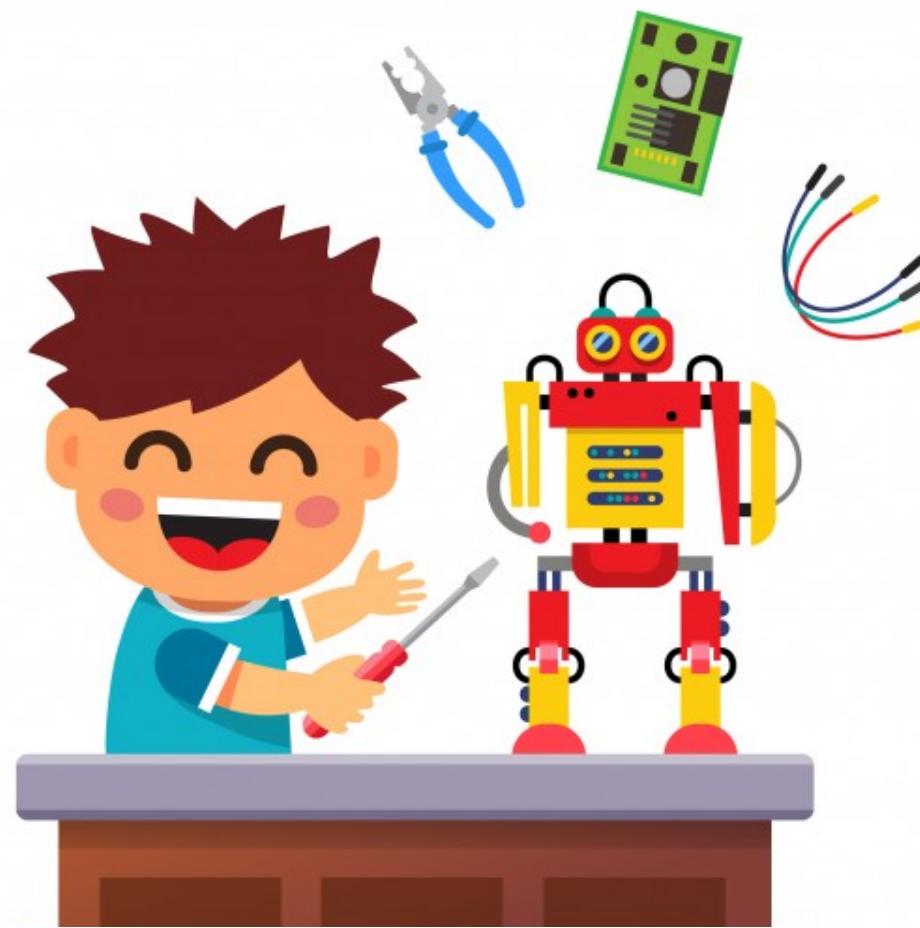


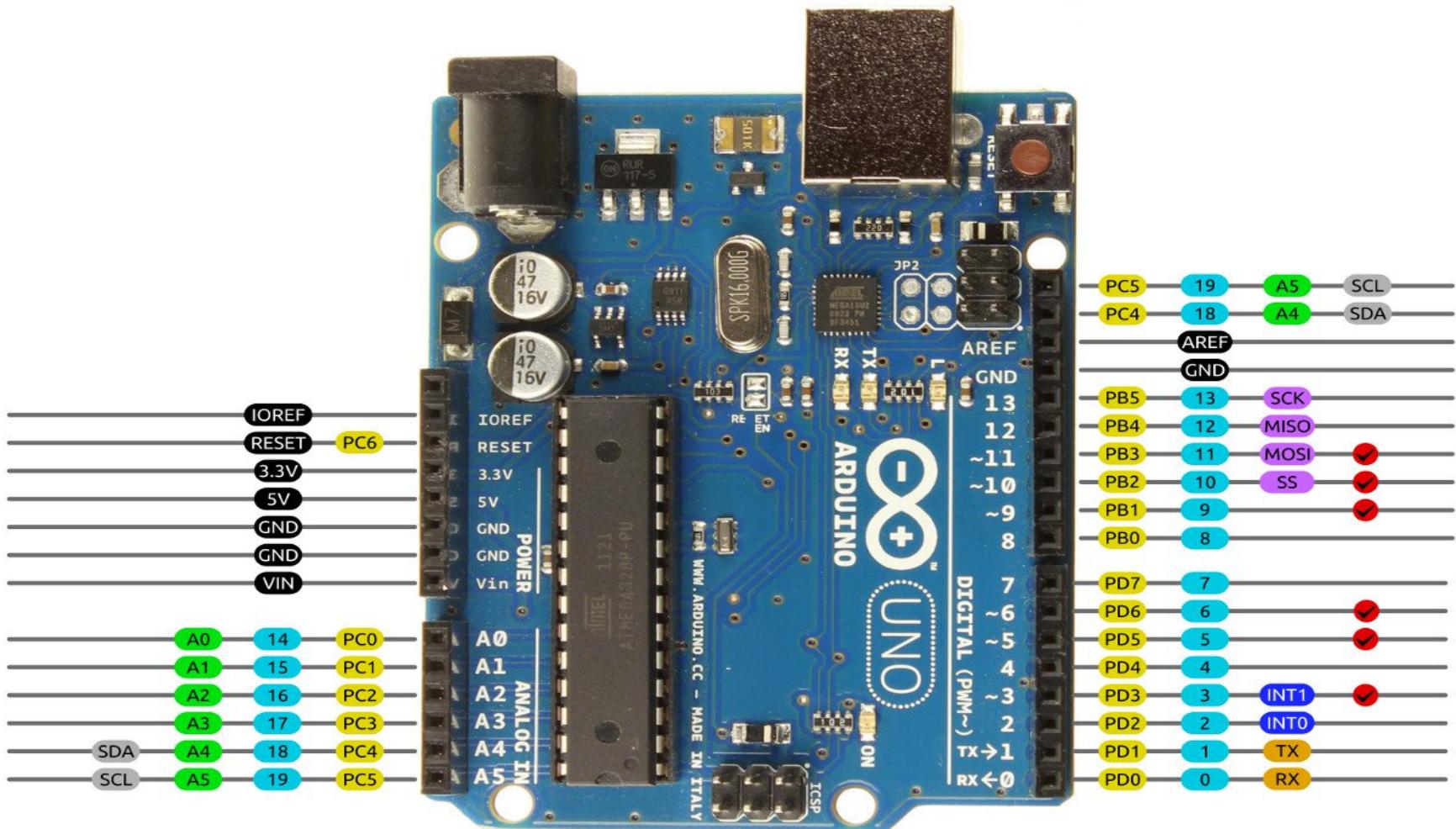
Arduino Workshop

Arduino and embedded system
introduction

DIY (Do it yourself)



