Electronics 1

Electronics for Interactive Media Design

Les 4

Emma Pareschi

From the last time

From class 2:
- How to count a switch
- For statement
- Array structure
- Generate sound: Buzzer
- Light sensor

Assignments:
1 - The Dice
2 - The buzzer

Today:
- RGB and “smart” LEDs
- Functions and libraries
- Soldering
- Review of the assignments

Light - LEDs

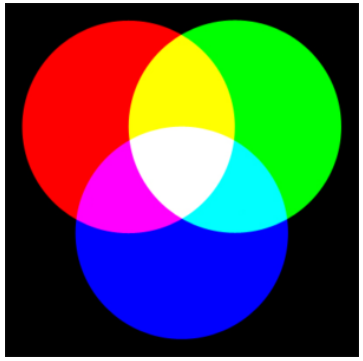
Led

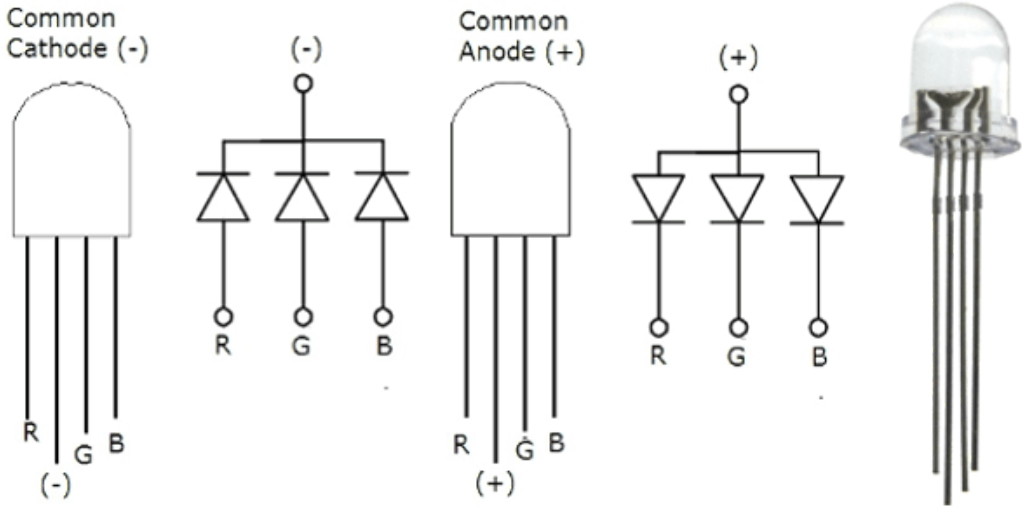
RGB Led

“Smart” Led

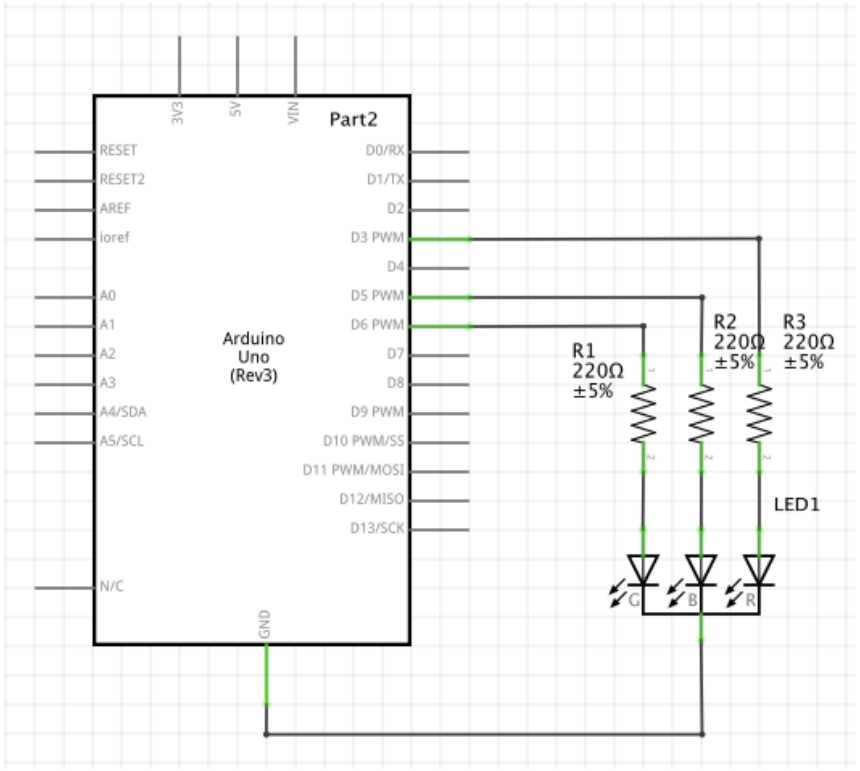
RGB Led

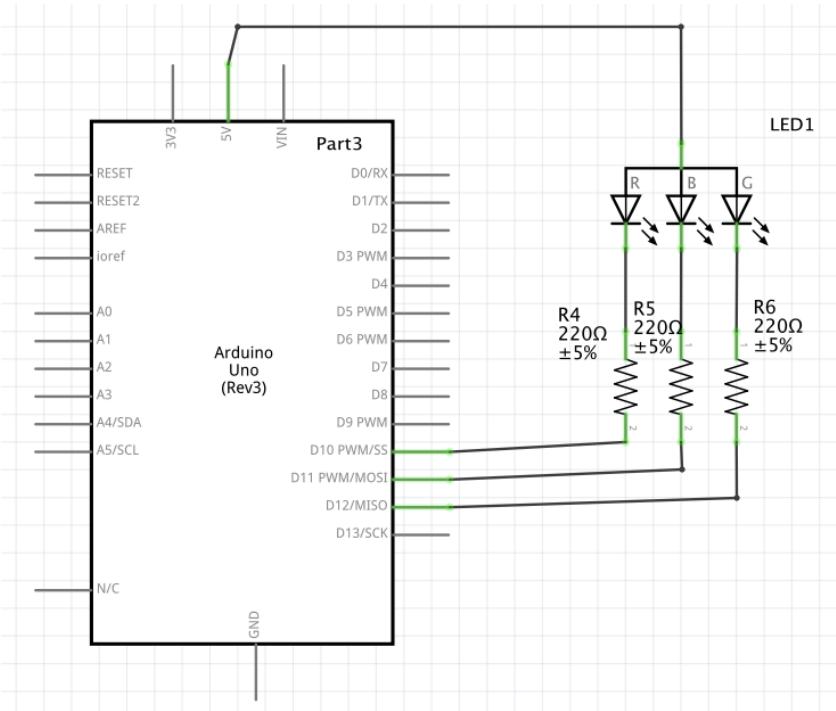
- It consists of 3 separate LEDs red, green and blue packed in a single case.
- The RGB LED can emit different colors by mixing the 3 basic colors red, green and blue.
- It has 4 leads, one lead for each of the 3 colors and one common cathode or anode depending of the RGB LED type.





RGB Led


Part2
3V3
5V
VIN
RESET
RESET2
AREF
ioref
A0
A1
A2
A3
A4/SDA
A5/SCL
N/C
GND
Arduino
Uno
(Rev3)
D0/RX
D1/TX
D2
D3 PWM
D4
D5 PWM
D6 PWM
D7
D8
D9 PWM
D10 PWM/SS
D11 PWM/MOSI
D12/MISO
D13/SCK
R1
220Ω
±5%
R2
220Ω
±5%
R3
220Ω
±5%
LED1
G
B
R


