

Project 13

Touchy-Feely Lamp

Discover: installing third party libraries, creating a
touch sensor



Introduction

- You'll be using the CapacitiveSensor library by Paul Badger for this project.
 - This library allows you to measure the capacitance of your body.
 - Capacitance is a measure of how much electrical charge something can store.
- The library checks two pins on your Arduino
 - From sender pin to receiver pin, and measures the time it takes for them to have the same state.
 - These pins will be connected to a metal object like aluminum foil.
 - As you get closer to the object, your body will absorb some of the charge, causing it to take longer for the two pins to be the same.

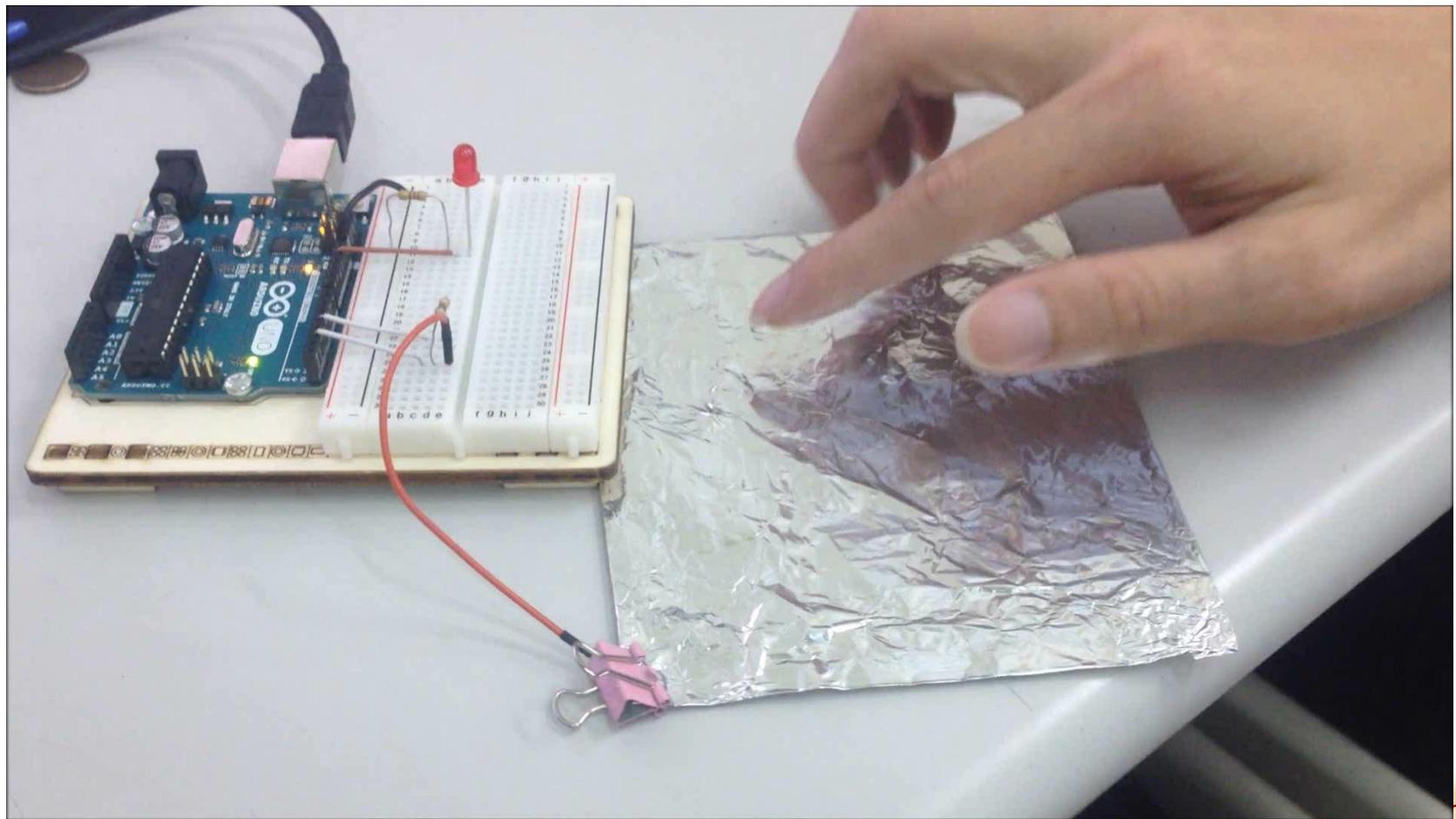


Human is a conductor

- You can hide the sensor behind something solid and it will still work. Capacitance can be measured through non-conductive materials like wood and plastic.
- Increasing the surface area of the sensor with a larger conductive surface will make it more sensitive.