Arduino Uno R3 Pinout



AVR

DIGITAL

ANALOG

POWER

SERIAL

SPI

I2C

PWM

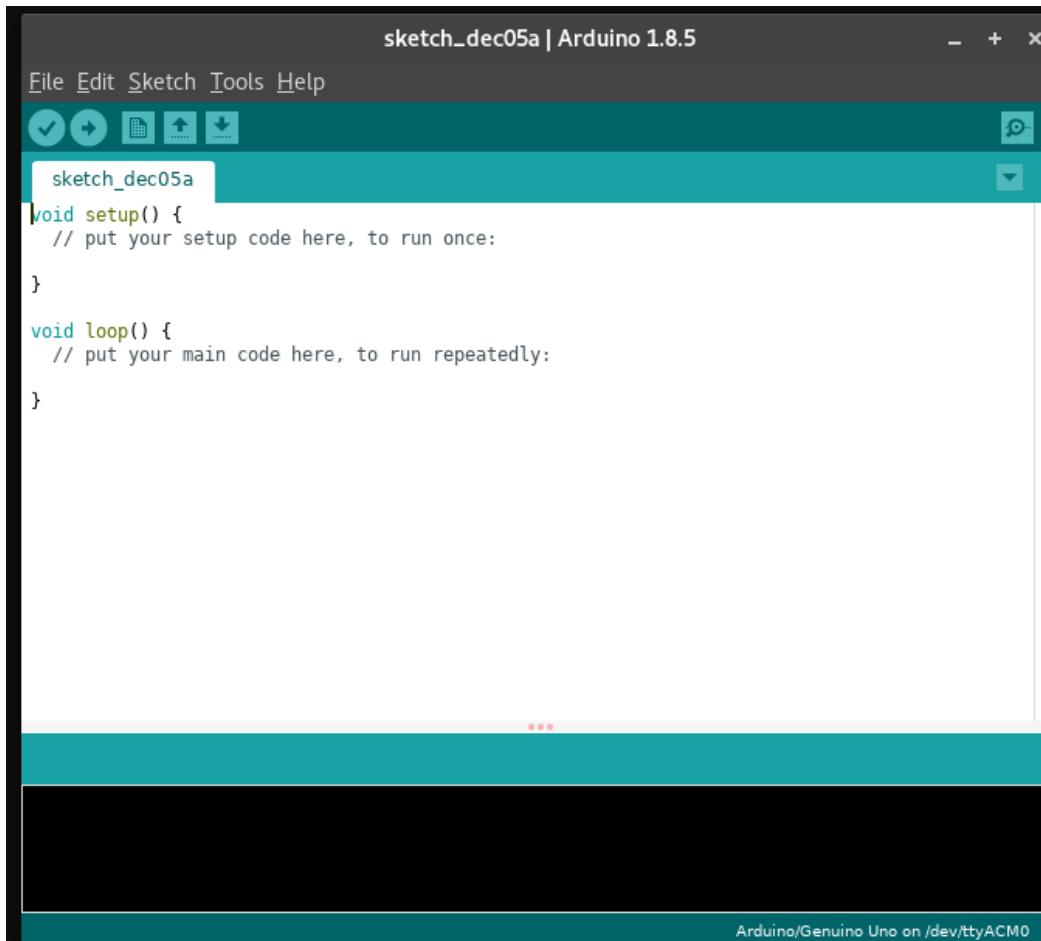
INTERRUPT



2014 by Bouni
Photo by Arduino.cc

Software

- Arduino IDE (Download and install):
<https://www.arduino.cc/en/Main/Software>



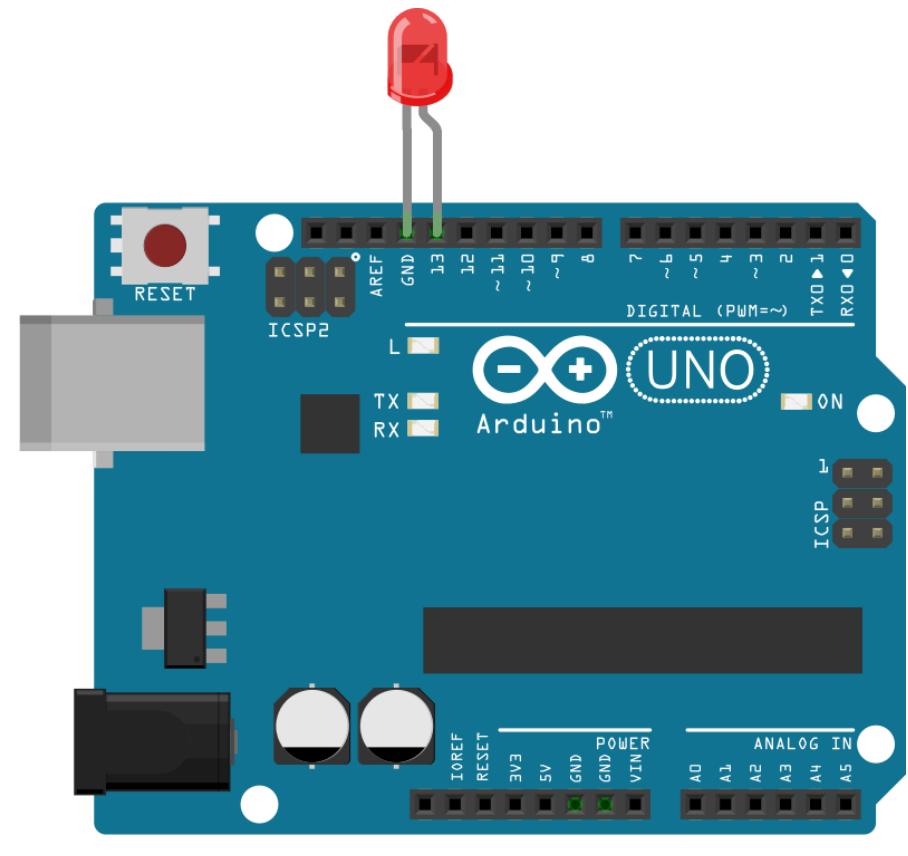
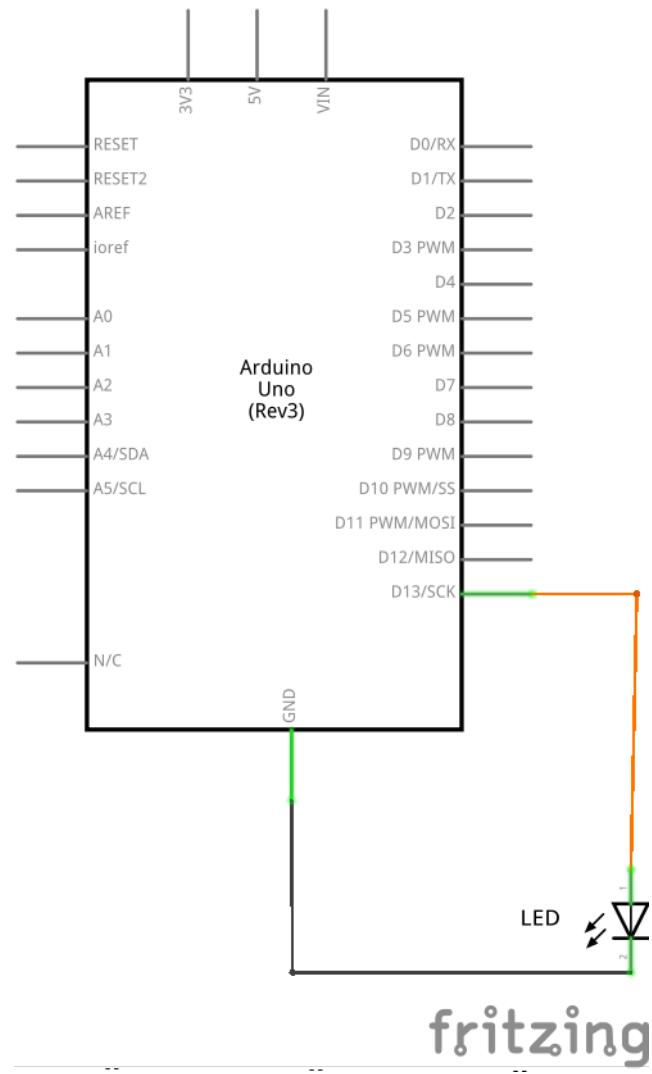
Arduino Programming

- Using arduino IDE C/C++
- Every sketch has these functions:
 - void **setup()**
 - Runs once at the very beginning
 - Set up your variables, peripherals
 - void **loop()**
 - Runs forever
 - Code that does actual work goes here

Arduino Programming

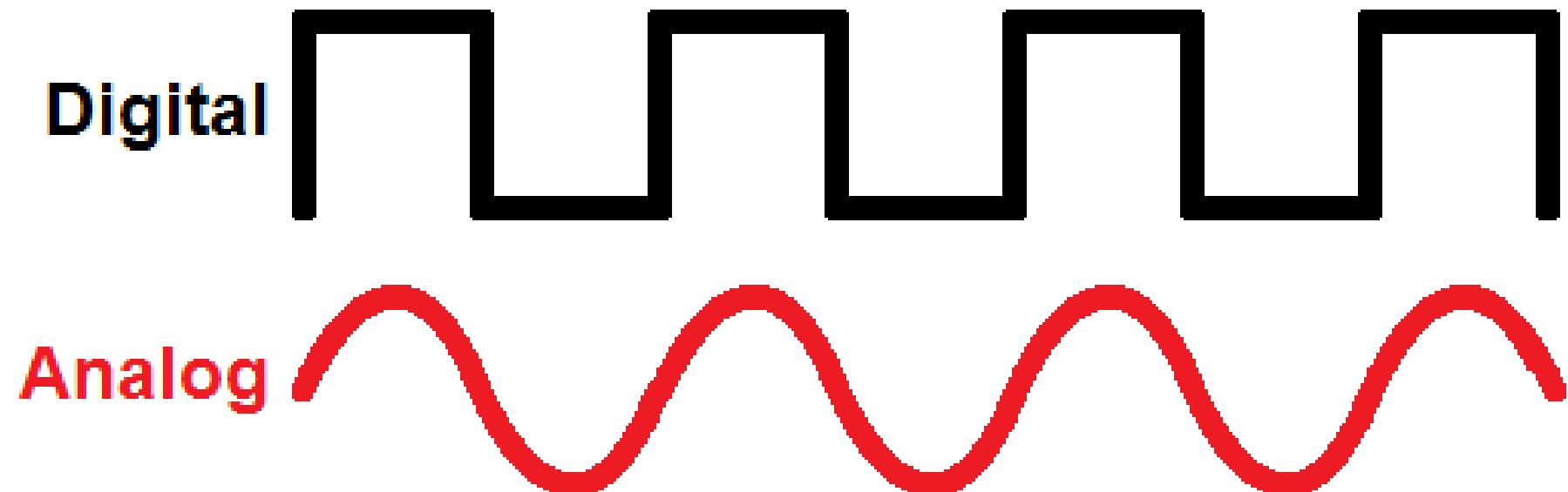
- Functions :
 - **pinMode**(pin, INPUT/OUTPUT)
 - **digitalWrite**(pin, HIGH/LOW)
 - **delay**(time in msec)

Lab 1 : Blinking LED



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Analog vs Digital



PWM (Pulse Width Modulation)

- Method to generate analog voltages from digital voltages .