Part3
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LED1
R
B
G
R4
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±5%
R5
220Ω
±5%
R6
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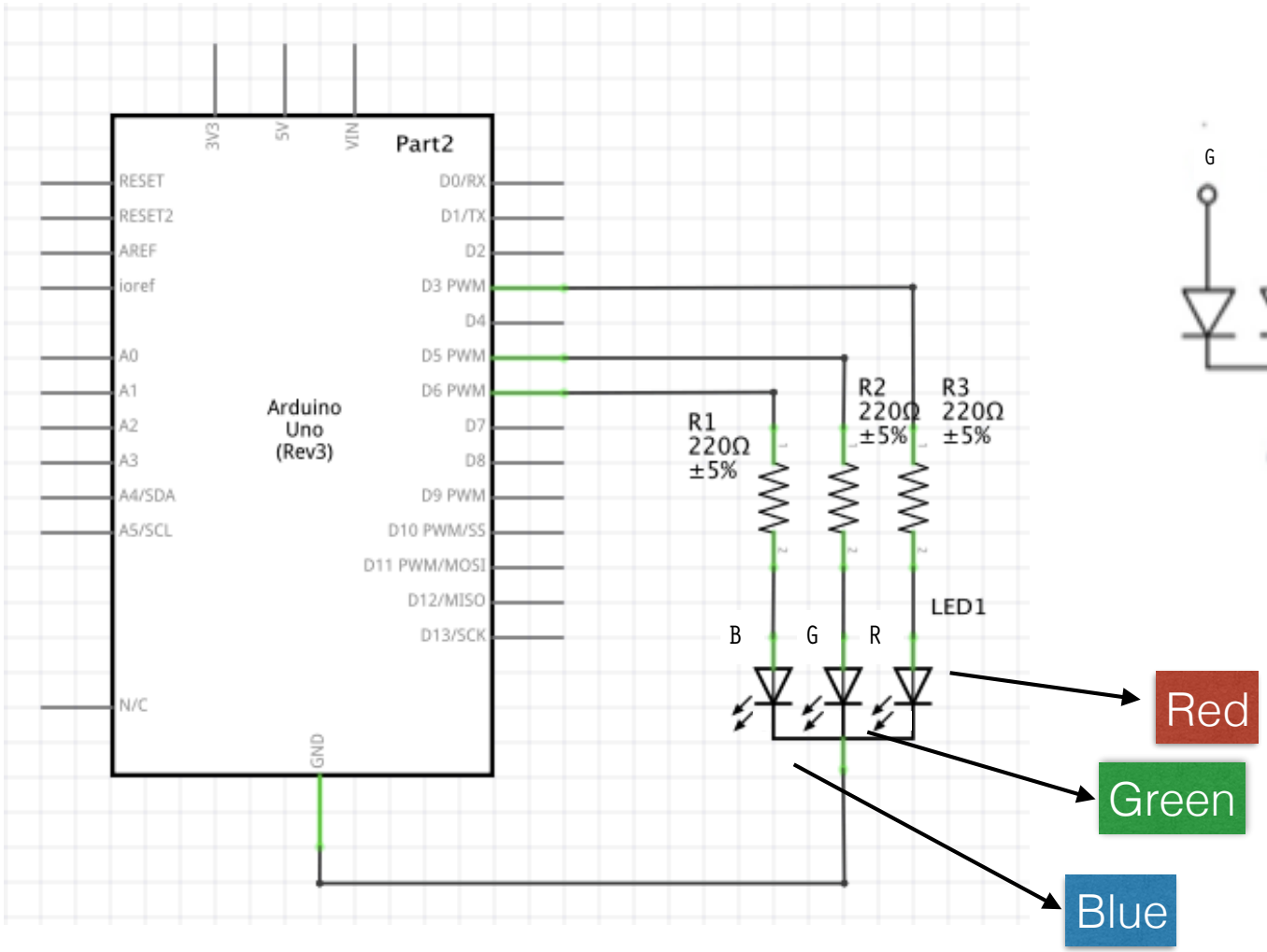
RGB LED


3V3
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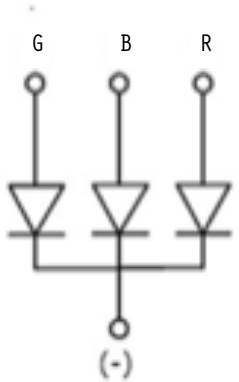
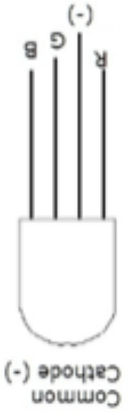
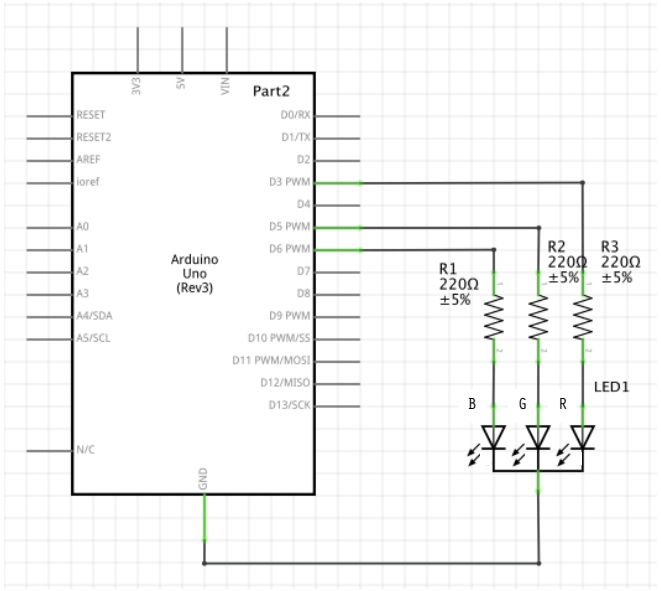
R1
220Ω
±5%
R2
220Ω
±5%
R3
220Ω
±5%
LED1
B
G
R
Red
Green
Blue