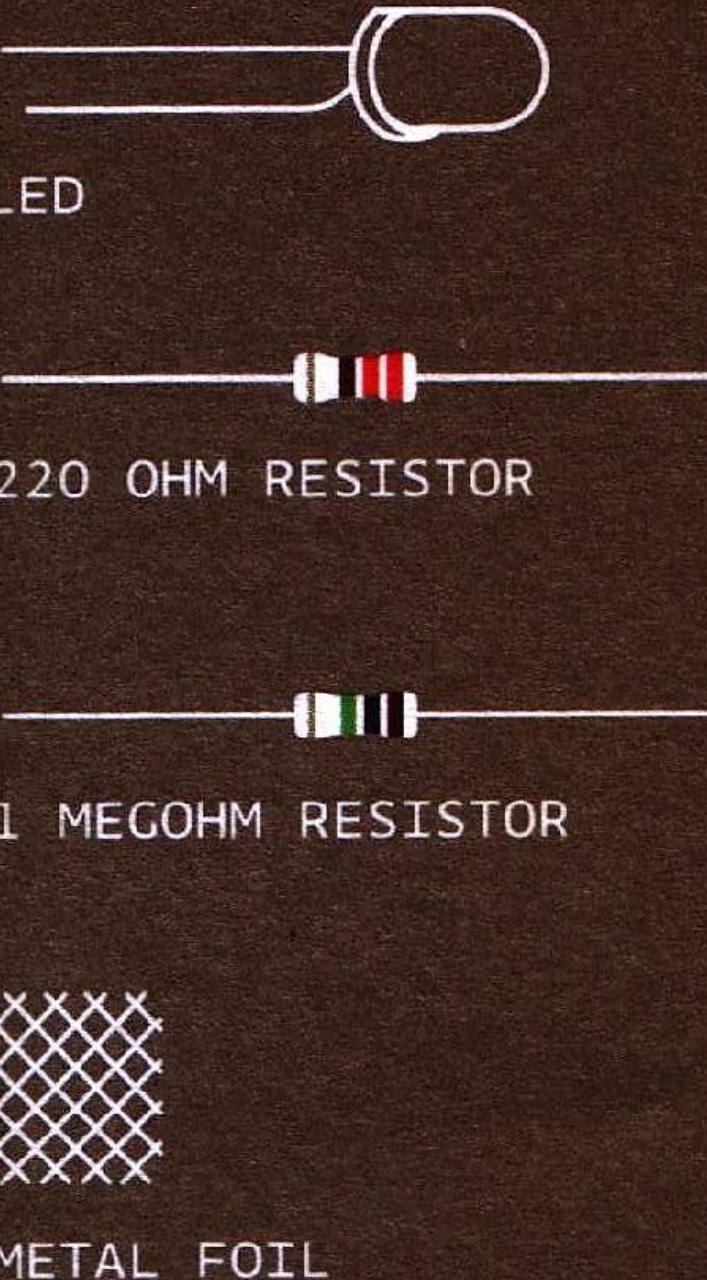


Demo

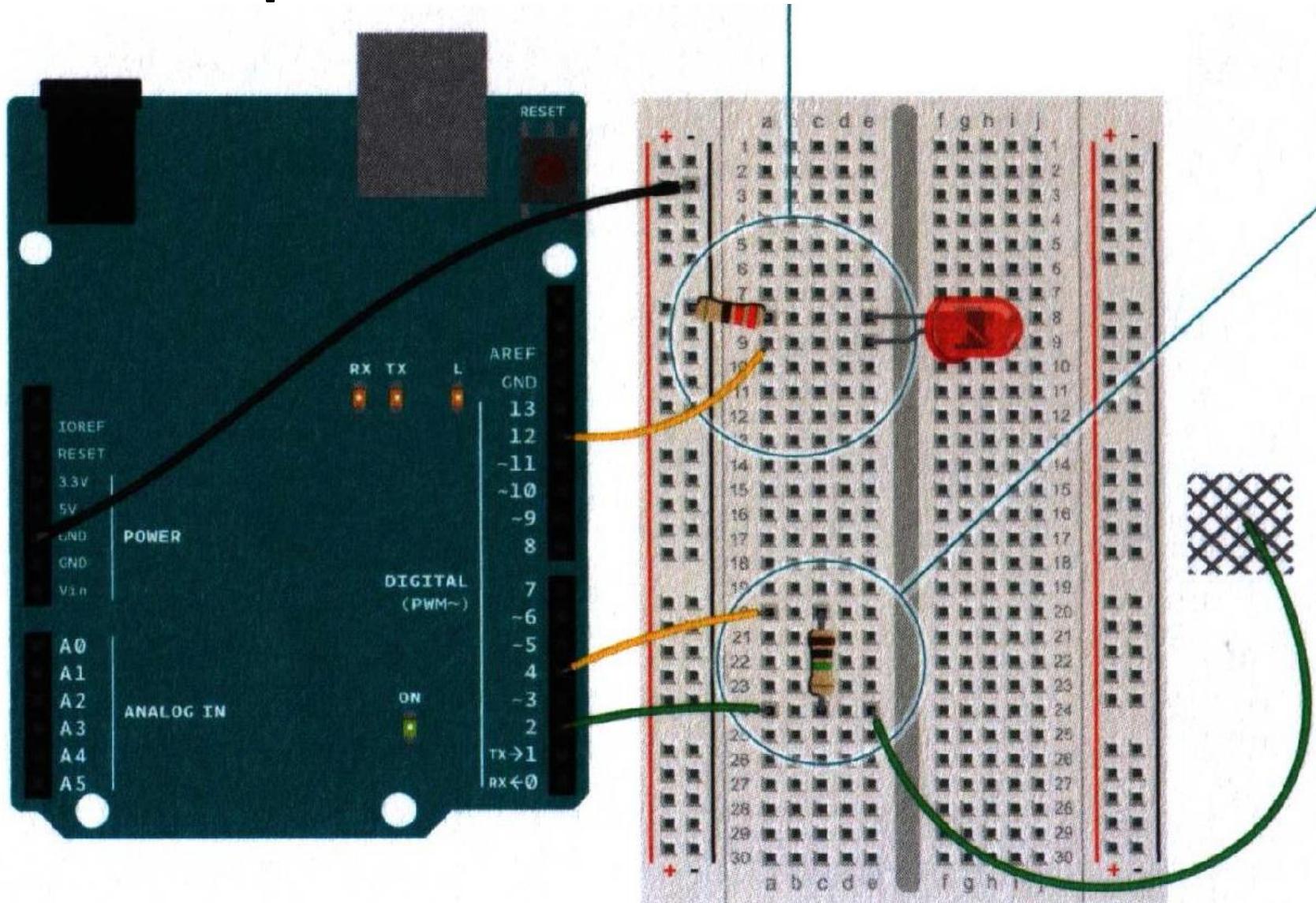


Ingredients

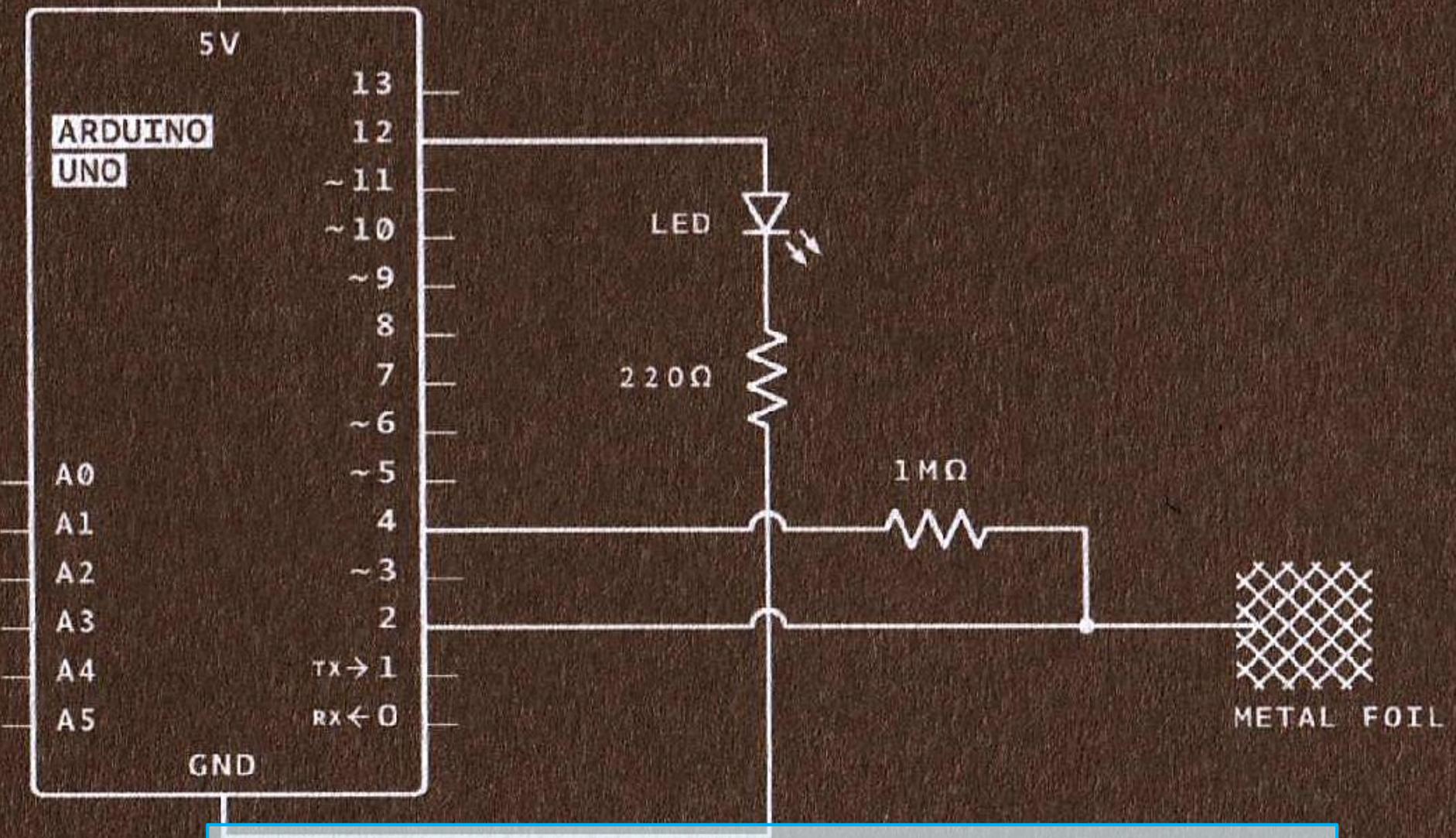
- 1個LED(燈)
- 1個 220Ω 電阻
- 1個 $1M\Omega$ 電阻
- 1個金屬薄片(箔紙), 或長導線



