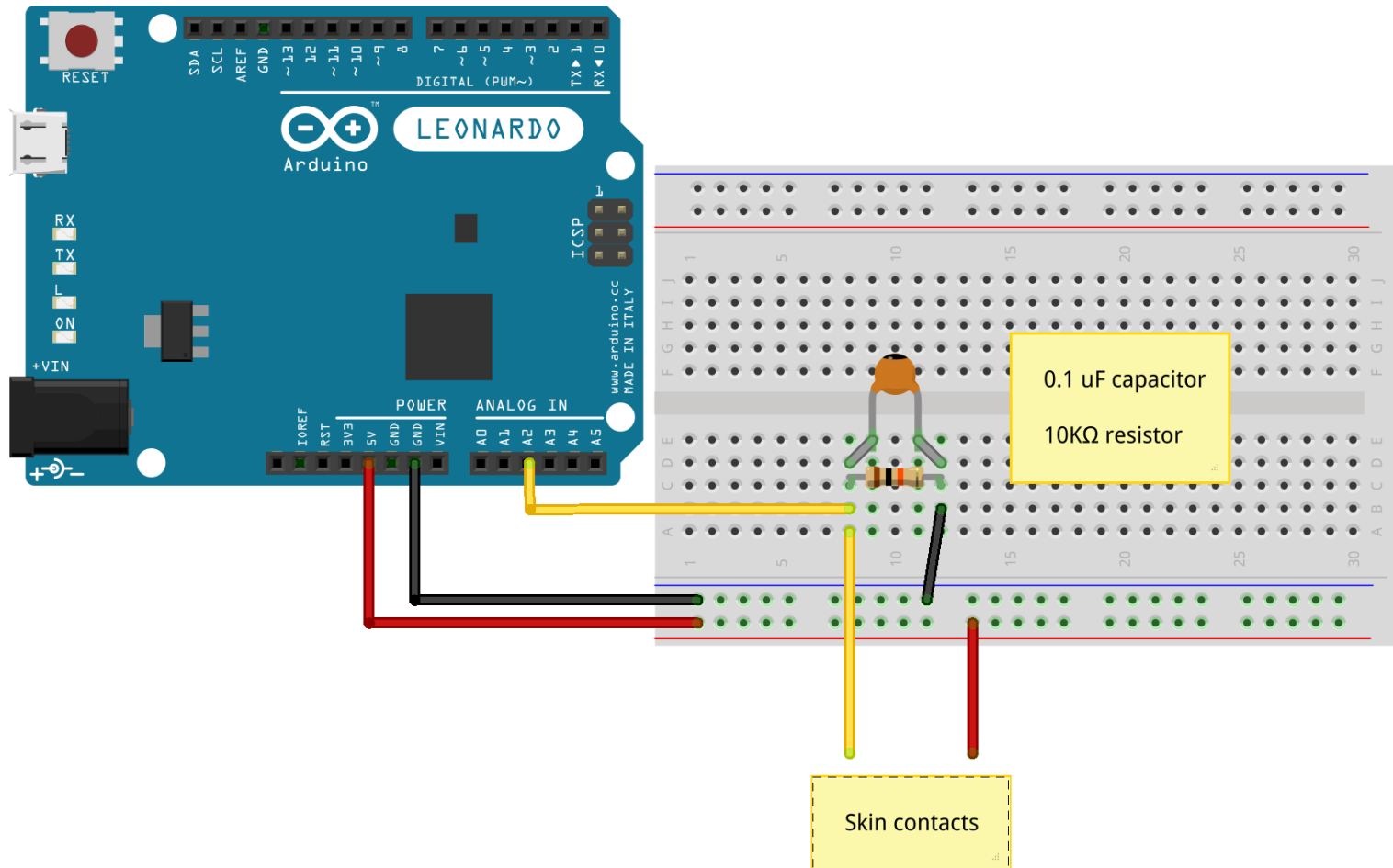