Rapid Prototyping of Urban Sensors
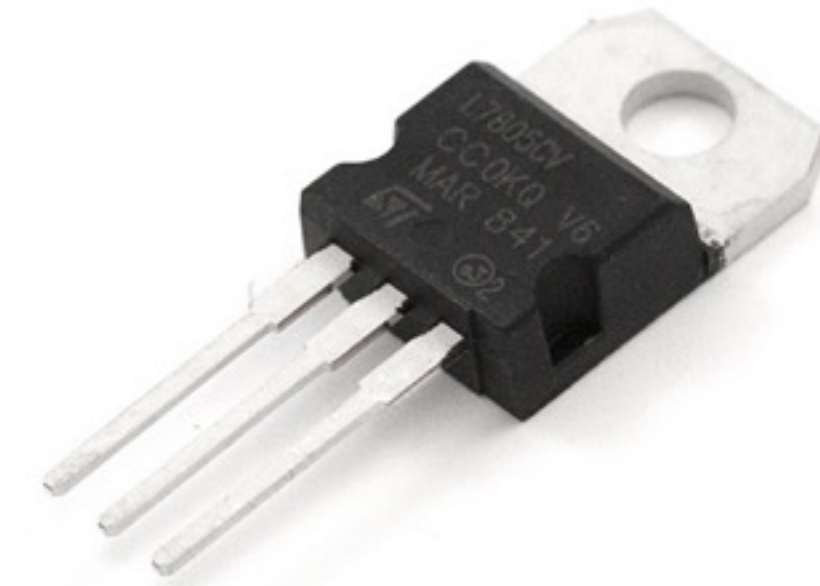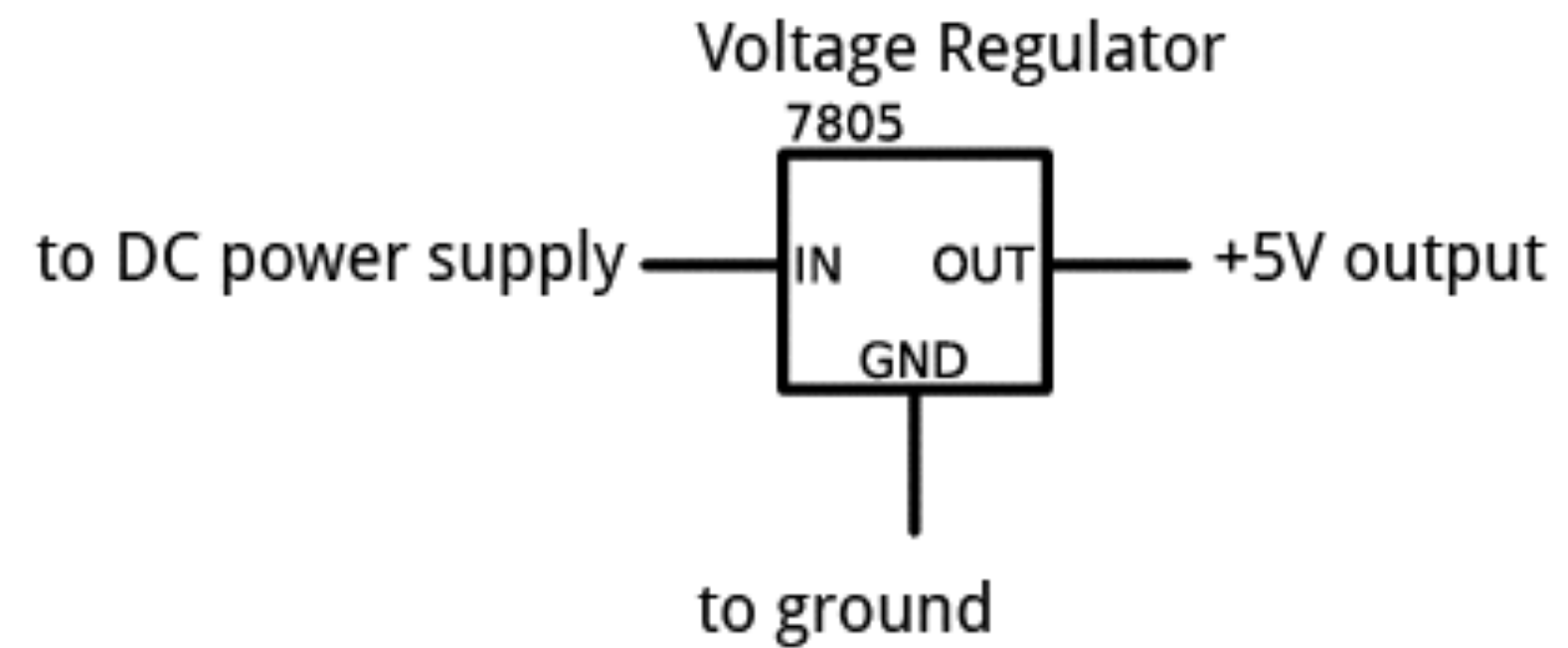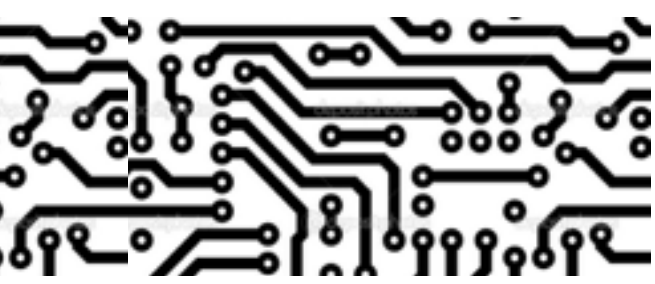
Lecture 2: Electricity and Programming Microcontrollers