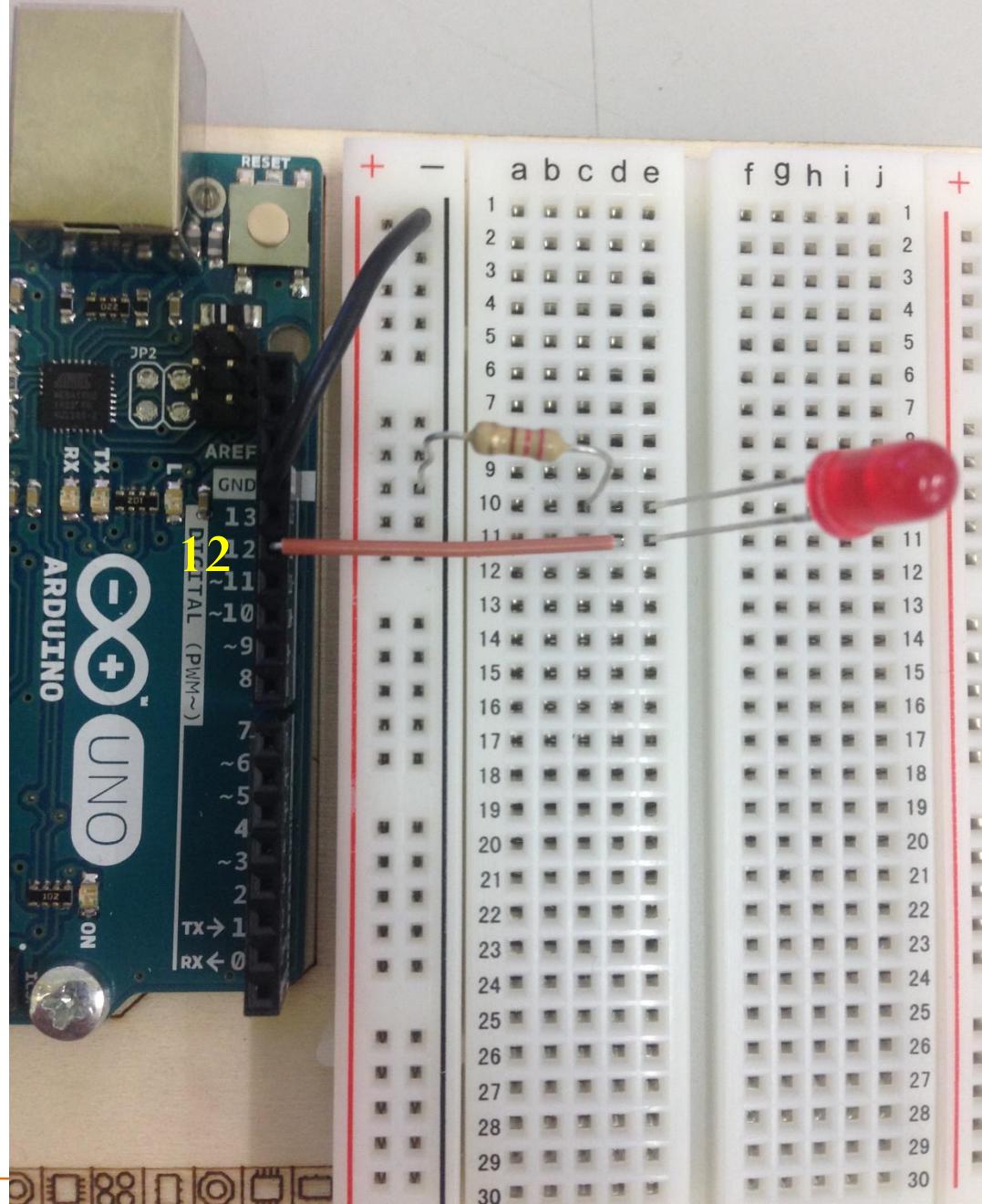
The Top View of the Circuit



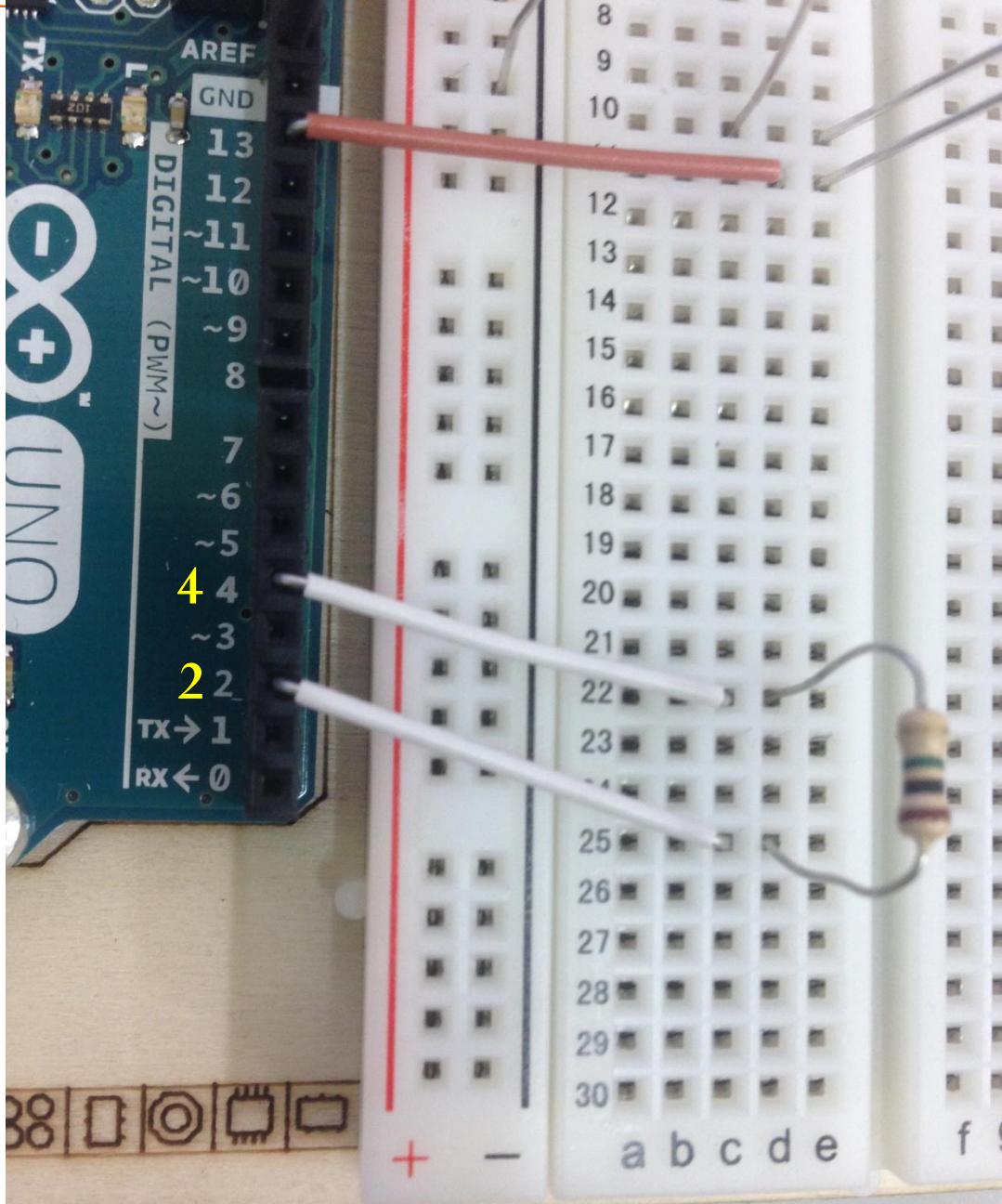
Schematic Diagram



The Circuit



The Circuit





Requirement of The Codes

Software required :

<http://arduino.cc/playground/Main/CapacitiveSensor>



[Home](#) [Buy](#) [Download](#) [Products](#) ▾ [Learning](#) ▾ [Forum](#) [Support](#) ▾ [Blog](#) [LOG IN](#) [SIGN UP](#)

[Manuals and Curriculum](#)

[Arduino StackExchange](#)

[Board Setup and Configuration](#)

[Development Tools](#)

[Arduino on other Atmel Chips](#)

[Interfacing With Hardware](#)

- Output
- Input
- User Interface
- Storage
- Communication
- Power supplies

Capacitive Sensing Library

by Paul Badger

Download

Download [CapacitiveSensor04.zip](#)

Click

This updated CapacitiveSensor version 05 adds support for Arduino Due and other non-AVR boards.

Requirement of The Codes

▶ 電腦 ▶ 本機磁碟 (C:) ▶ Program Files (x86) ▶ Arduino ▶

drivers	2014/6/27 下午 1...	檔案資料夾
examples	2014/6/27 下午 1...	檔案資料夾
hardware	2014/6/27 下午 1...	檔案資料夾
java	2014/6/27 下午 1...	檔案資料夾
lib	2014/6/27 下午 1...	檔案資料夾
libraries	2014/11/25 下午 ...	檔案資料夾
reference	2014/6/27 下午 1...	檔案資料夾
tools	2014/6/27 下午 1...	檔案資料夾
arduino.exe	2014/1/9 上午 03...	應用程式
cygiconv-2.dll	2014/1/9 上午 03...	應用程式擴充
cygwin1.dll	2014/1/9 上午 03...	應用程式擴充
libusb0.dll	2014/1/9 上午 03...	應用程式擴充
revisions.txt	2014/1/9 上午 03...	文字文件
rxtxSerial.dll	2014/1/9 上午 03...	應用程式擴充
uninstall.exe	2014/6/27 下午 1...	應用程式

Put into



CapacitiveSensor



CapacitiveSensorDue





The Codes

```
1 #include <CapacitiveSensor.h>
2 CapacitiveSensor capSensor = CapacitiveSensor(4,2);
3
4 int threshold = 1000;
5 const int ledPin = 12;
6
7 void setup() {
8     Serial.begin(9600);
9     pinMode(ledPin, OUTPUT);
10 }
```

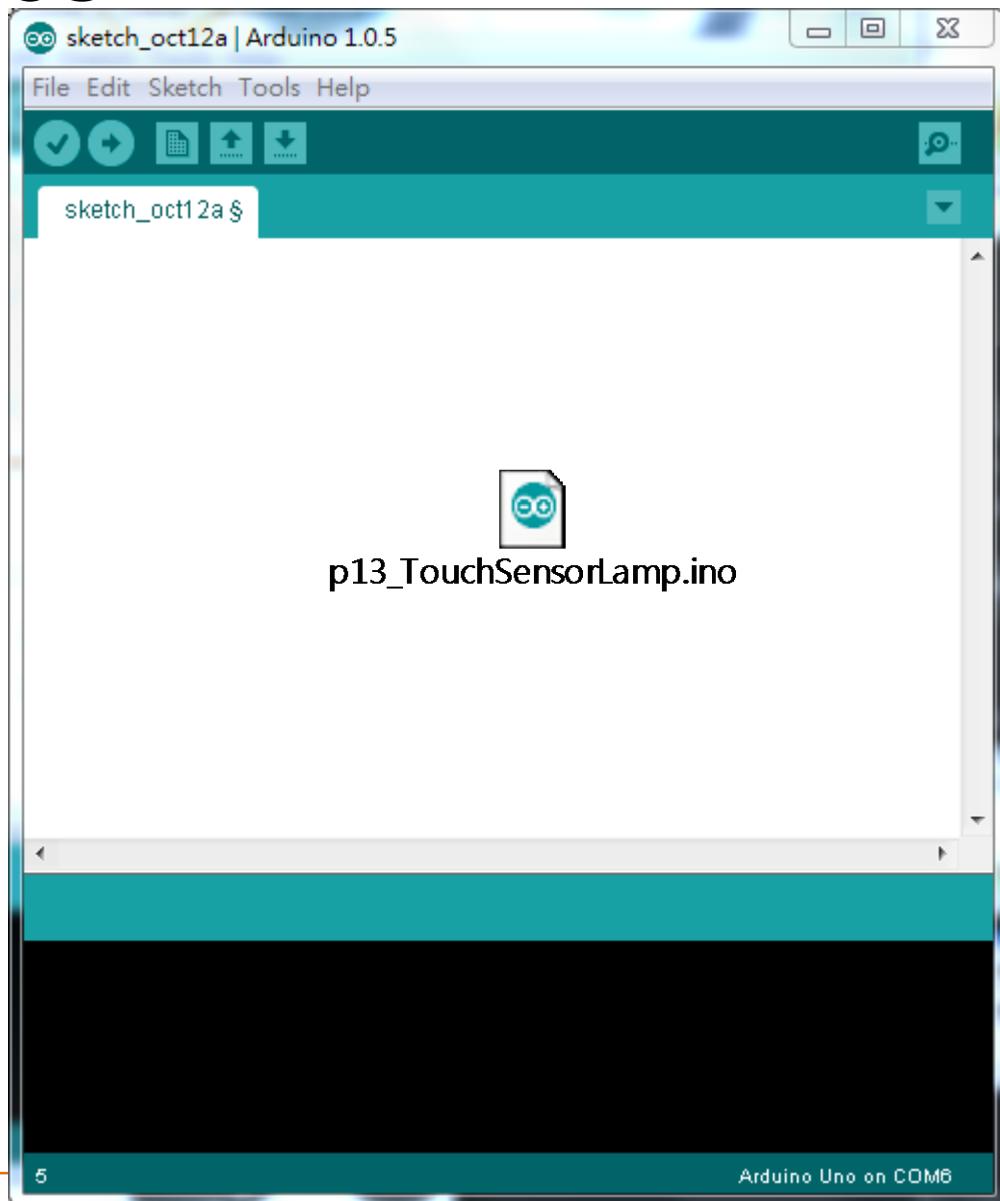


The Codes (cont.)

30 samples is a good starting value.
Print the sensor value to the serial monitor.

```
9 void loop() {  
10    long sensorValue = capSensor.capacitiveSensor(30);  
11    Serial.println(sensorValue);  
  
12    if(sensorValue > threshold) {  
13        digitalWrite(ledPin, HIGH);  
14    }  
15    else {  
16        digitalWrite(ledPin, LOW);  
17    }  
18    delay(10);  
19 }
```

Codes



13/41

What if?