50% duty cycle



75% duty cycle

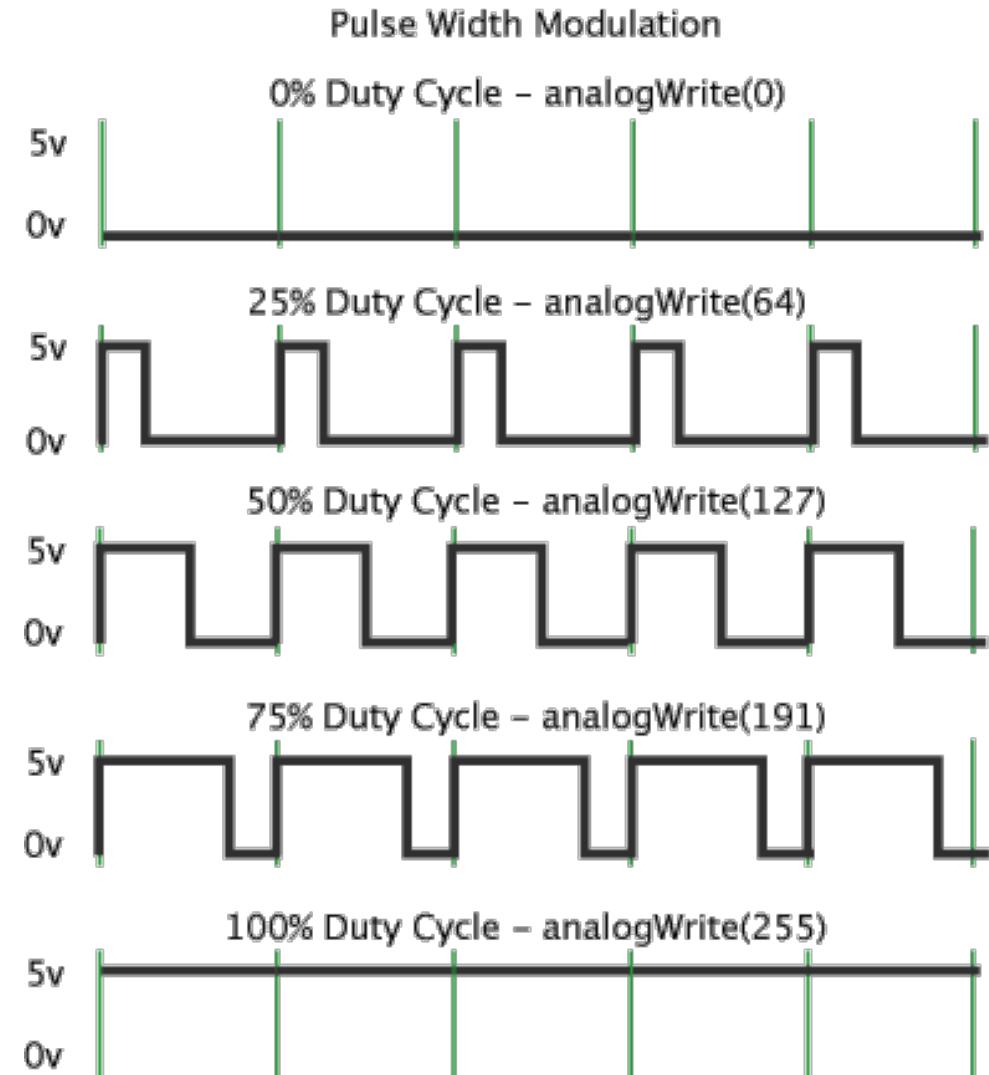


25% duty cycle

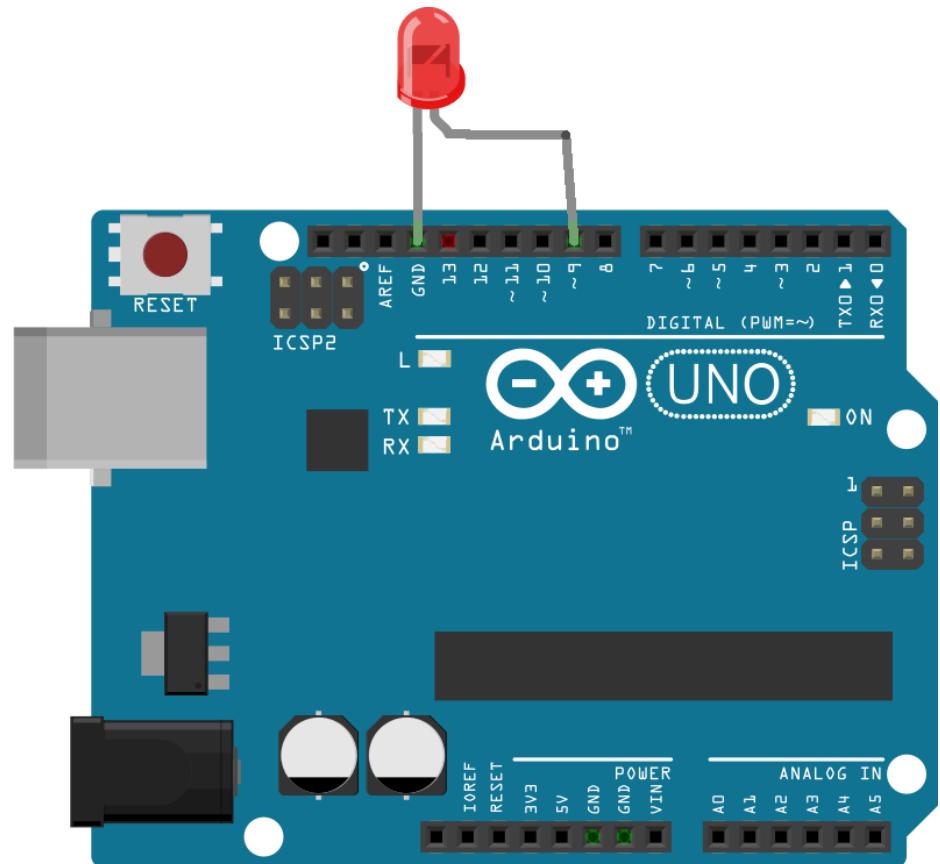
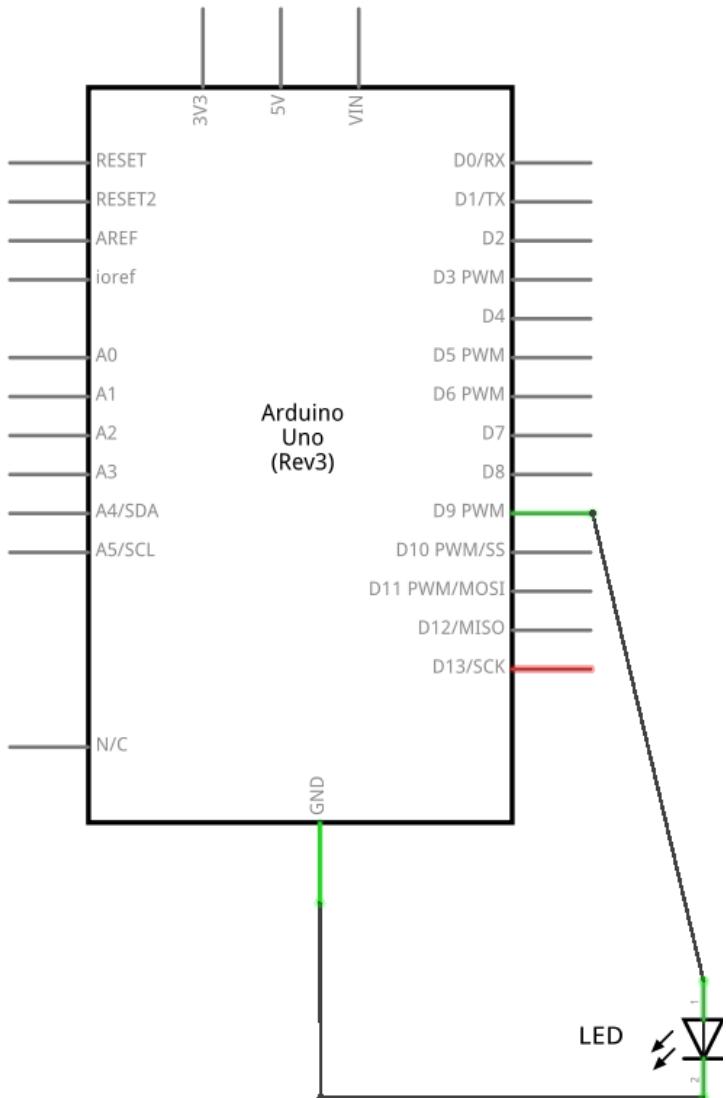


Arduino Programming

- Functions :
- **analogWrite(pin, val)**
val = 0 to 255
- $A_v = (\text{onTime}/T) * 5v$