G
B
R
(-)


(-)
B
G
R
Common
Cathode (-)

RGB Led



Code: 01_RGB

```
int redPin= 3;
int greenPin = 5;
int bluePin = 6;
```

```
//Color Red
analogWrite(redPin, 255);
analogWrite(greenPin, 0);
analogWrite(bluePin, 0);
```

Note:
- You can use the functions: digitalWrite and analogWrite.
- Use PWM pins and analogWrite to control the color.
- For standard RGB LEDs -> resistors = 220Ohm
- RGB codes:
  - https://www.w3schools.com/colors/colors_rgb.asp
  - https://www.rapidtables.com/web/color/RGB_Color.html

Function

sketch_nov11d §

```
int redPin= 3;
int greenPin = 5;
int bluePin = 6;

int wait = 1000;

void setup() {
  pinMode(redPin, OUTPUT);
  pinMode(greenPin, OUTPUT);
  pinMode(bluePin, OUTPUT);
}

void loop() {

  //Color Red
  analogWrite(redPin, 255);
  analogWrite(greenPin, 0);
  analogWrite(bluePin, 0);
  delay(wait);

  //Light off
  analogWrite(redPin, 0);
  analogWrite(greenPin, 0);
  analogWrite(bluePin, 0);
  delay(wait);

}
```

Code: 01_RGB

RGB_simple_function

```
int redPin= 3;
int greenPin = 5;
int bluePin = 6;

int wait = 1000;

void setup() {
  pinMode(redPin, OUTPUT);
  pinMode(greenPin, OUTPUT);
  pinMode(bluePin, OUTPUT);
}

void loop() {
  setColor(255, 0, 0); // Red Color
  delay(wait);

  setColor(0, 0, 0); //  Light off
  delay(wait);
}

void setColor(int redValue, int greenValue, int blueValue) {
  analogWrite(redPin, redValue);
  analogWrite(greenPin, greenValue);
  analogWrite(bluePin, blueValue);
}
```

Code: 02_RGB_function

Function

sketch_nov11d §

```
int redPin= 3;
int greenPin = 5;
int bluePin = 6;

int wait = 1000;


void setup() {
  pinMode(redPin, OUTPUT);
  pinMode(greenPin, OUTPUT);
  pinMode(bluePin, OUTPUT);
}

void loop() {

  //Color Red
  analogWrite(redPin, 255);
  analogWrite(greenPin, 0);
  analogWrite(bluePin, 0);
  delay(wait);

  //Light off
  analogWrite(redPin, 0);
  analogWrite(greenPin, 0);
  analogWrite(bluePin, 0);
  delay(wait);

}
```

Code: 01_RGB

RGB_simple_function

```
int redPin= 3;
int greenPin = 5;
int bluePin = 6;

int wait = 1000;


void setup() {
  pinMode(redPin, OUTPUT);
  pinMode(greenPin, OUTPUT);
  pinMode(bluePin, OUTPUT);
}

void loop() {
  setColor(255, 0, 0); // Red Color
  delay(wait);

  setColor(0, 0, 0); // Light off
  delay(wait);
}

void setColor(int redValue, int greenValue, int blueValue) {
  analogWrite(redPin, redValue);
  analogWrite(greenPin, greenValue);
  analogWrite(bluePin, blueValue);
}
```

Code: 02_RGB_function

RGB Led - Function

```
//Color Red
analogWrite(redPin, 255);
analogWrite(greenPin, 0);
analogWrite(bluePin, 0);
```

Instead to write three lines overtime you want to set a color:
We use a function: setColor

```
setColor(255, 0, 0); // Red Color
```