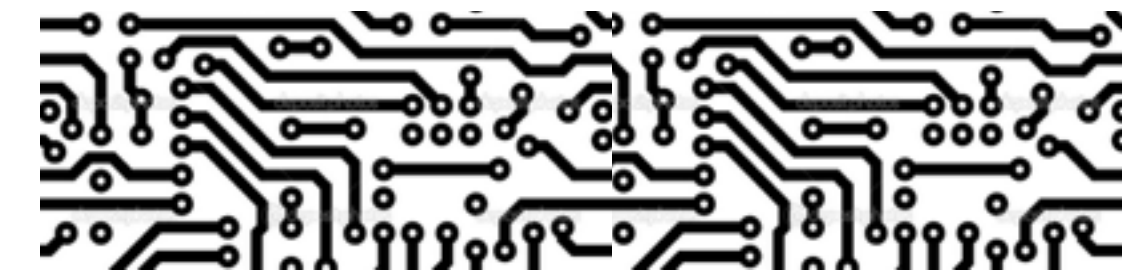- takes 5-18volts and outputs a steady 5v signal

Voltage Regulator
7805
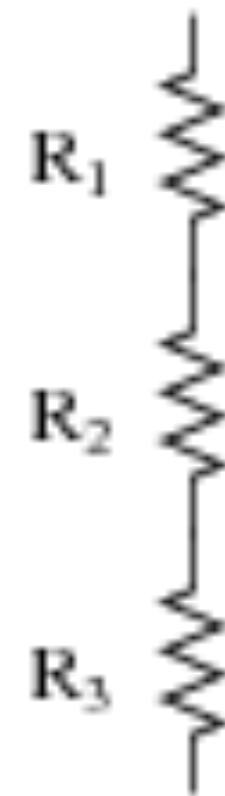
to DC power supply ———— IN   OUT ———— +5V output