Lab 2 : Fade an LED in and out



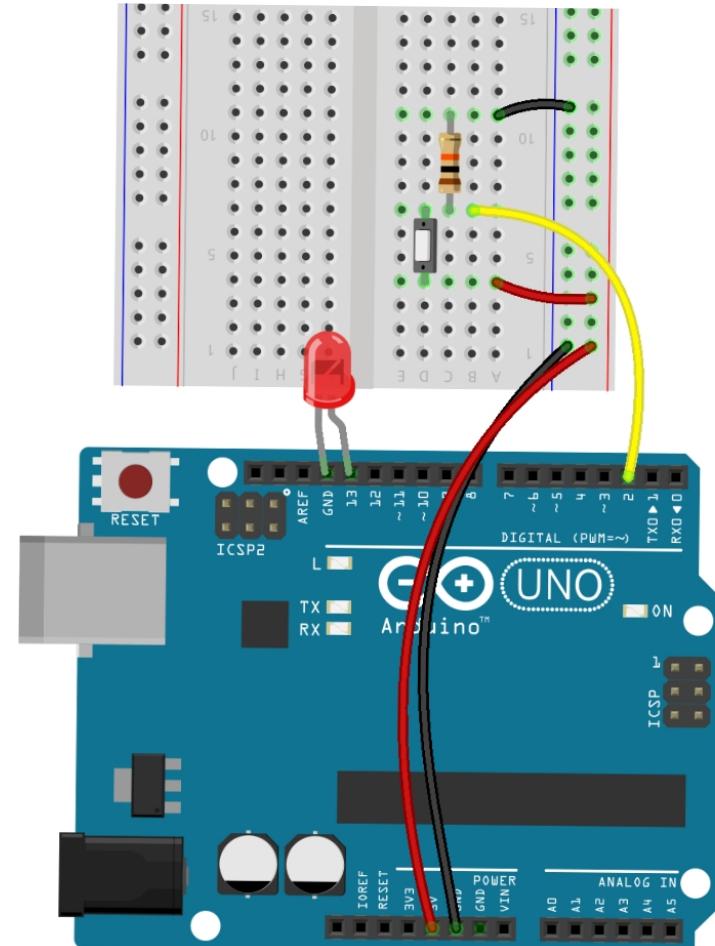
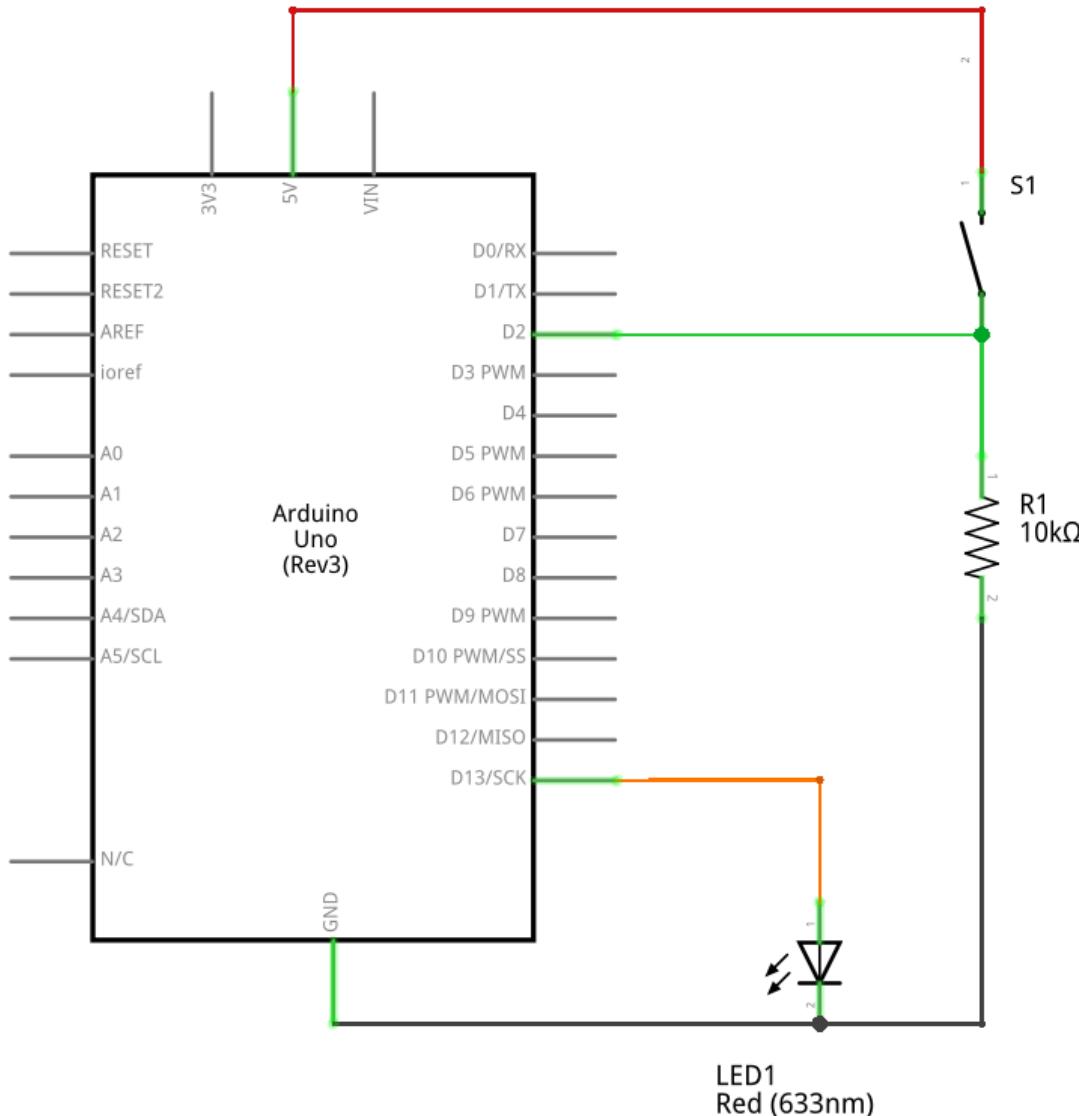
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Arduino Programming

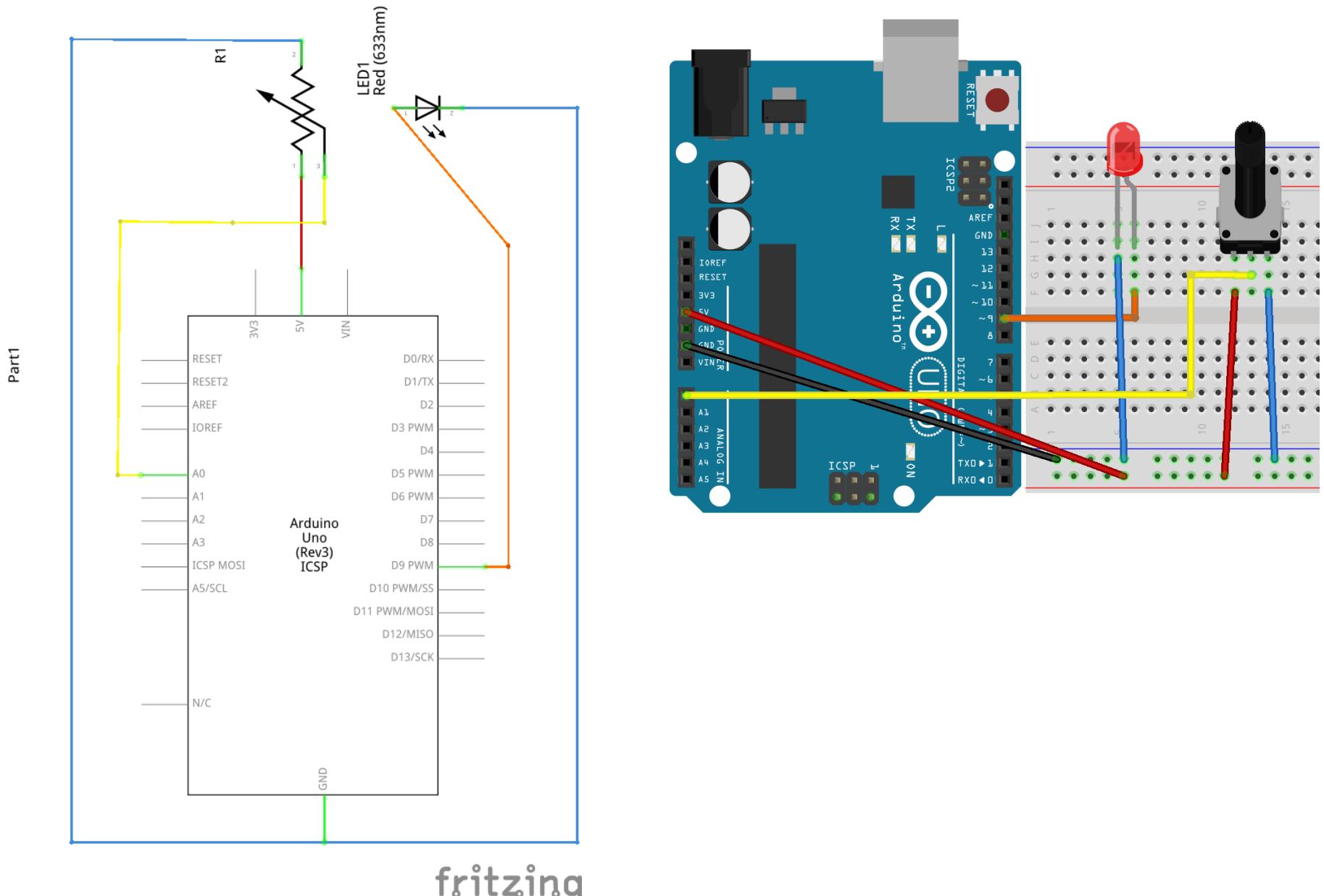
- Functions :
 - **digitalRead(pin)** : return a val 0 or 1
 - **analogRead(pin)** : return a val between 0 and 1023
 - ADC : $v = (\text{val} / 1023) * \text{Vref}$ (default : 5v)