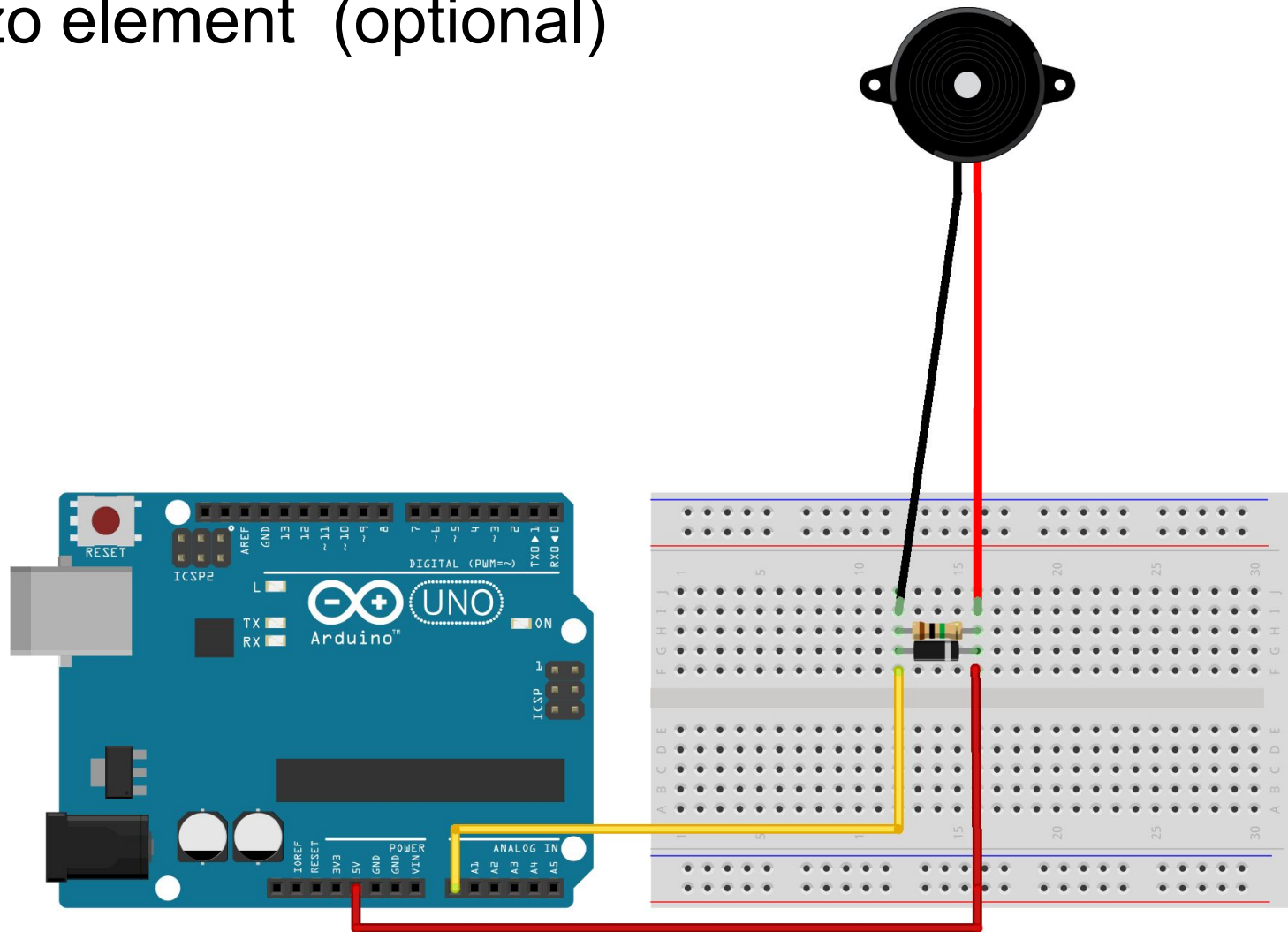
# Optional:

- Measuring the skin moisture (GSR sensor) to make a lie detector
- Using other conductive materials like conductive paint and conductive rubber as a variable resistor
- Piezo element as a vibration sensor
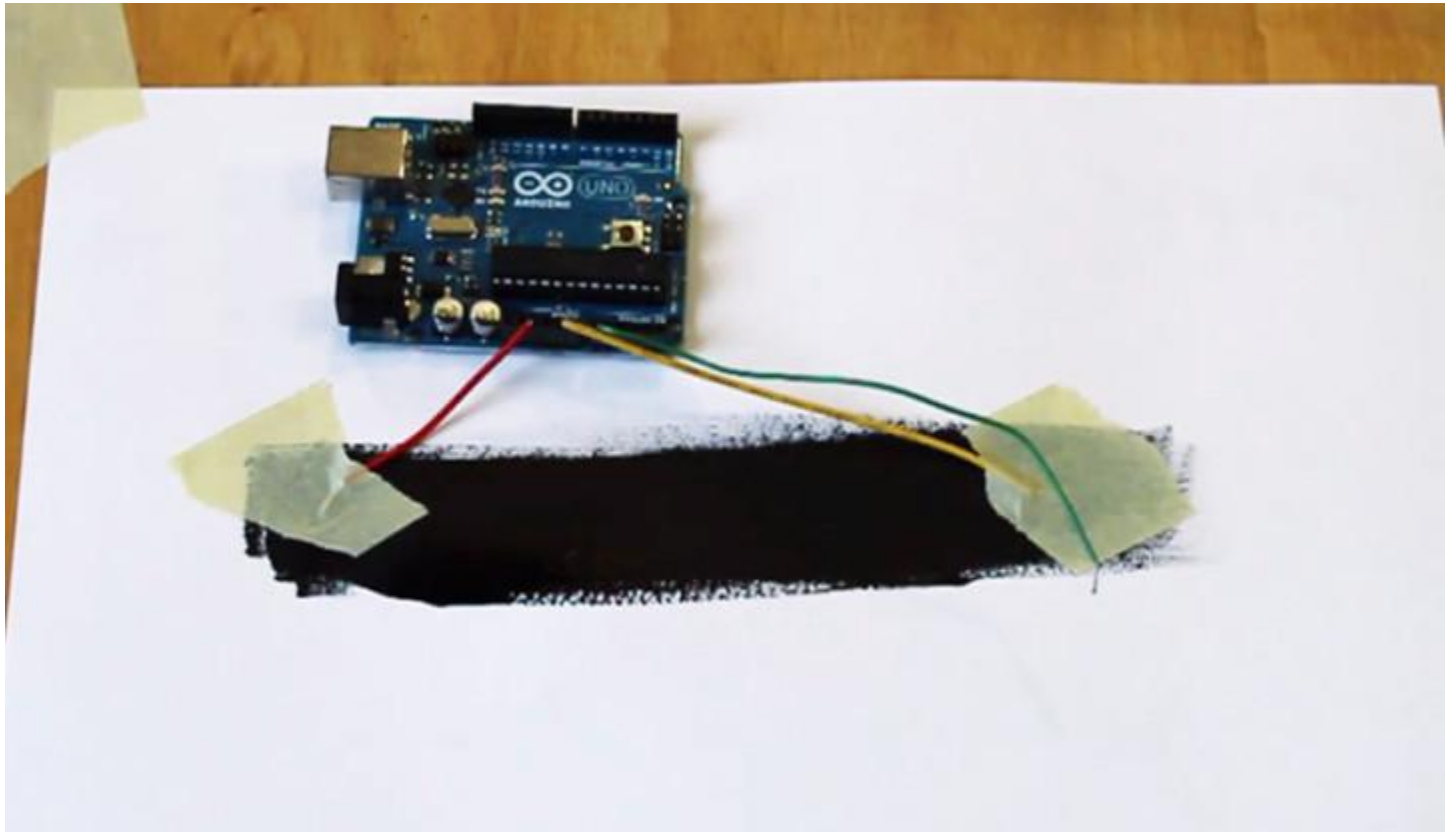
# DIY Lie Detector (GSR sensor)

Galvanic Skin Response



0.1 uF capacitor

10KΩ resistor

Skin contacts

# Piezo element  (optional)

# Making a Potentiometer with Conductive paint



https://www.bareconductive.com/make/making-a-potentiometer-with-electric-paint/