- Toggle mode?
- Can you use this to get other interactions with the LED?
 - The values from the sensor changed depending on how much of your finger was touching the conductor.
 - n finger n light?
- What about multiple sensors for fading the light brighter and darker?
 - If you place a different value resistor between pins 2 and 4 it will change the sensitivity.



Project 14

Tweak the Arduino Logo in Processing

Discover: serial communication with a computer
program

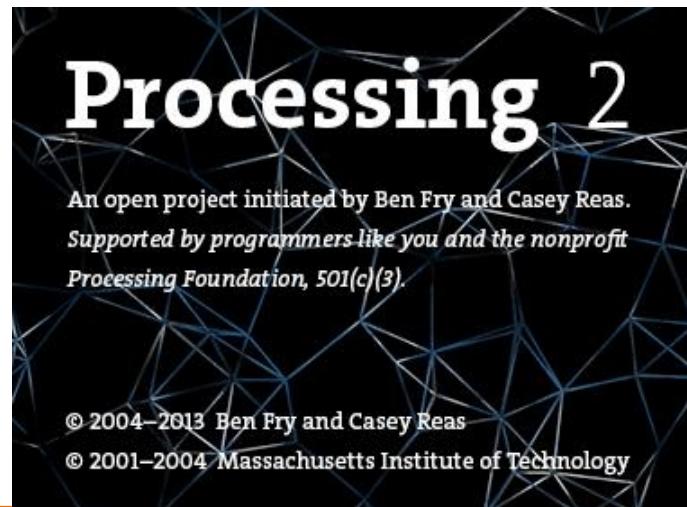
Introduction

- You've done a lot of cool stuff with the physical world, now it's time to control your computer with your Arduino.
- When you program your Arduino, you're opening a connection between the computer and the microcontroller.
 - You can use this connection to send data back and forth to other applications.

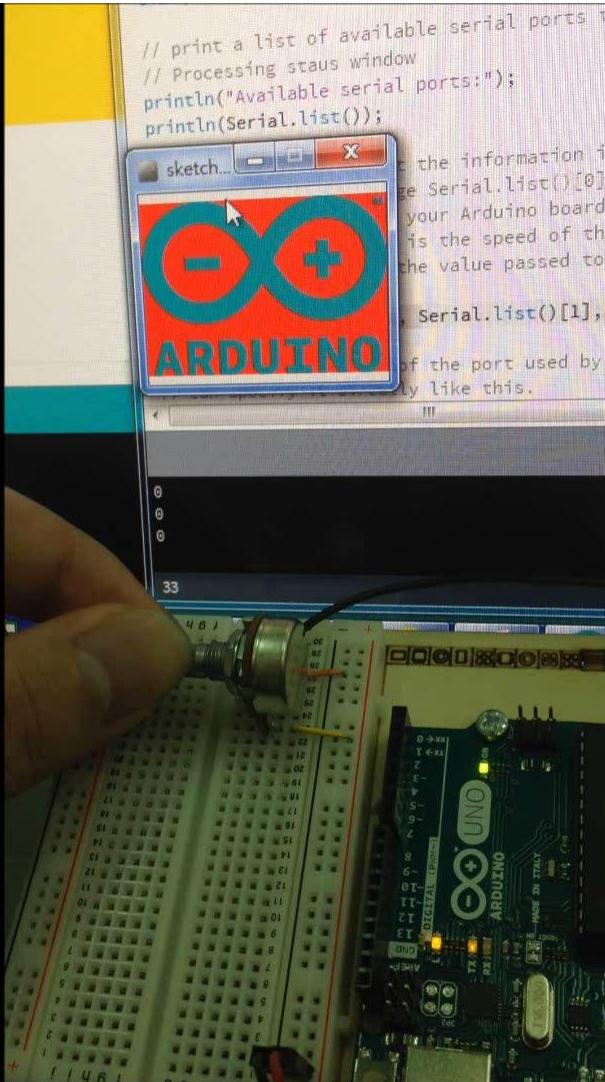


Processing

- Processing is an open source programming environment that the Arduino IDE is based upon.
- Processing is based on Java.
- When using serial communication, only one application can talk to the Arduino at a time.
 - If you're running a Processing sketch that is connected to your Arduino → You won't be able to upload a new Arduino sketch.