Lab 3 : Turn a LED ON/OFF using button

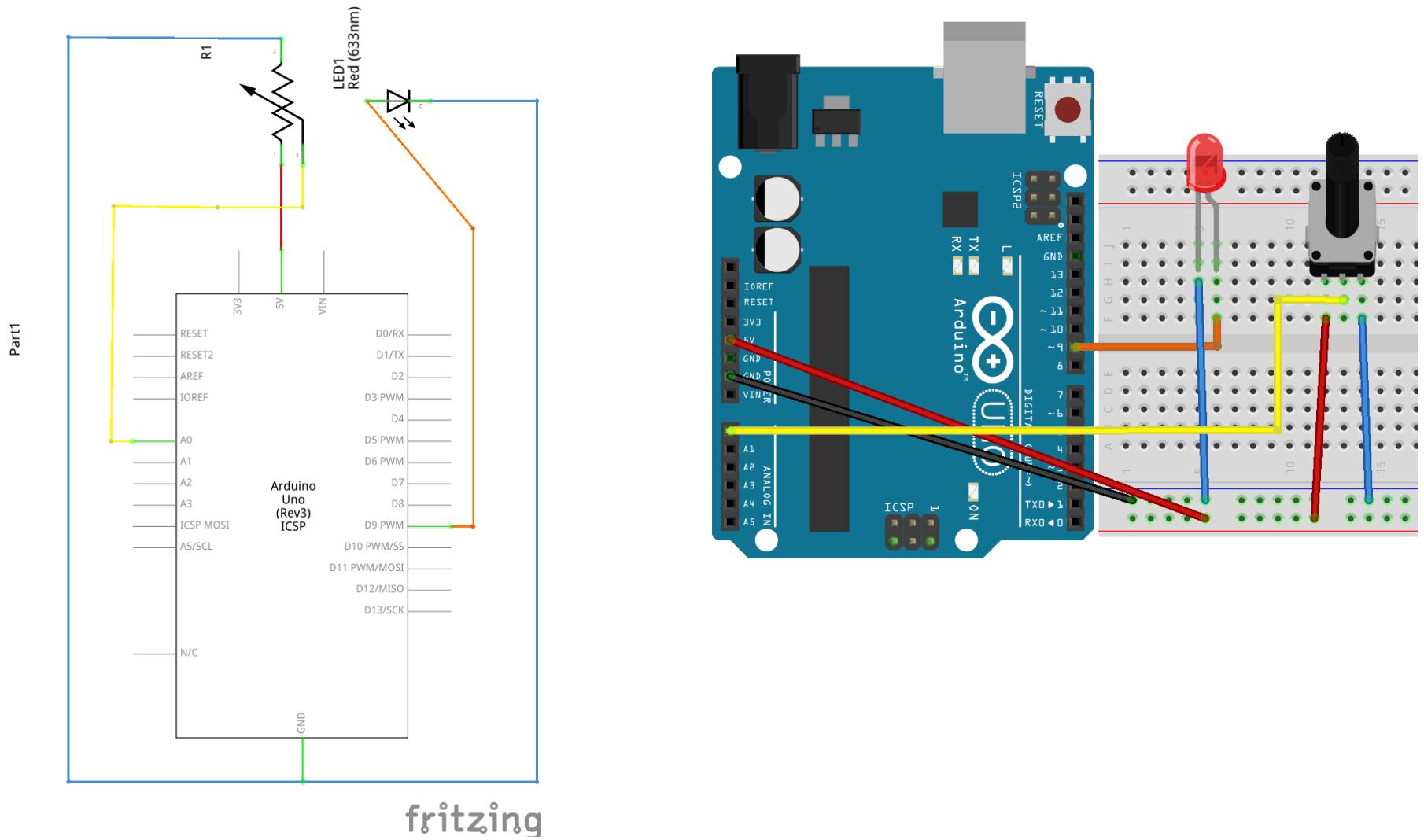


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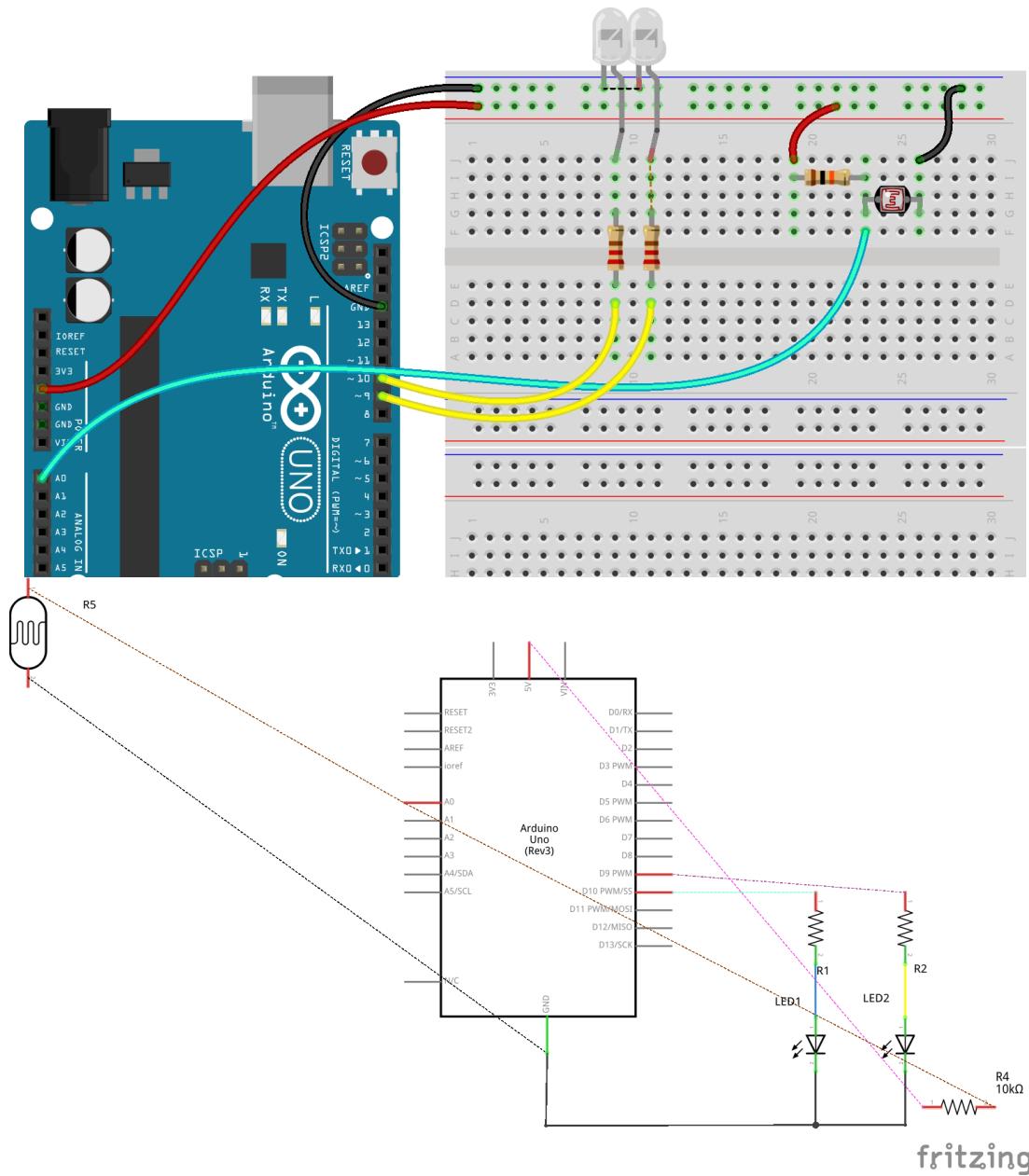
Lab 4 : Blink LED at a rate specified by the value of the analogue input



Lab 5 : Set the brightness of LED to a brightness specified by the value of the analogue input