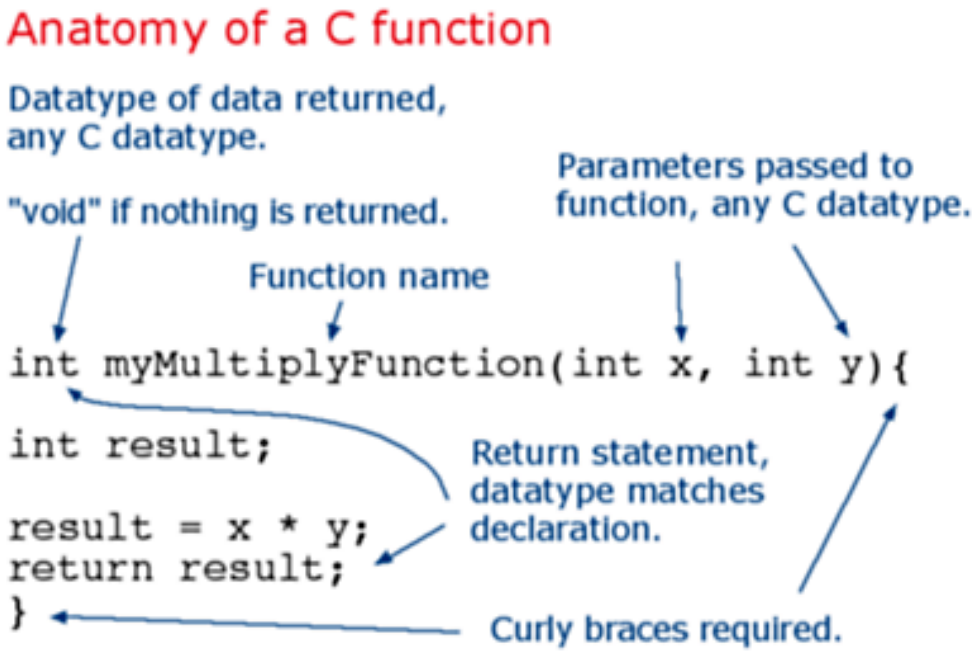
We use the function setColor inside loop and give to the function three parameters: the RGB values

```
void setColor(int redValue, int greenValue, int blueValue) {
  analogWrite(redPin, redValue);
  analogWrite(greenPin, greenValue);
  analogWrite(bluePin, blueValue);
}
```

We define the function setColor outside loop.

Function

Segmenting code into functions allows a programmer to create modular pieces of code that perform a defined task and then return to the area of code from which the function was "called".



Assignment

RGB LED

- Read the page: https://www.arduino.cc/en/Reference/FunctionDeclaration

Ex 1

Write a sketch and call it: “MyMath.ino”.
In MyMath create four functions that execute the four calculations: and call the functions: MyMultiplication, MyAddition, MySubtraction, MyDivision.
Share the code on your blog

Ex 2

- Using the code 02_RGB_rainbow: create your Color sequence and create a function called “MyRainbow”. The function MyRainbow takes a parameter to change the speed of the rainbow.
- Extra: trigger the rainbow sequence with a sensor.

Light - intelligent LEDs

Red, green and blue LEDs are integrated alongside a driver chip into a tiny surface-mount package controlled through a single wire.

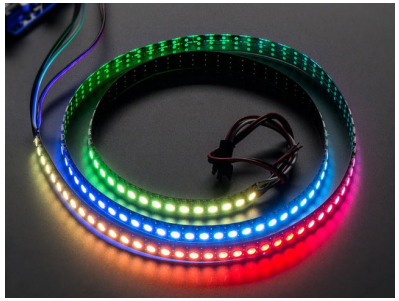
They require a microcontroller (such as Arduino) and some programming. We provide some sample code to get you started.