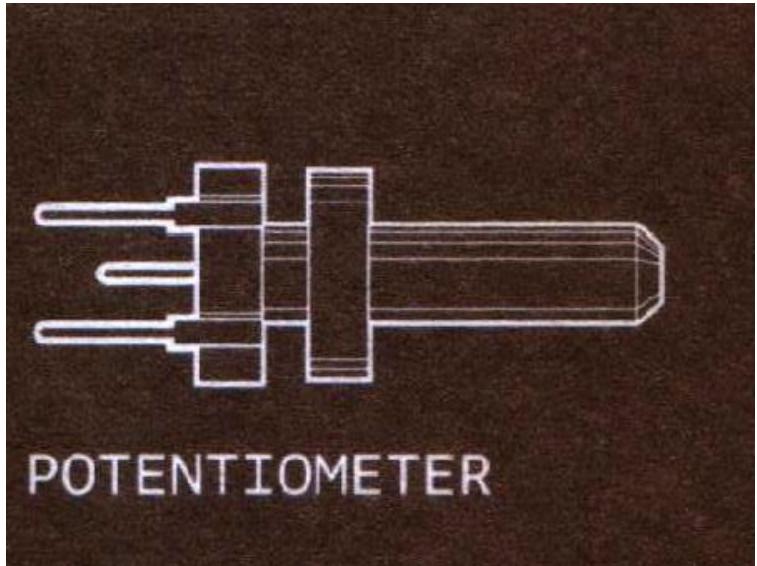


Demo

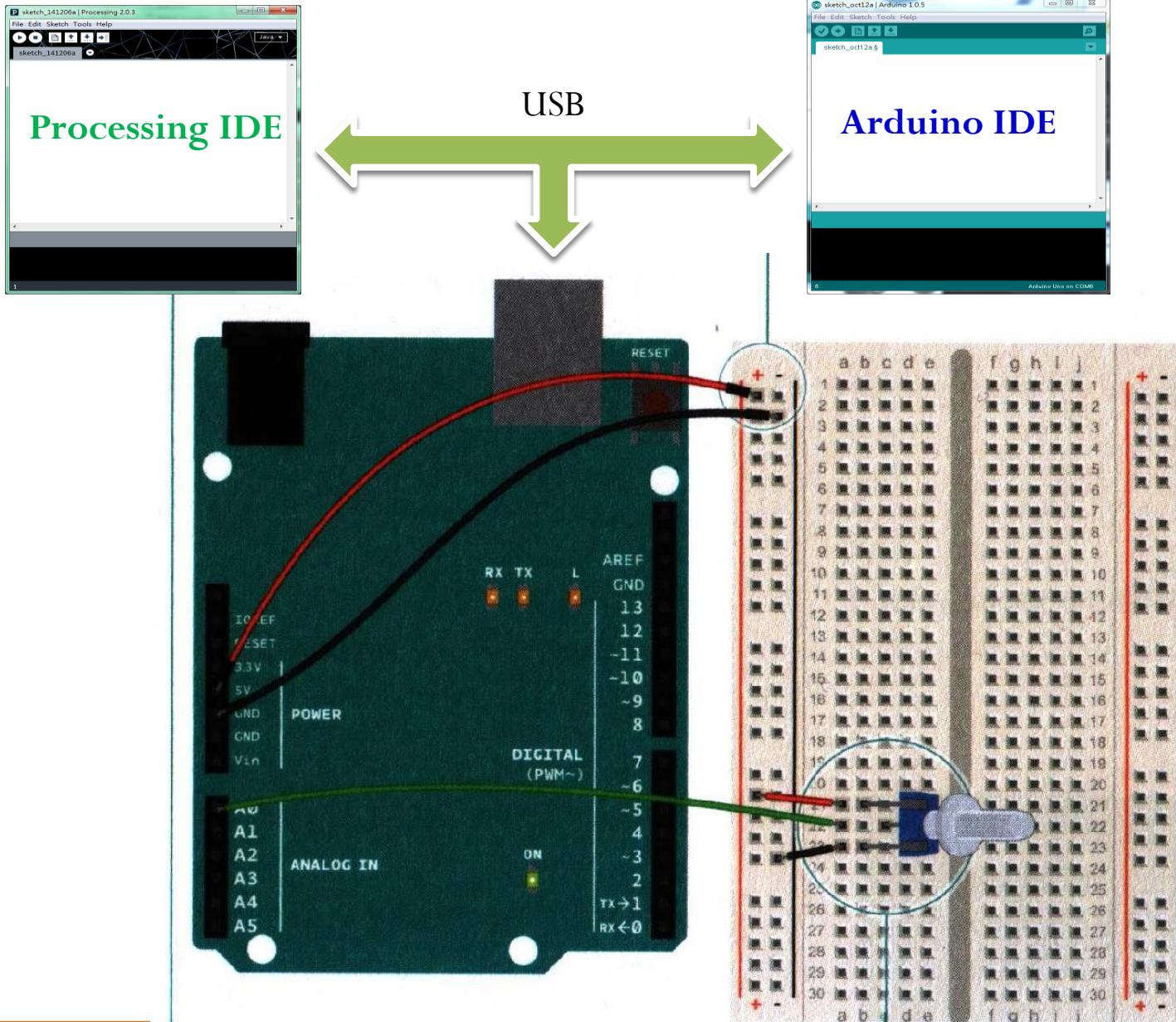


Ingredients

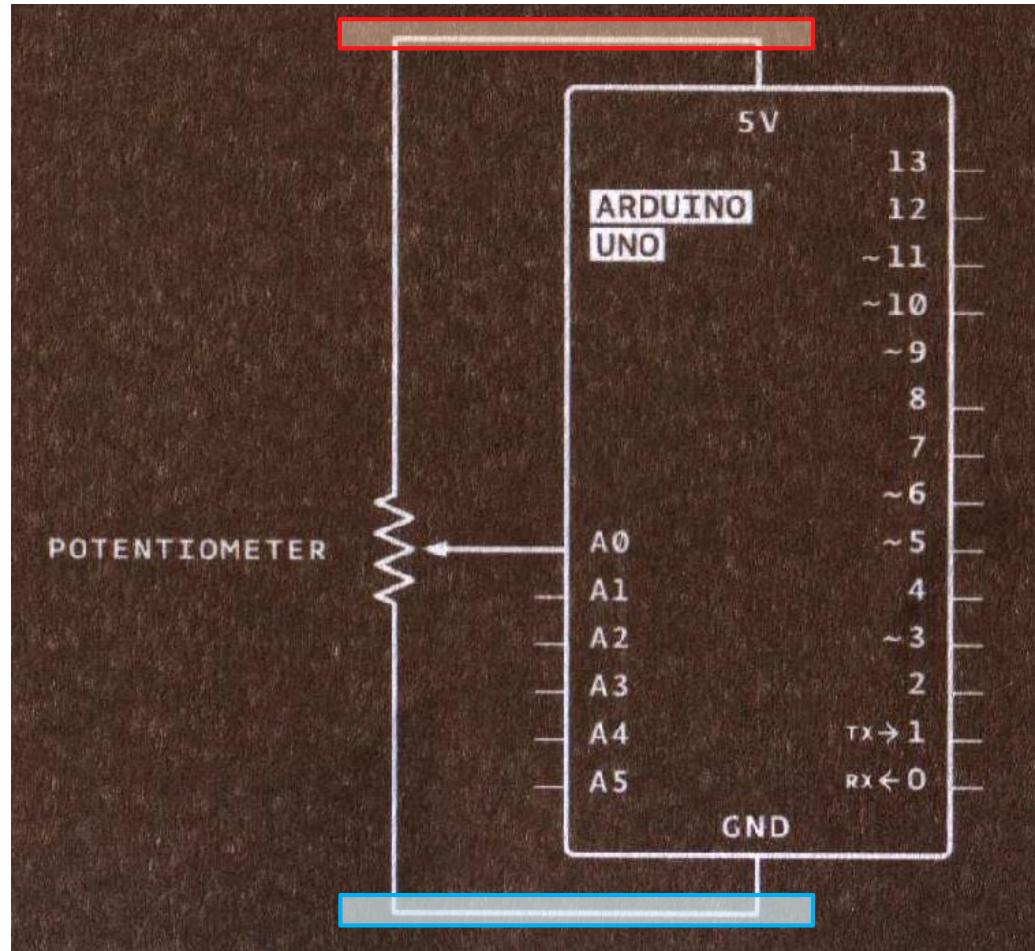
- 1個電位計(可變電阻)



The Top View of the Circuit

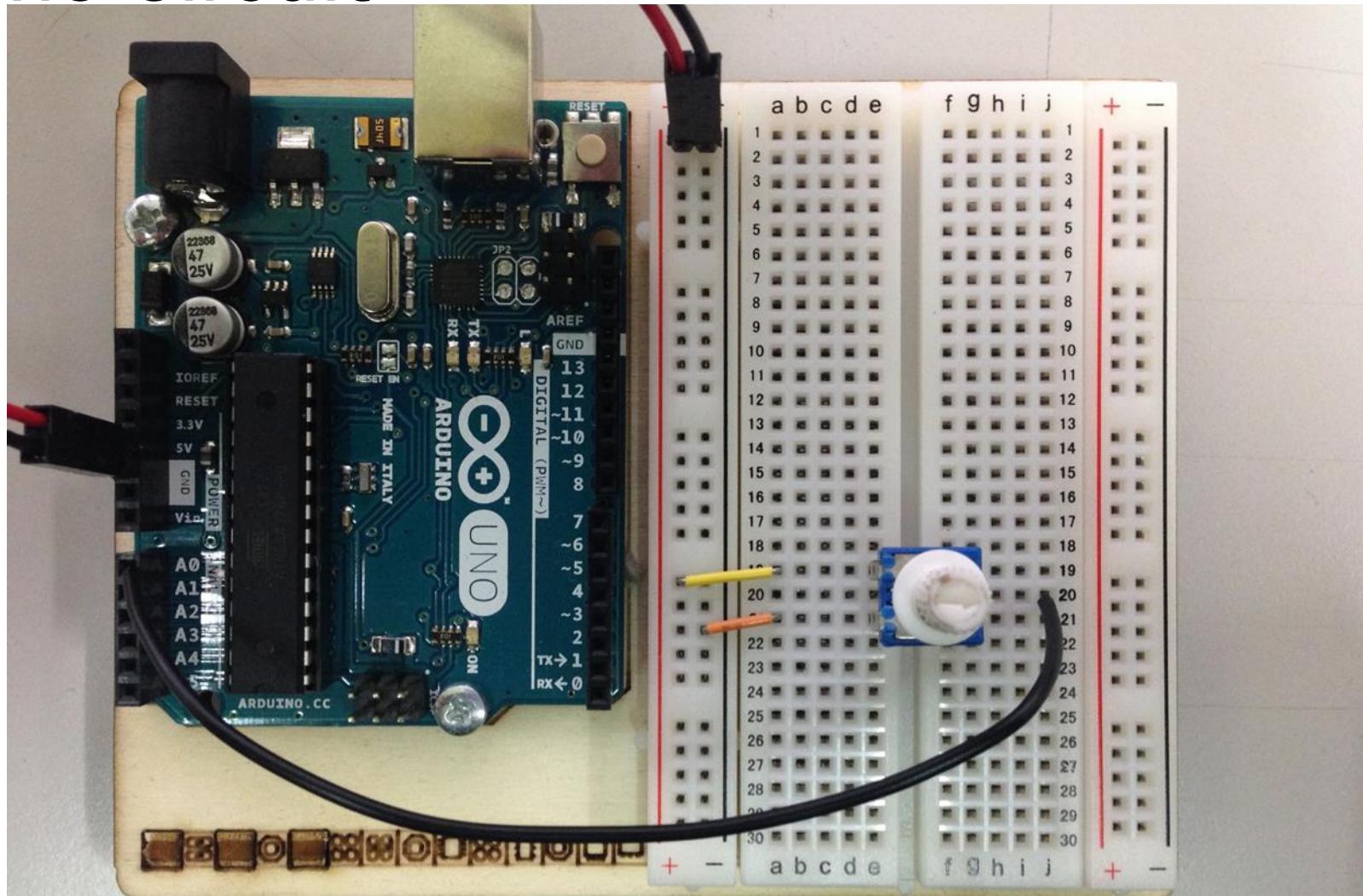


Schematic Diagram





The Circuit



Requirement of The Codes

Software required :

Processing www.processing.org



Cover

Download

Exhibition

» [Download Processing](#) click

» [Play With Examples](#)

» [Browse Tutorials](#)

» [Exhibition](#)



Requirement of The Codes

[Cover](#)[Download](#)[Exhibition](#)[Reference
Libraries
Tools
Environment](#)[Tutorials
Examples
Books](#)[Overview](#)

Download Processing. Please consider making a donation to the Processing Foundation before downloading the software.

Processing is open source, free software. All donations fund the [Processing Foundation](#), a nonprofit organization devoted to advancing the role of programming within the visual arts through developing Processing.



No Donation



\$10



\$25



\$50



\$100



\$

1. Select

[Download](#)

2. Click



The Codes (Arduino)

```
1 void setup() {  
2     Serial.begin(9600);  
3 }
```

```
4 void loop() {  
5     Serial.write(analogRead(A0)/4);
```

```
6     delay(1);  
7 }
```



The Codes (Processing)

```
1 import processing.serial.*;
2 Serial myPort;
3 PImage logo;
```



The Codes (Processing)

```
4 int bgcolor = 0;  
  
5 void setup() {  
  
6   colorMode(HSB, 255); //not RGB, HSB is Hue, Saturation, and Brightness  
  
7   logo = loadImage("http://arduino.cc/logo.png");  
8   size(logo.width, logo.height);  
  
9   println("Available serial ports:");  
10  println(Serial.list());
```

The Codes (Processing)

```
11 myPort =  
    new Serial(this, Serial.list()[0], 9600);  
12 }
```

```
Available serial ports:  
COM1 COM27 .....  
0, 1, .....
```

The parameters it expects are
which application it will be speaking to, which serial port it will
communicate over, and at what speed.



The Codes (Processing)

```
13 void draw() {          //like loop() in Arduino  
14     if (myPort.available() > 0) {  
15         bgcolor = myPort.read();  
16         println(bgcolor);  
17     }  
18     background(bgcolor, 255, 255); //HSB  
19     image(logo, 0, 0);  
20 }
```

Codes



29/41

What if?

- Try replace an image when press a button on Arduino.
- Running a sample project from the built-in sketch book.



Project 15

Hacking Buttons

Discover: optocoupler, connecting with other components



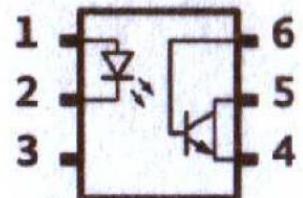
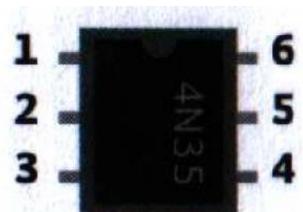
Introduction

- Now, you're no longer a beginner if you're doing this project.
- You'll be opening up an electronic device and modifying it.
 - You'll void your device's warranty, and if you're not careful, you might damage the device.
- We recommend you use inexpensive items you don't mind damaging for your first few projects.