GND

to ground

$$R_{total} = R_1 + R_2 + R_3$$

$$G_{total} = G_1 + G_2 + G_3$$

R_1

R_2

R_3

R_1 R_2 R_3

$$G_{total} = \cfrac{1}{\cfrac{1}{G_1} + \cfrac{1}{G_2} + \cfrac{1}{G_3}}$$
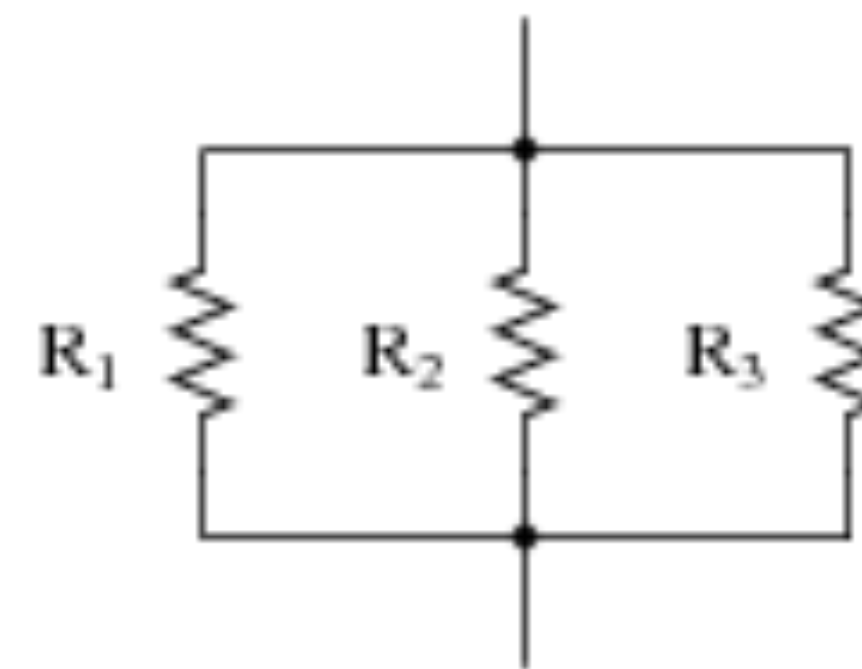
$$R_{total} = \cfrac{1}{\cfrac{1}{R_1} + \cfrac{1}{R_2} + \cfrac{1}{R_3}}$$
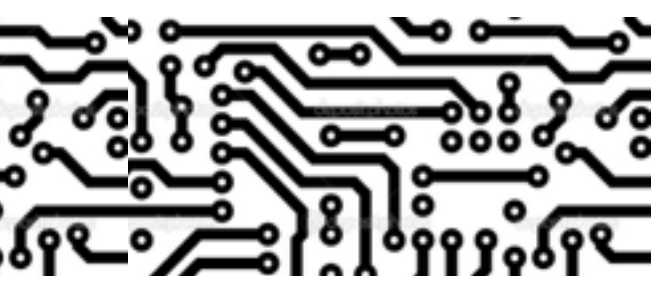
Buttons/Switches
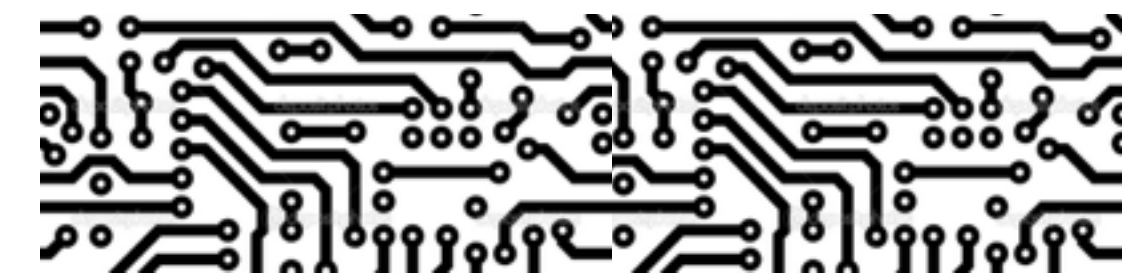
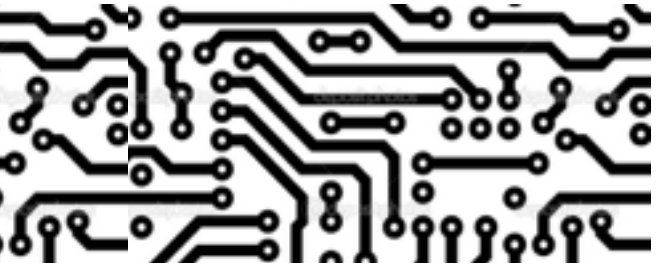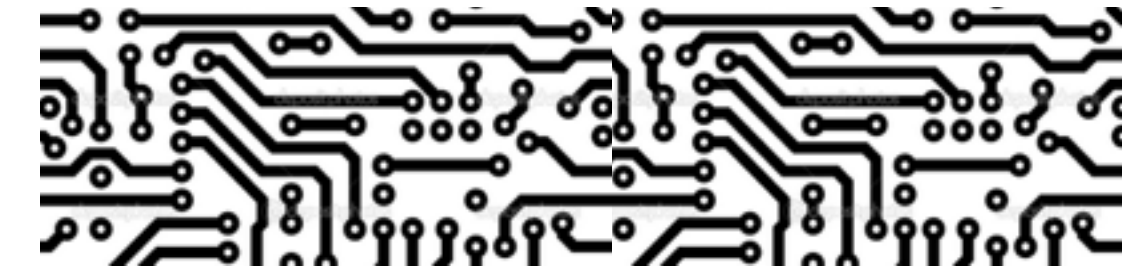Push button