RGB: WS2812, WS2811
RGBW: SK6812
NeoPixel -> Adafruit

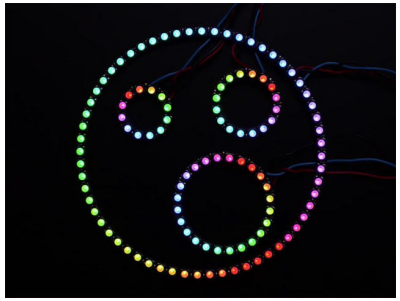
Light - intelligent LEDs

Different shapes, Form factors 

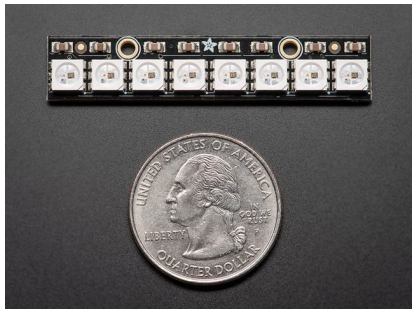
NeoPixel Strips

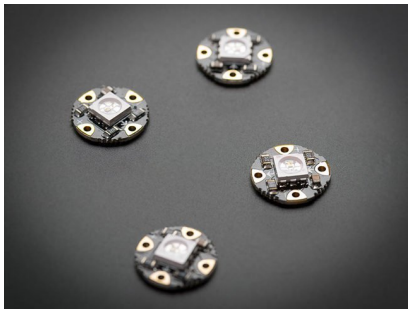


NeoPixel Rings

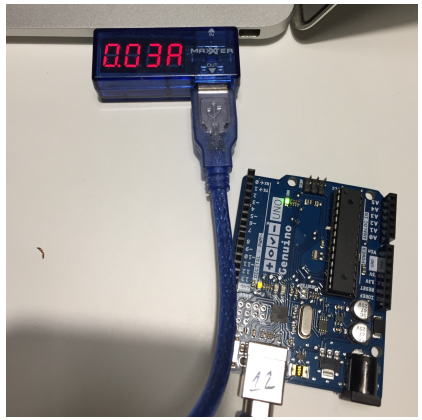