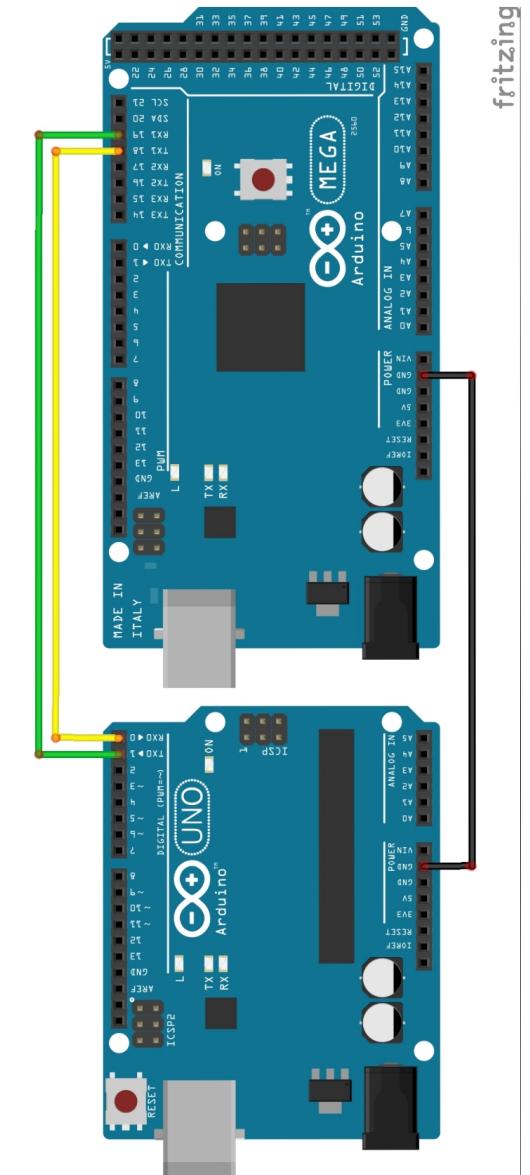
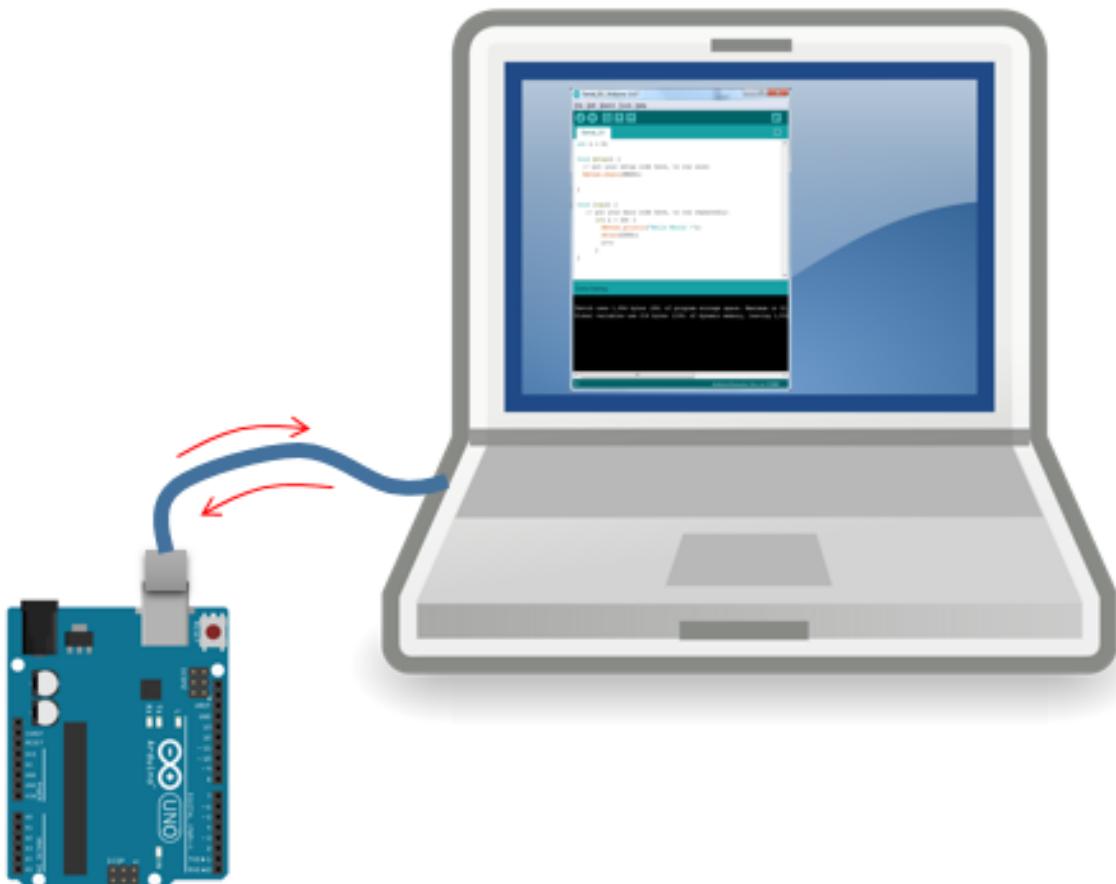
Lab 6 : LDR and LED



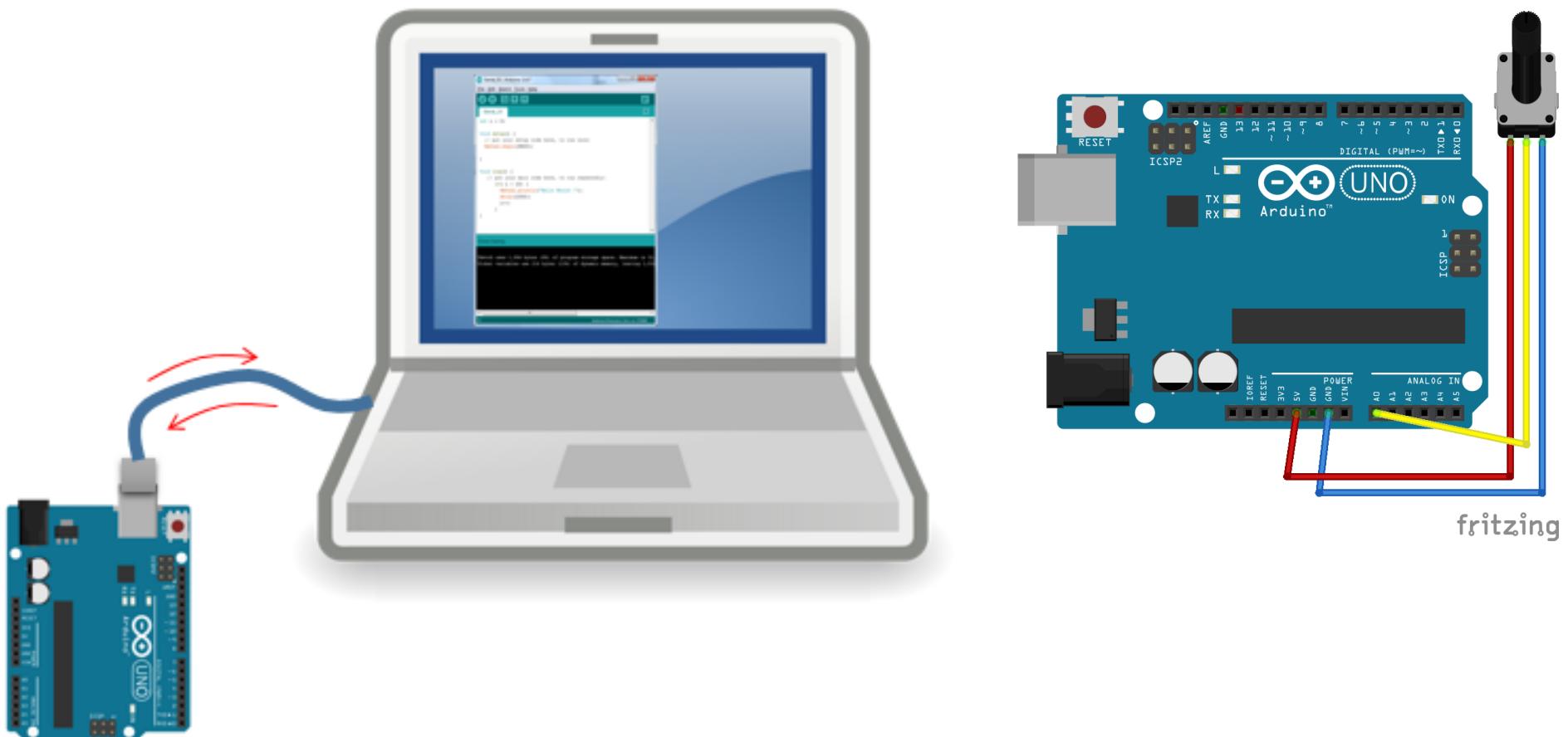
Arduino Programming

- Serial Communication
 - Functions :
 - **Serial.begin(speed(bps))**
 - **Serial.available()**
 - **Serial.print(val)**
 - **Serial.println(val,format)**
 - Format : DEC,HEX ...
 - **Serial.read()**

Lab 7 : read a value from Serial port and prints the received data to the Serial Monitor.