Tilt switch

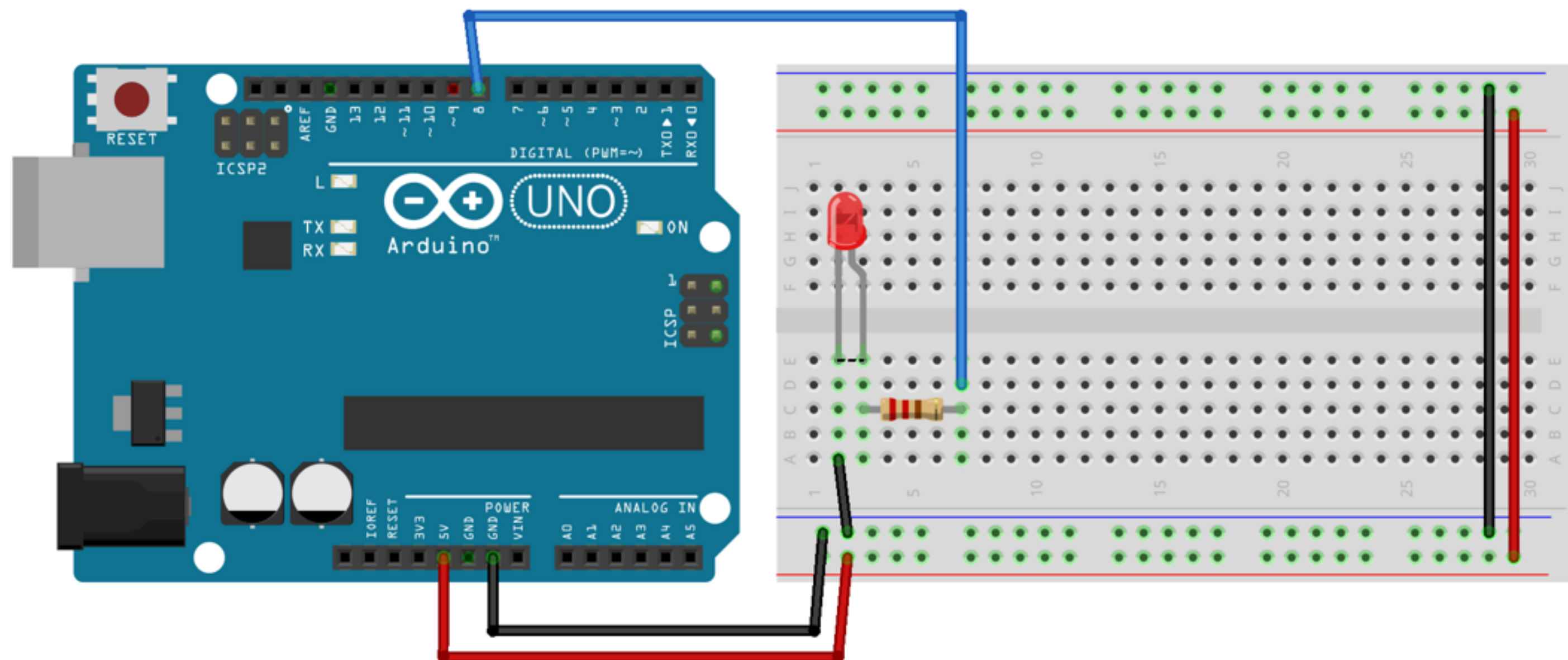Magnetic

Toggle switches

Roller

slide switch

Notes on Arduino

- USB - Data and power, 5v

- 8-15v DC (not needed if using usb)

- once the board is programmed you can disconnect USB

- Vin is what's coming in from the DC connector

- Analog inputs - input a voltage

- Digital in/out (only read/write 5v)

Digital Output

- Setting up the breadboard

- connecting 5v and Ground

- 220ohm resistor, LED


```
void setup() {
  pinMode(8, OUTPUT);
}

void loop() {
  digitalWrite(8, HIGH);
  delay(1000);
  digitalWrite(8, LOW);
  delay(1000);
}
```