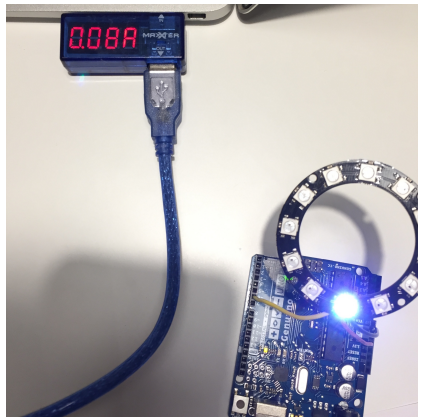
NeoPixel Matrix

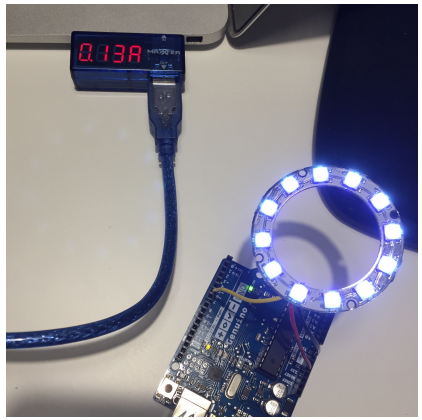




Light - intelligent LEDs

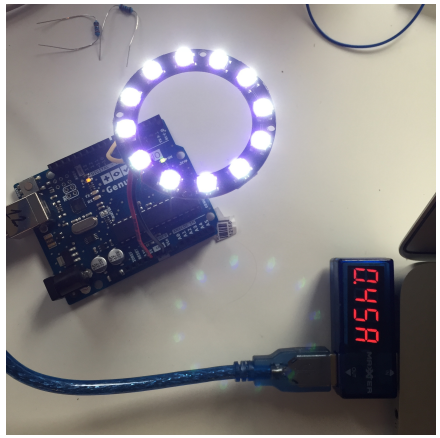






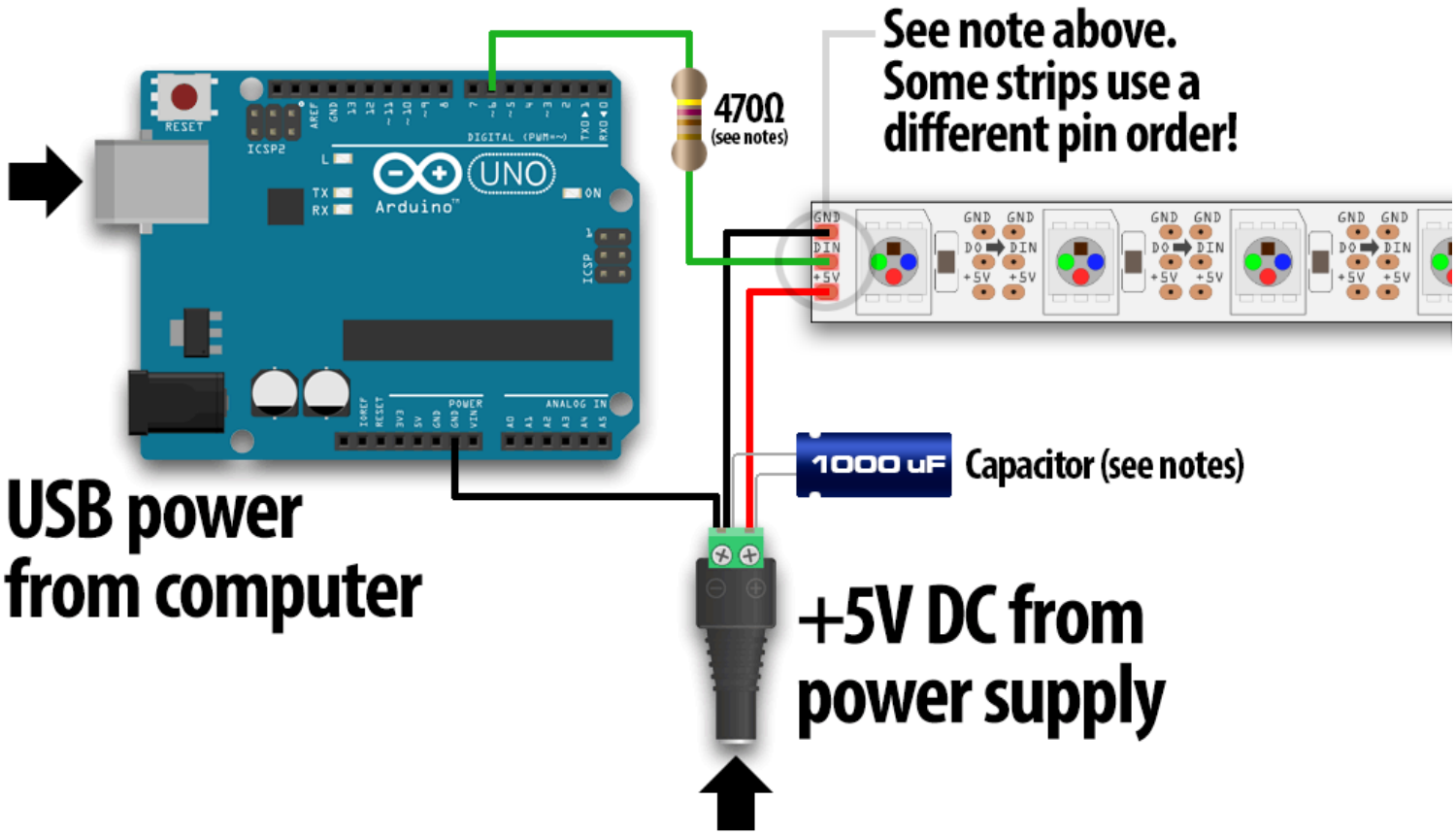
1 Neopixel: 20mA x 3 = 60mA
12 Neopixel: 60mA x 12 = 720 mA