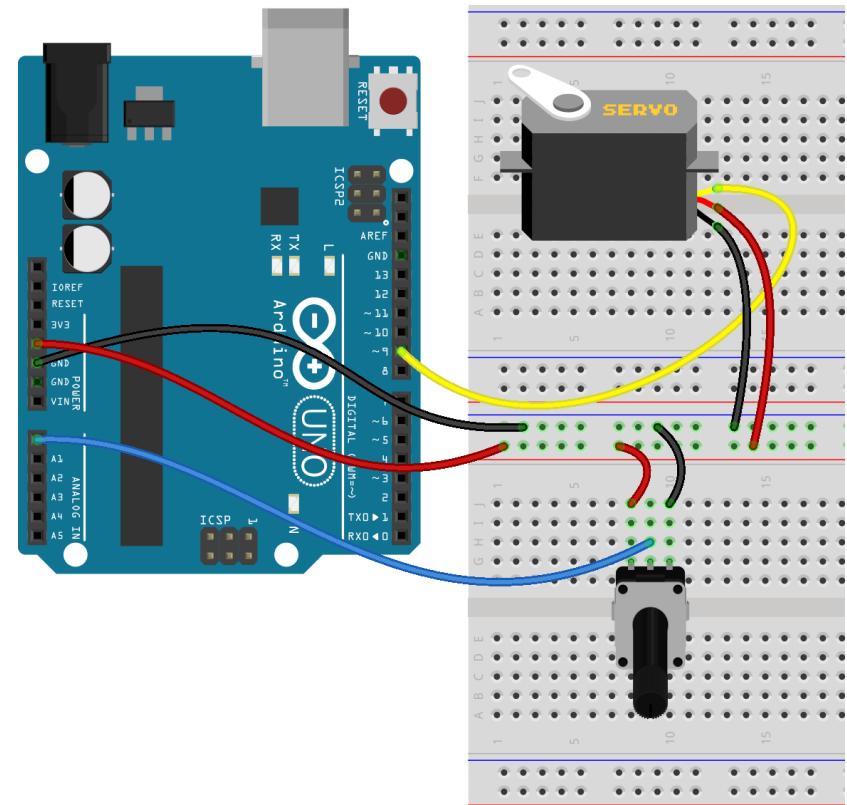
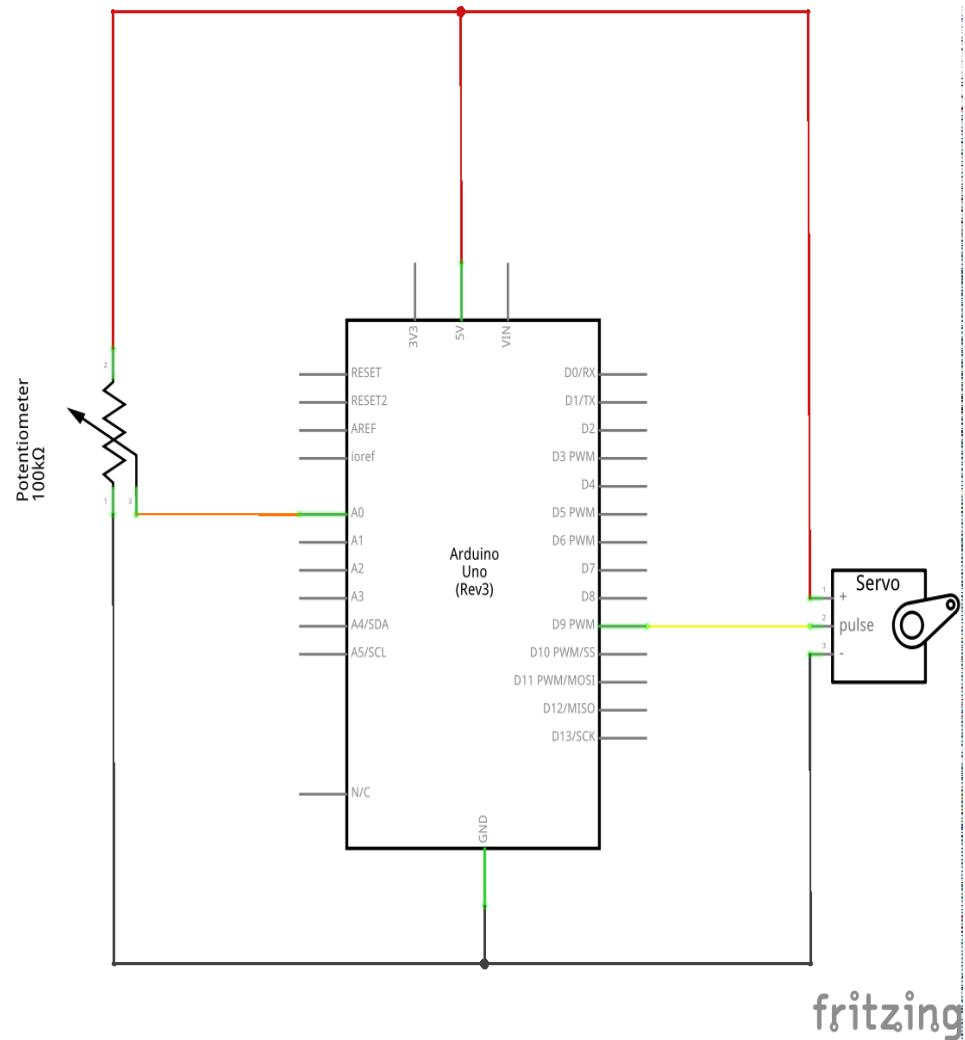
Lab 8 : reading an analog value and prints the result to the Serial Monitor



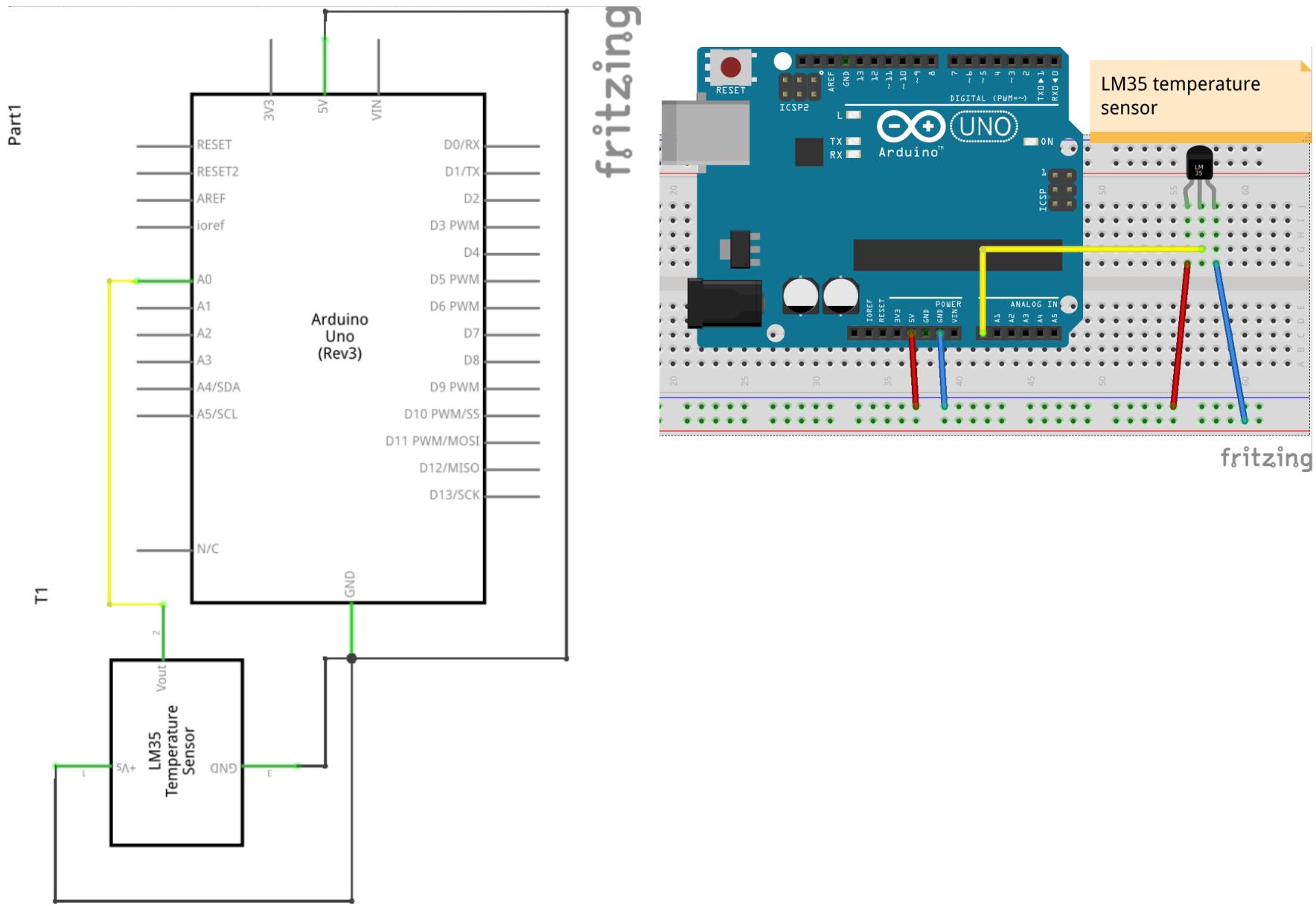
Arduino Programming

- Using libraries :
 - `#include <libraryname.h>`
 - For exemple :
 - `#include <Ultrasonic.h>`
 - `#include <Servo.h>`