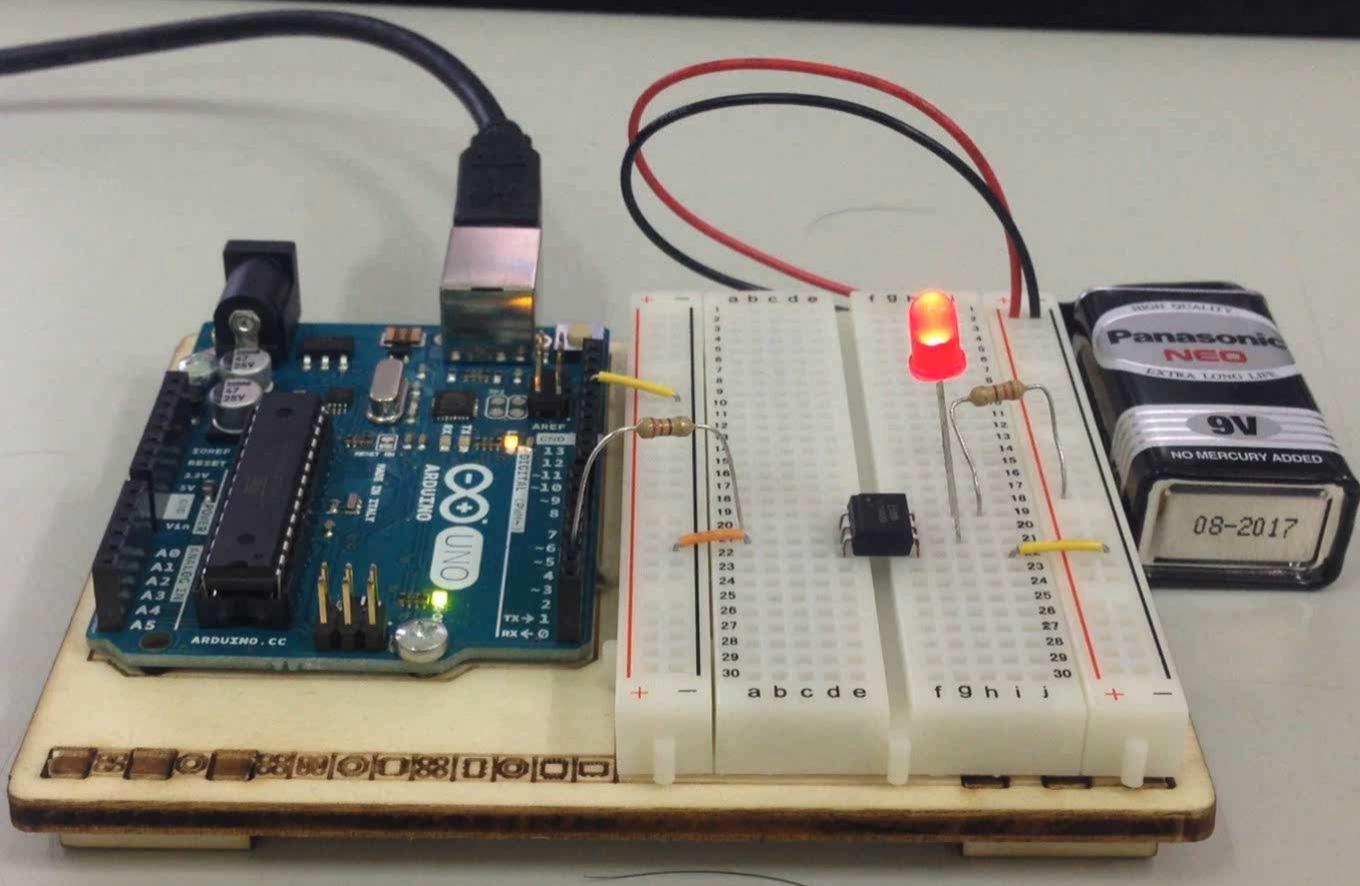


Optocouplers

- are ICs that allow you to control one circuit from a different one without any electrical connection between the two.
- Inside an optocoupler is an LED and a light detector.
 - When the LED is turned on by an Arduino, the light detector closes a switch internally.
 - The switch is connected to output pins (4 and 5)
 - When the internal switch is closed, the two output pins are connected.
 - .