sketch_jun05a | Arduino 1.6.4

sketch_jun05a §

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Arduino Uno on /dev/cu.usbmodem1411
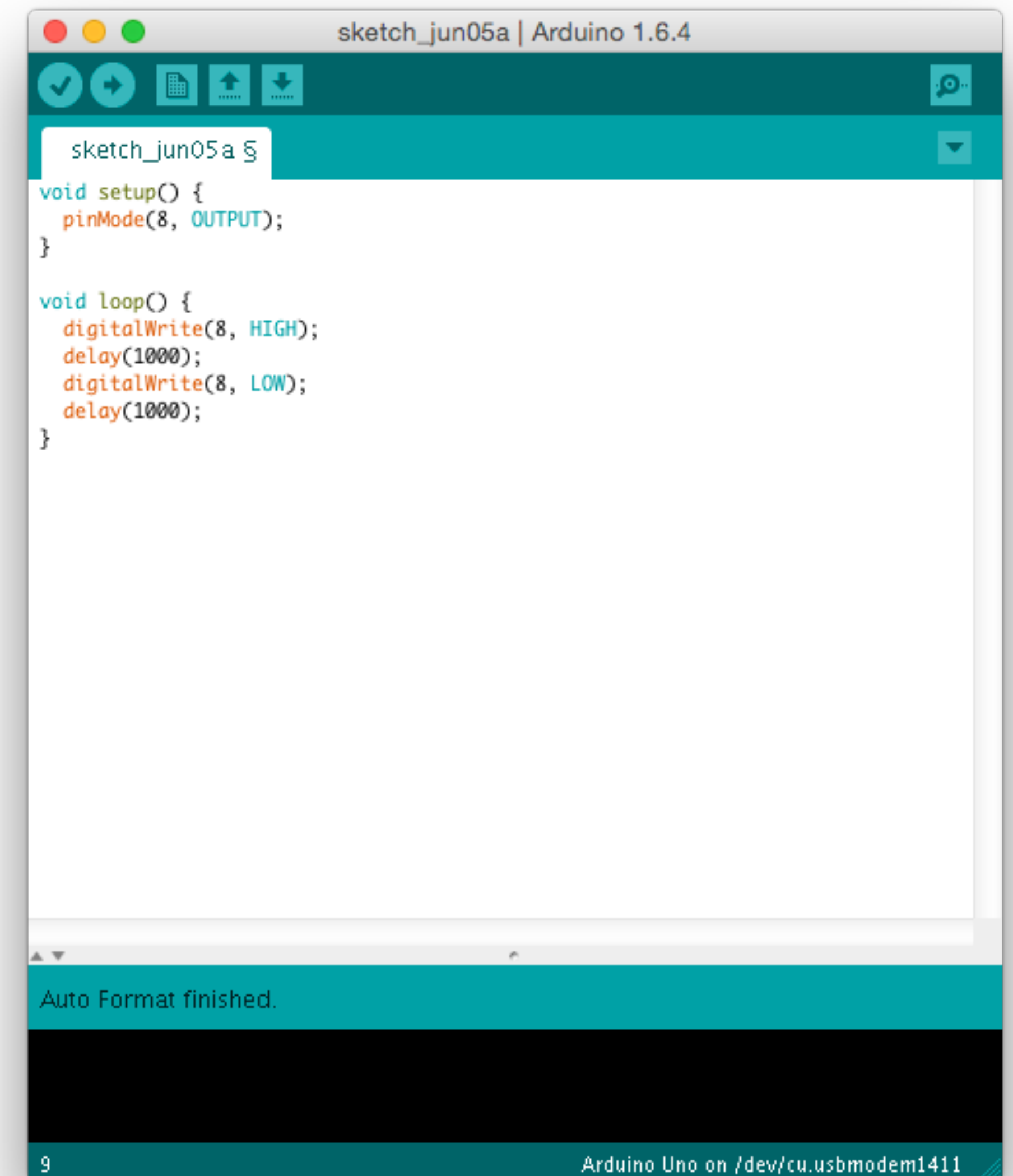
Digital Input