…using Arduino +5V => 0.450A



Light - intelligent LEDs

Power



What you need to solder

Soldering stand

Tin

Soldering sponge

Soldering Iron

Stripper Wire

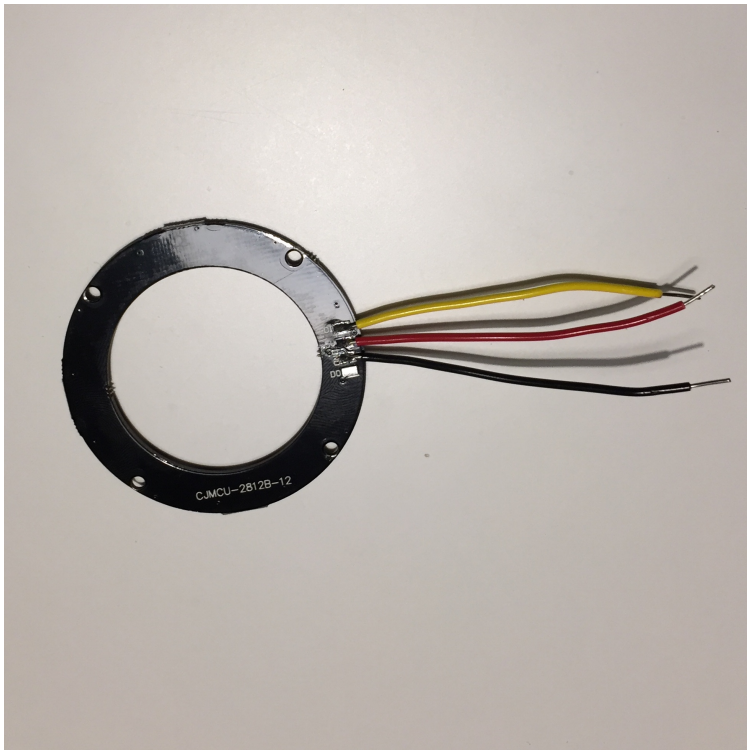
Wire cutter

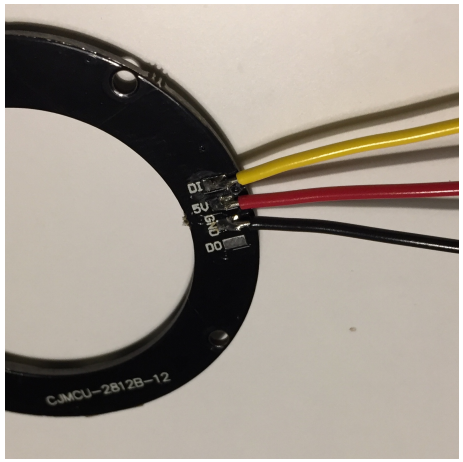
Desoldering Pump

Desoldering Wire

tweezers

Solder





DI: Yellow
5V: Red
GND: black

NeoPixel Library

NeoPixel_single

```
/*
 * Emma Pareschi
 *
 * Basic commands of Library Adafruit_NeoPixel
 * Using some parts from the example "strandtest"
 */

#include <Adafruit_NeoPixel.h>

// Which pin on the Arduino is connected to the NeoPixels?
#define PIN            6

// How many NeoPixels are attached to the Arduino?
#define NUMPIXELS      12

// Parameter 1 = number of pixels in strip
// Parameter 2 = Arduino pin number (most are valid)
// Parameter 3 = pixel type flags, add together as needed:
//   NEO_KHZ800  800 KHz bitstream (most NeoPixel products w/WS2812 LEDs)
//   NEO_KHZ400  400 KHz (classic 'v1' (not v2) FLORA pixels, WS2811 drivers)
//   NEO_GRB     Pixels are wired for GRB bitstream (most NeoPixel products)
//   NEO_RGB     Pixels are wired for RGB bitstream (v1 FLORA pixels, not v2)
//   NEO_RGBW    Pixels are wired for RGBW bitstream (NeoPixel RGBW products)
Adafruit_NeoPixel pixels = Adafruit_NeoPixel(NUMPIXELS, PIN, NEO_GRB + NEO_KHZ800);

int delayval = 2000; // delay for half a second

void setup() {

  pixels.begin(); // This initializes the NeoPixel library.

}
```

Install Library

Create an Object Of the library NeoPixel

pixels.setBrightness(255);

NeoPixel Library

```
void loop() {

  // For a set of NeoPixels the first NeoPixel is 0, second is 1

  pixels.setPixelColor(0, 255, 255, 255);
  pixels.show();

  delay(delayval);

  pixels.setPixelColor(0, 0, 0, 0);
  pixels.show();

  delay(delayval);

}
```

Code 04_NeoPixel_single

```
void loop() {

  uint32_t magenta = pixels.Color(255, 0, 255);
  uint32_t white = pixels.Color(255, 255, 255);

  delay(delayval);

  pixels.setPixelColor(0, magenta);
  pixels.show();

  delay(delayval);

  pixels.setPixelColor(0, white);
  pixels.show();

  delay(delayval);

}
```

Code 05_NeoPixel_single

Assignment

NeoPixel

- Read the page “powering neopixel”: https://learn.adafruit.com/adafruit-neopixel-uberguide/powering-neopixels
- Using the example “strandtest”, create five sketches called:
    - MyColorWipe
    - MyTheaterChase
    - MyRainbow
    - MyRainbowCycle
    - MyTheaterChaseRainbow

- trigger the sequence that you like most with a sensor.

Extra: visualise the data of an analog sensor with the Neopixels.

Solder