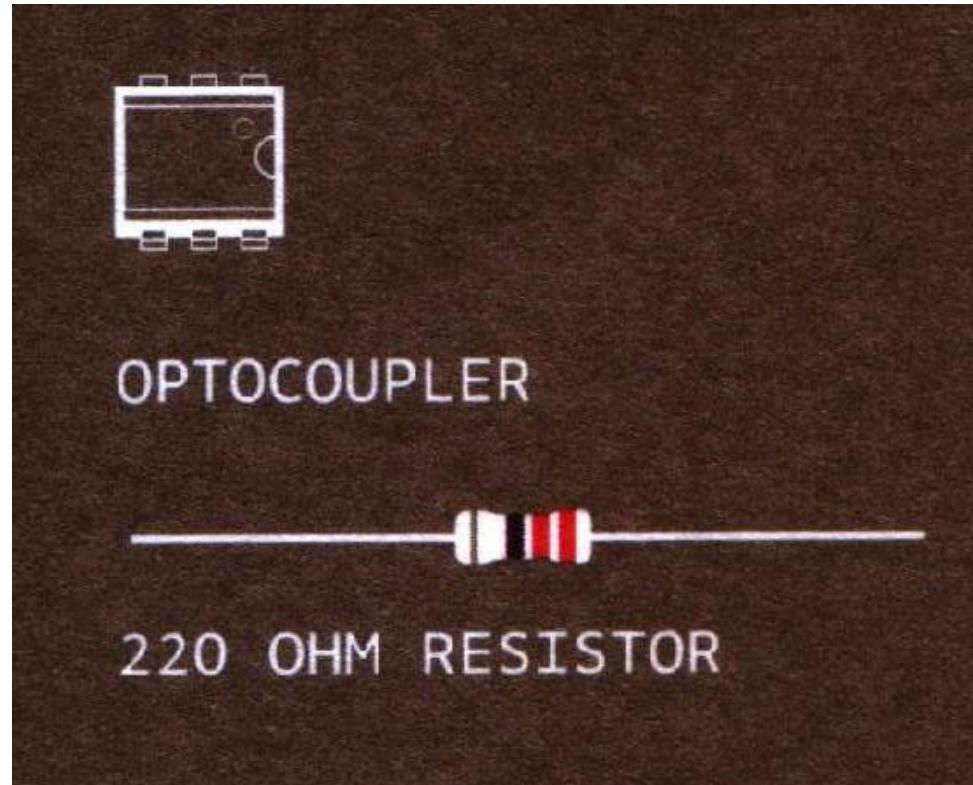


Demo

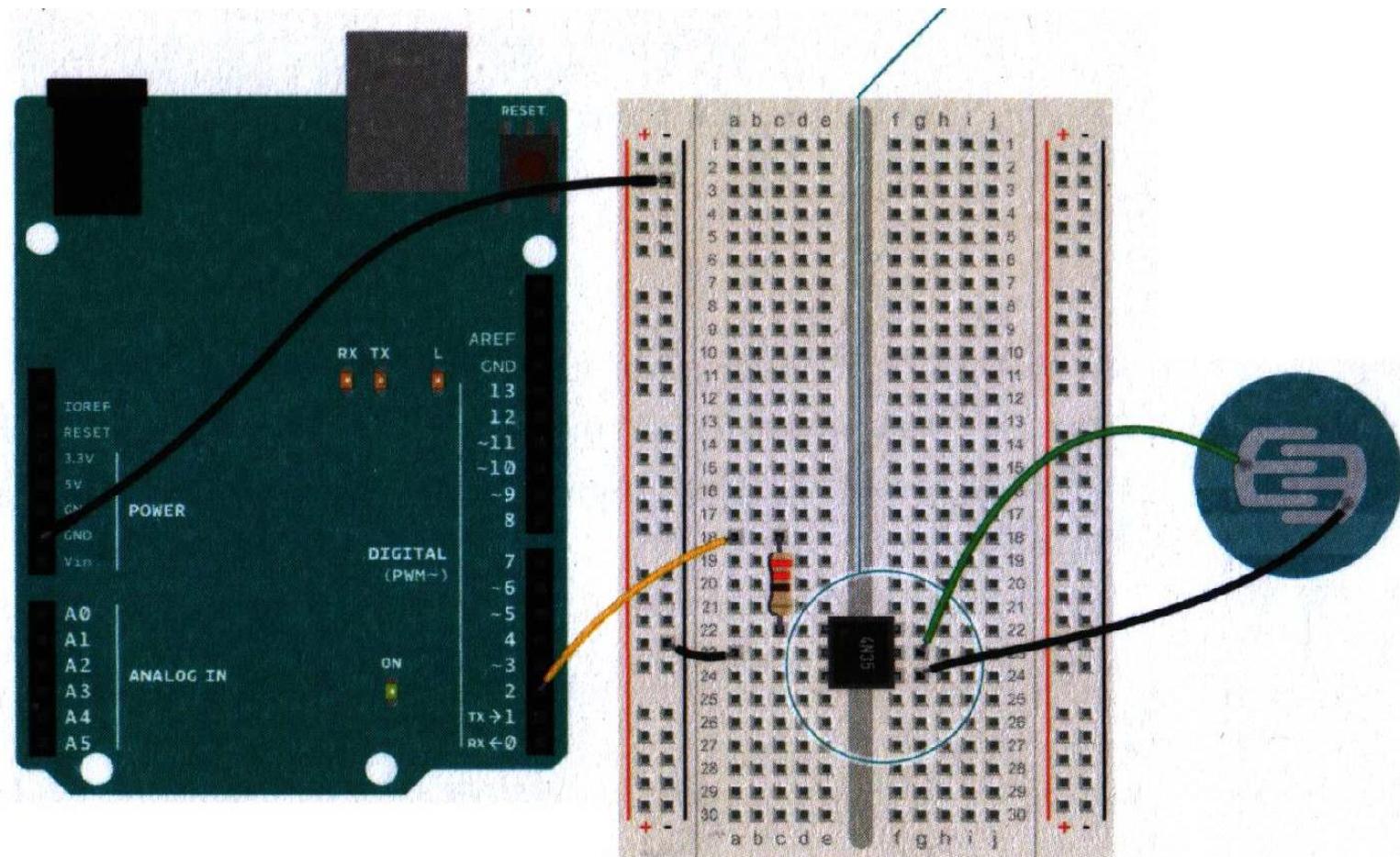


Ingredients

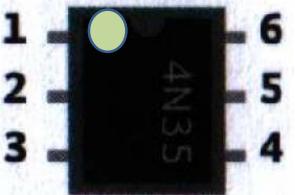
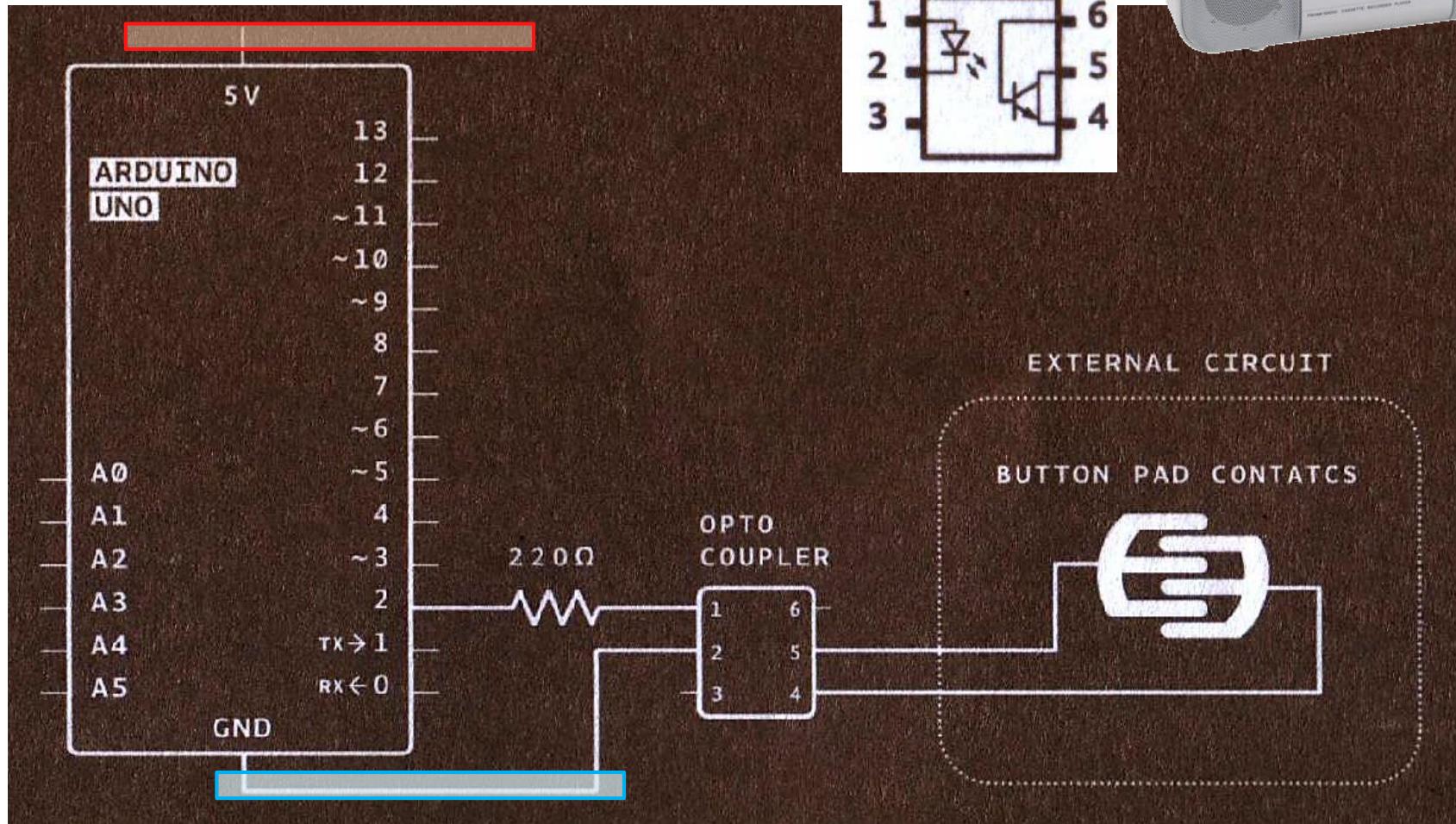
- 1個光耦合器[4N35]
- 1個220 OHM電阻
- 1個LED