- Blink Example with a switch to turn the LED on and off

- 10k ohm resistor
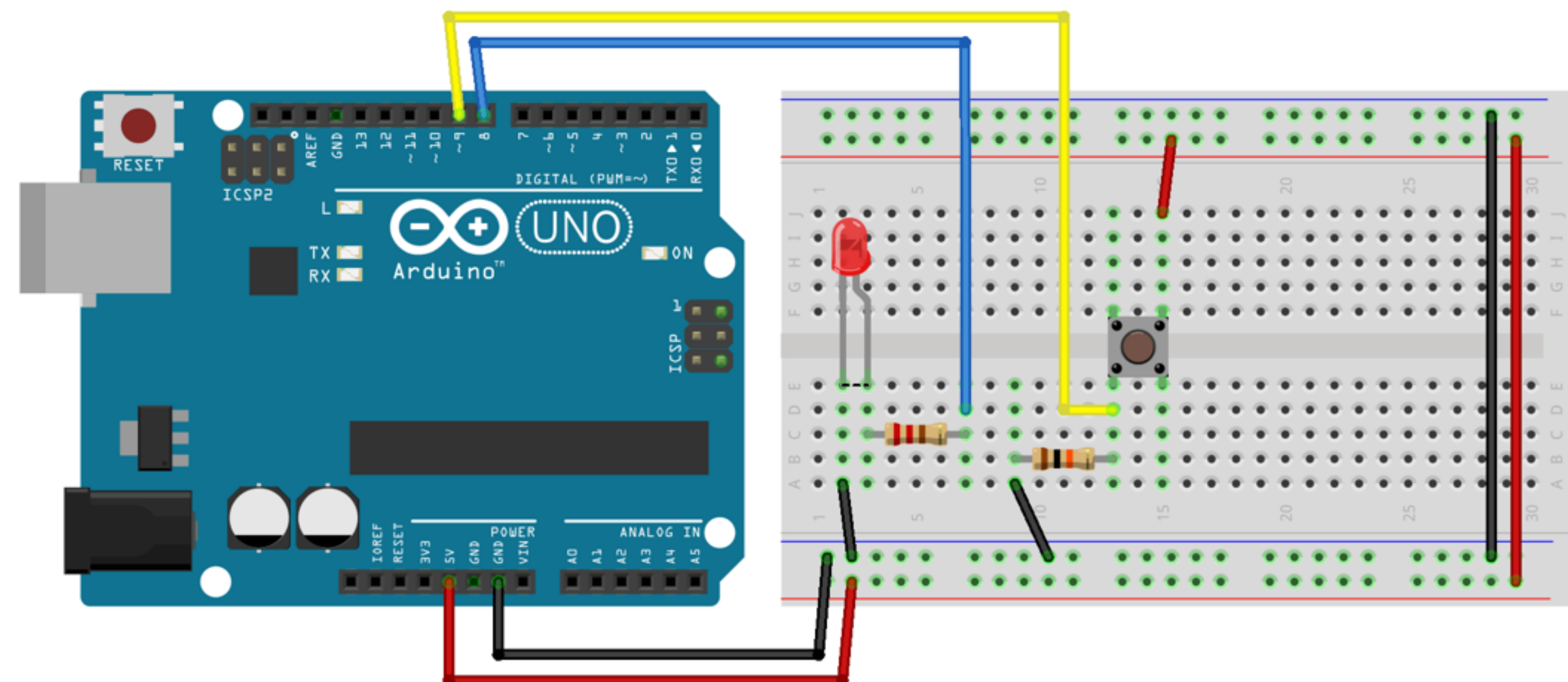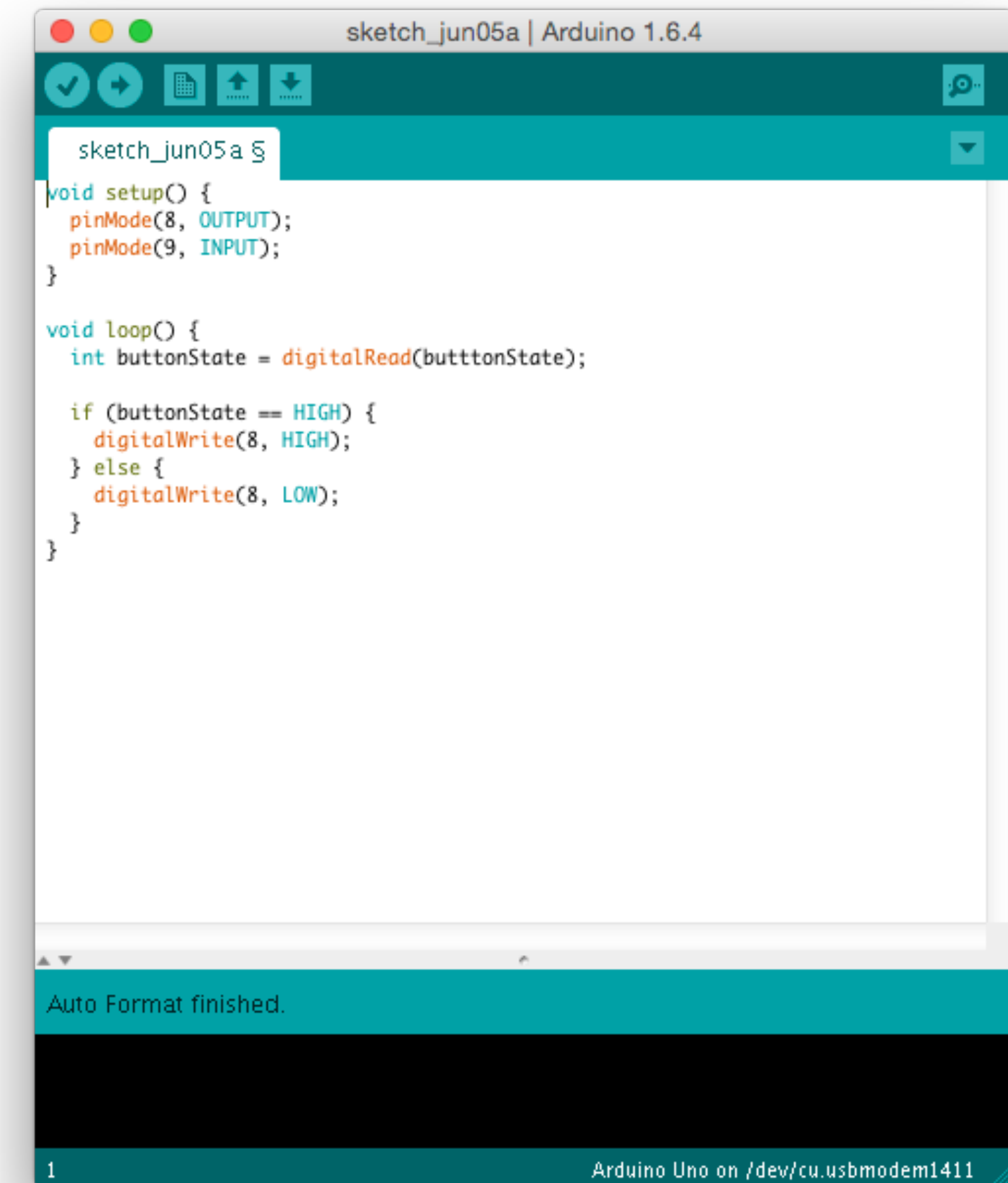


```
void setup() {
  pinMode(8, OUTPUT);
  pinMode(9, INPUT);
}

void loop() {
  int buttonState = digitalRead(butttonState);

  if (buttonState == HIGH) {
    digitalWrite(8, HIGH);
  } else {
    digitalWrite(8, LOW);
  }
}
```