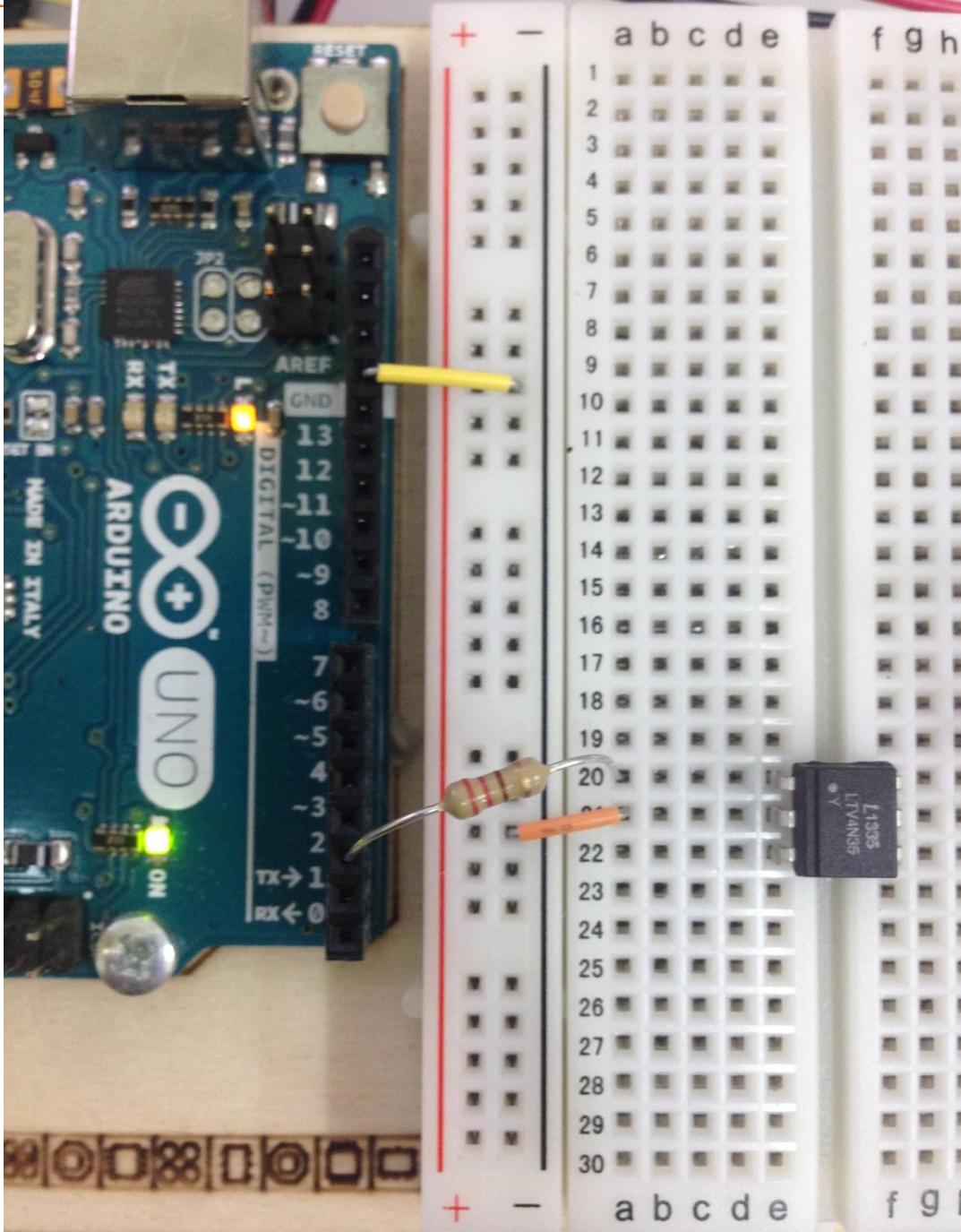
The Top View of the Circuit



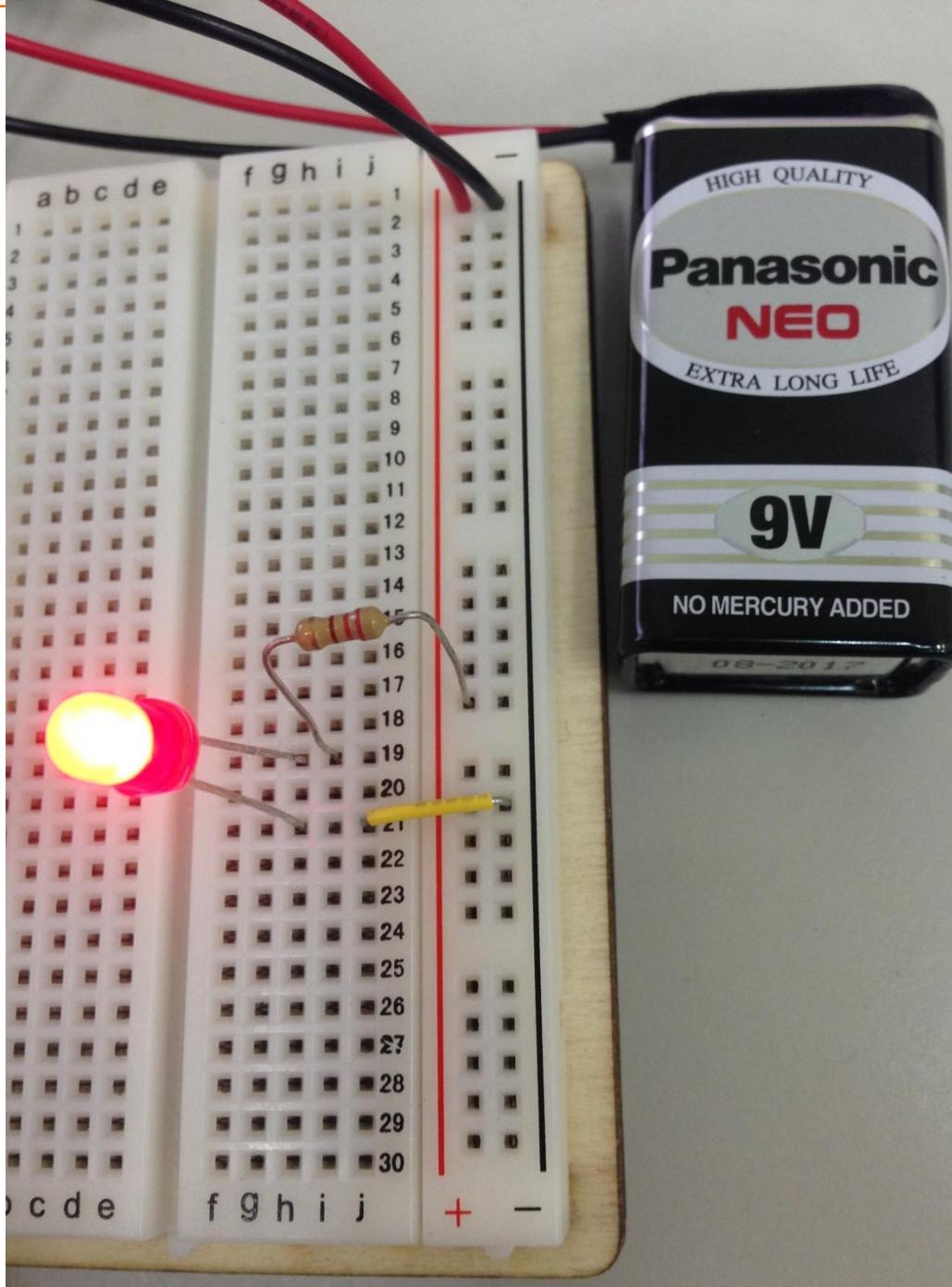
Schematic Diagram



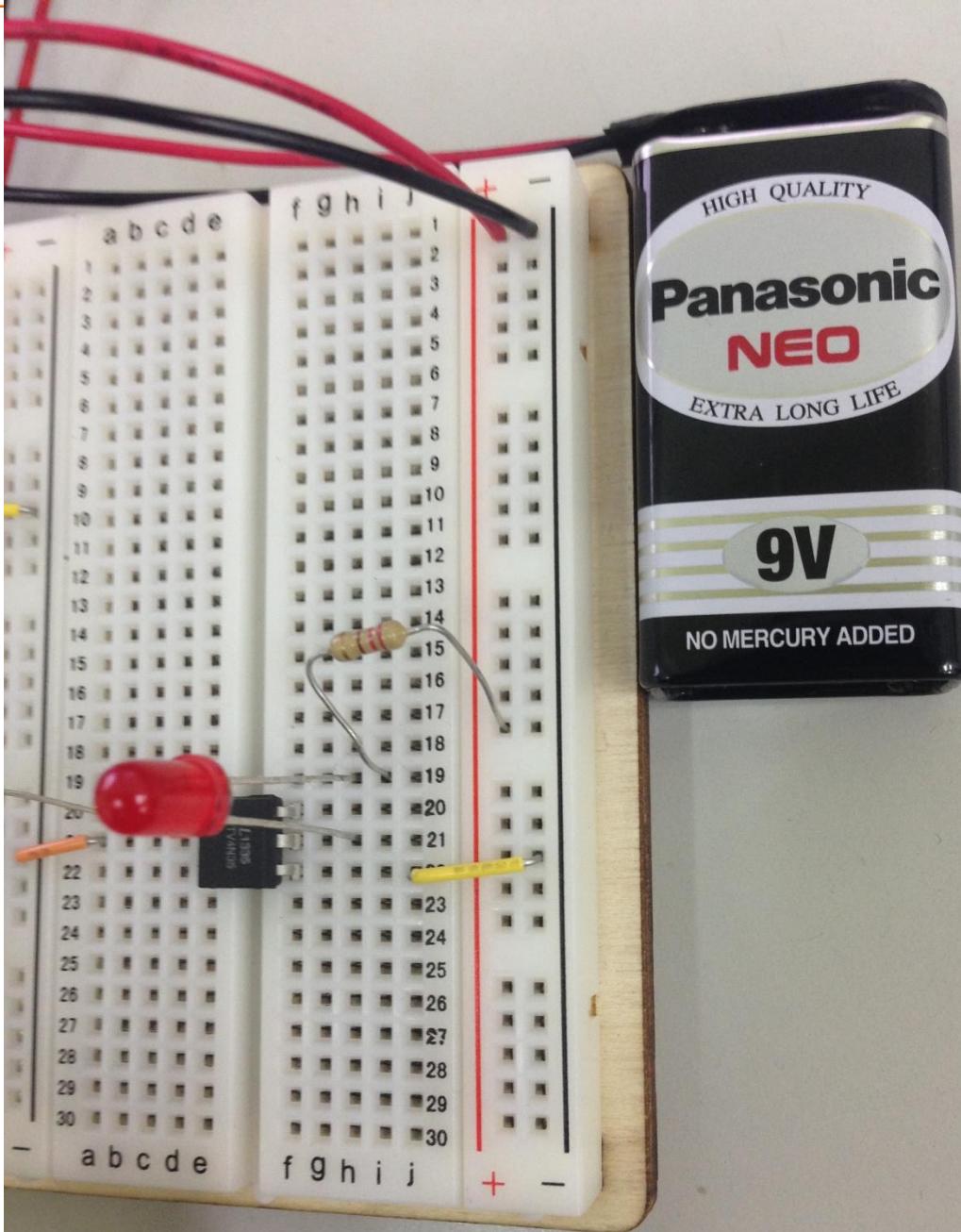
The Circuit



The Circuit



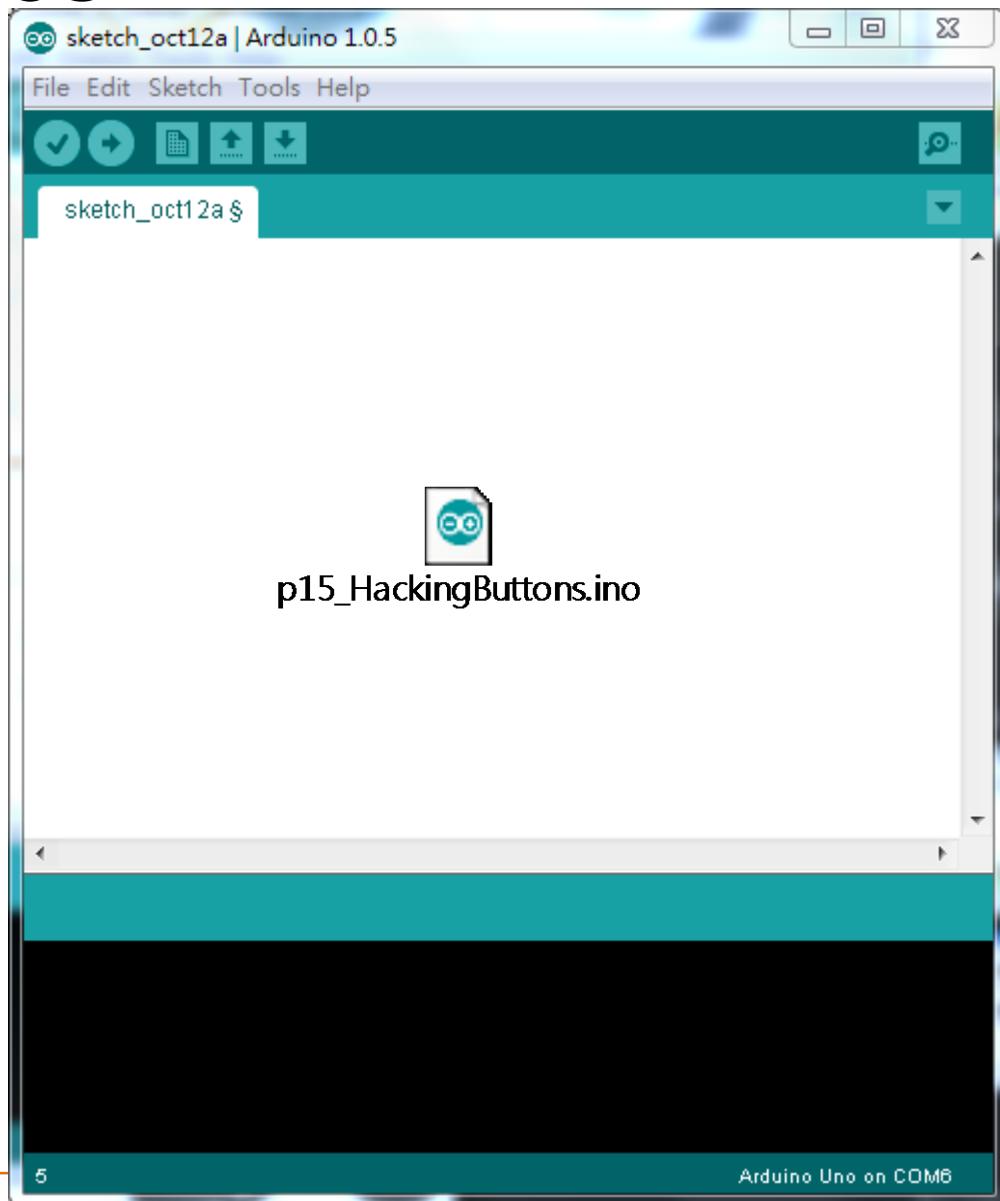
The Circuit



The Codes

```
1 const int optoPin = 2;  
2 void setup(){  
3     pinMode(optoPin, OUTPUT);  
4 }  
5 void loop(){  
6     digitalWrite(optoPin, HIGH);  
7     delay(15);  
8     digitalWrite(optoPin, LOW);  
9     delay(21000); // 21秒 因為等太久 可以改成delay(1000); // 1秒  
10 }
```

Codes



41/41