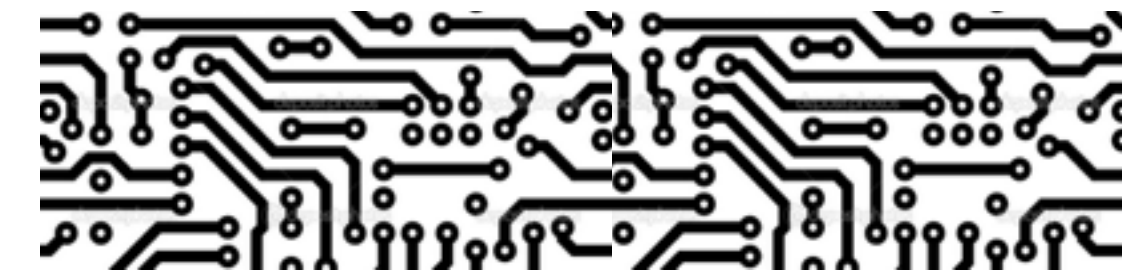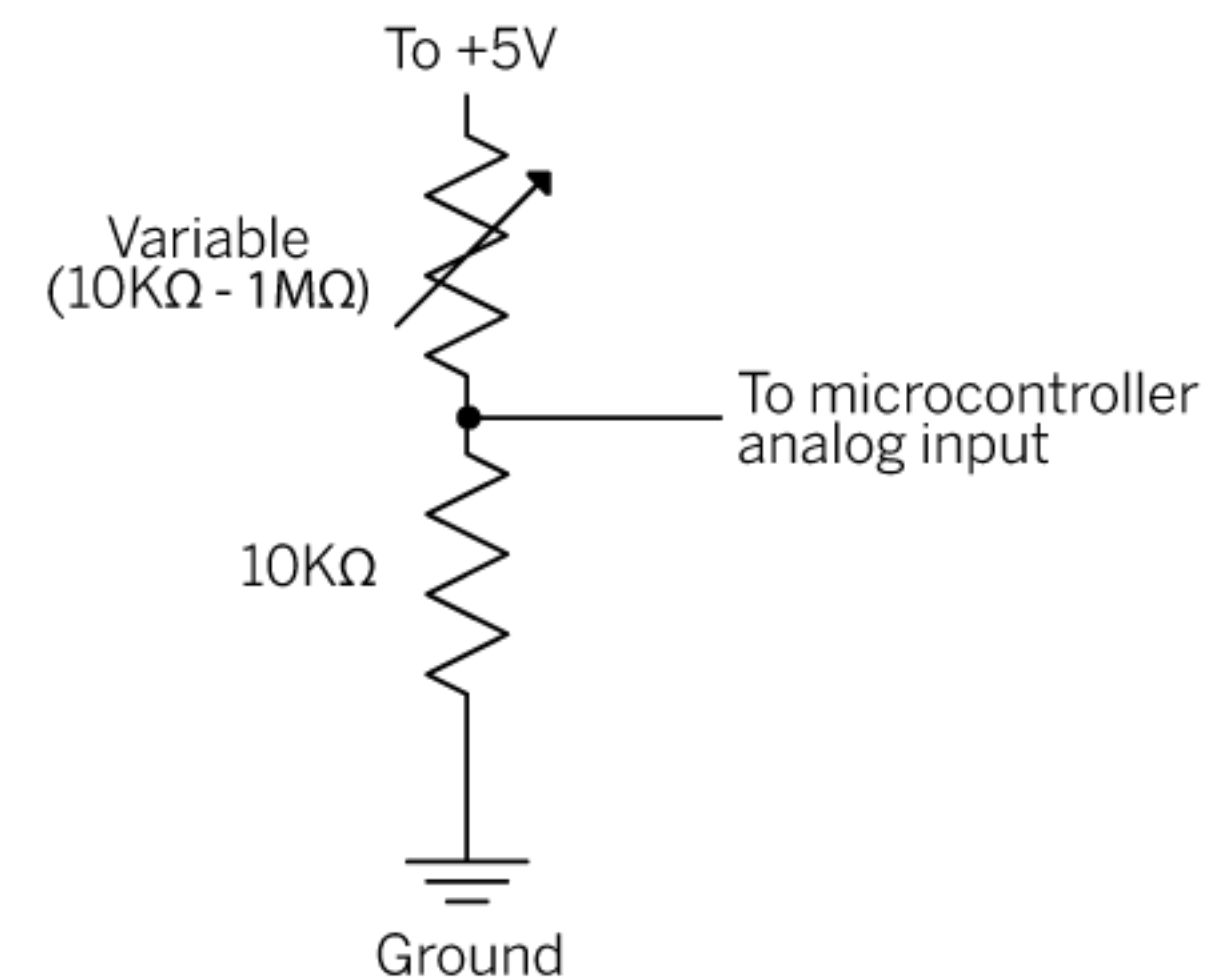
fritzing
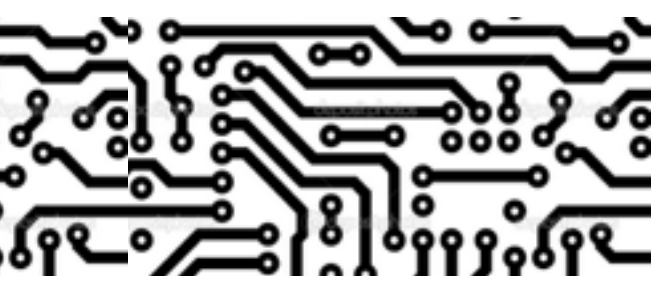
Analog Input - Voltage Divider Circuit

- The Arduino has an analog to digital converter of 10bits. Which means it can change a +5v signal into a number between 0 and 1023

```
int sensorReading = analogRead(A1);
float voltage = sensorReading * (5.0 / 1024.0);
```

- can map() ranges

To +5V

Variable
(10KΩ - 1MΩ)

To microcontroller
analog input

10KΩ

Ground

Analog Input

- Read a potentiometer value(analog value) and print it to the Serial Monitor


```
sketch_jun05a §
void setup() {
  pinMode(8, OUTPUT);
  Serial.begin(9600);
}

void loop() {
  float potentiometerValue = analogRead(A0);
  Serial.println(potentiometerValue);
}
```

Auto Format finished.

2   Arduino Uno on /dev/cu.usbmodem1411