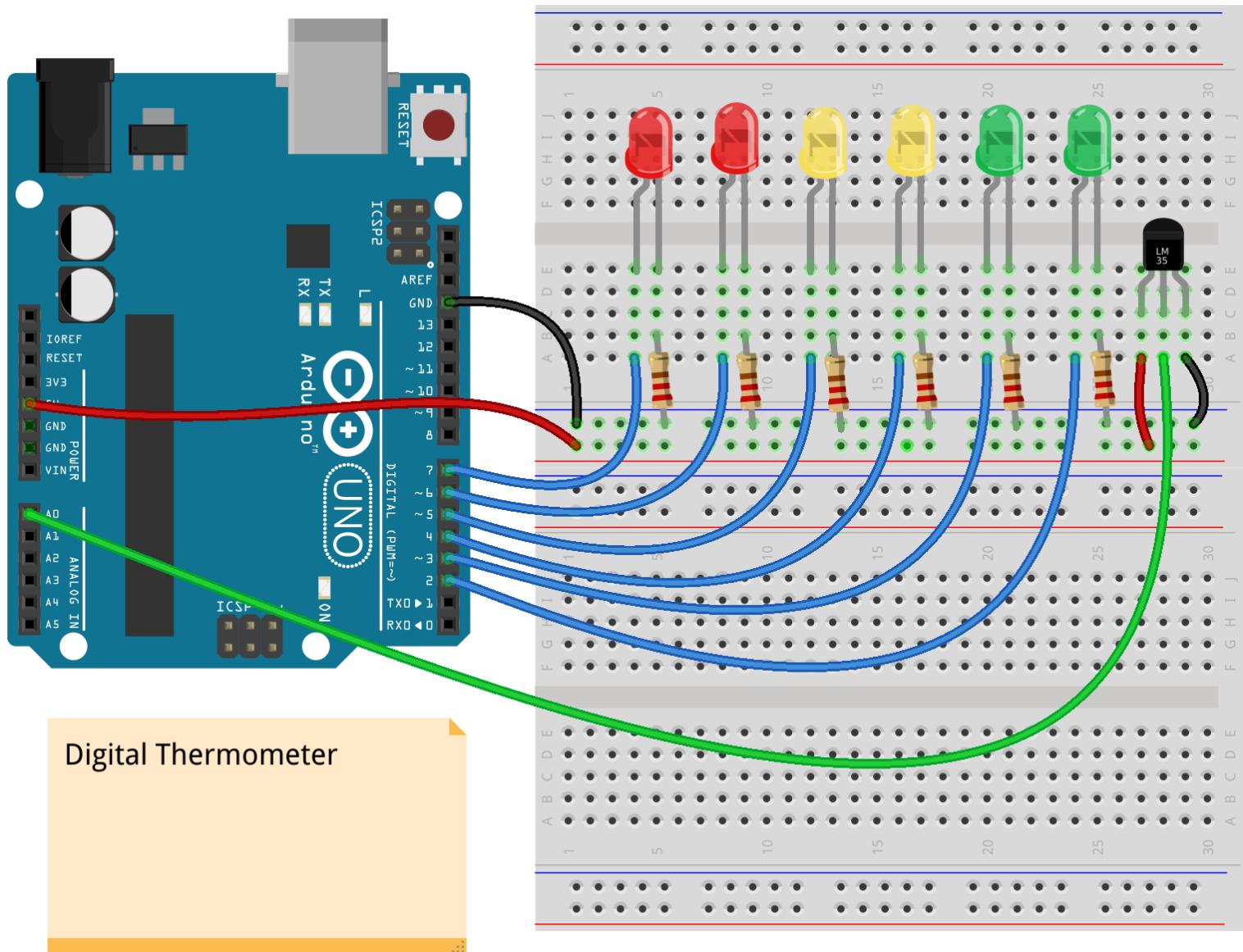
Lab 9: Controll a Servo Motor



Lab 10 :thermometer

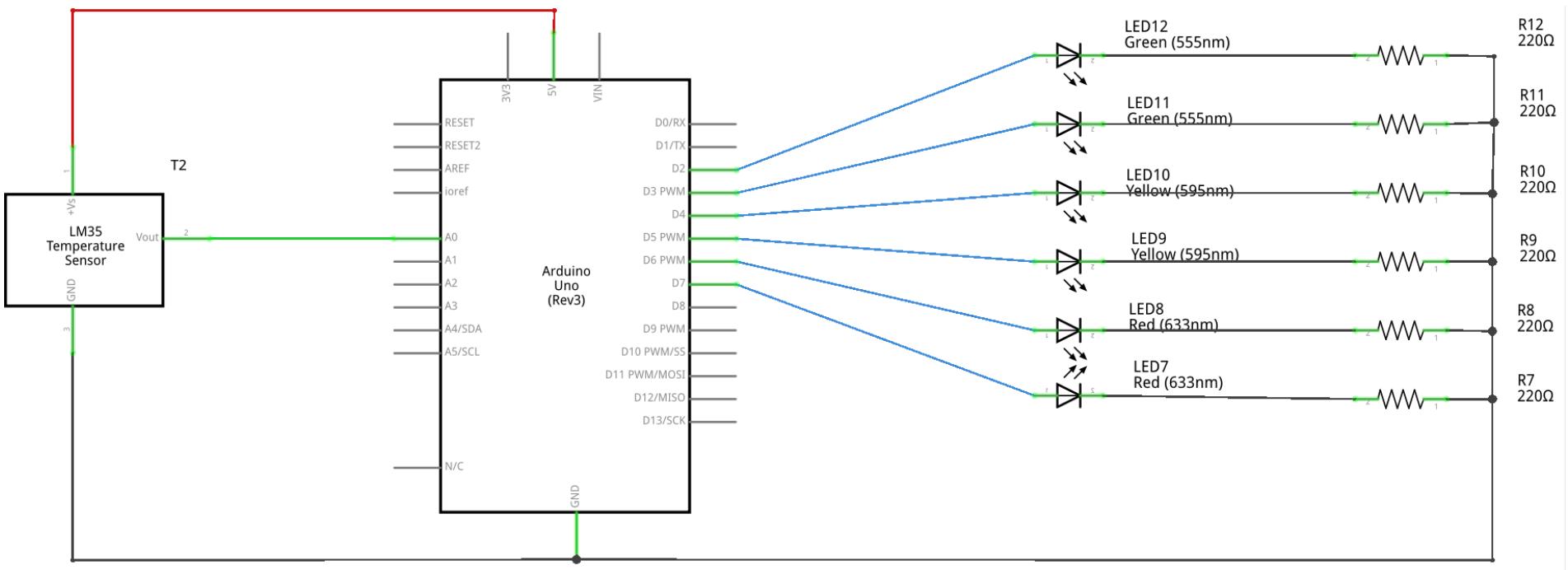


Lab 10: thermometer



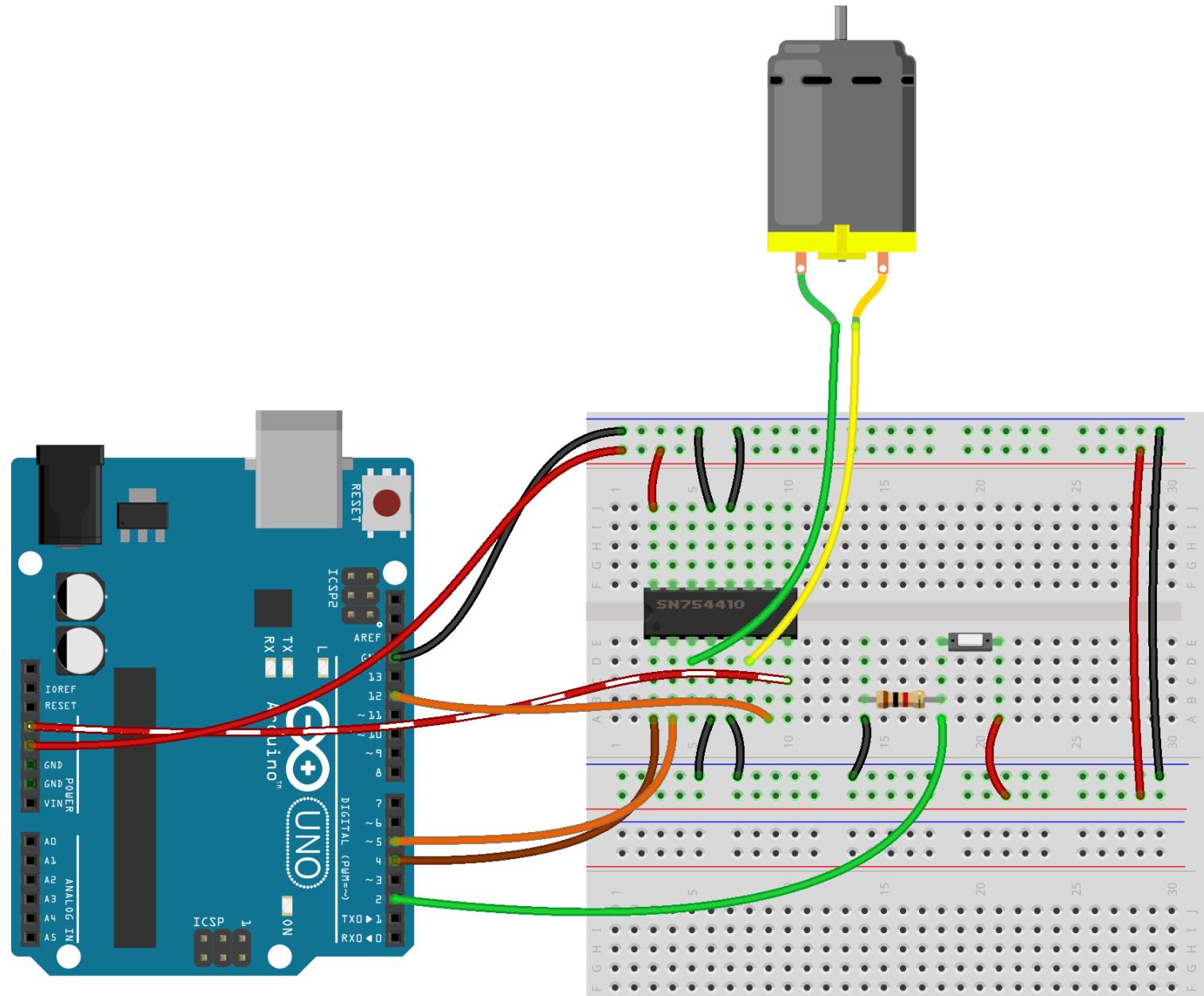
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Lab 10 : thermometer

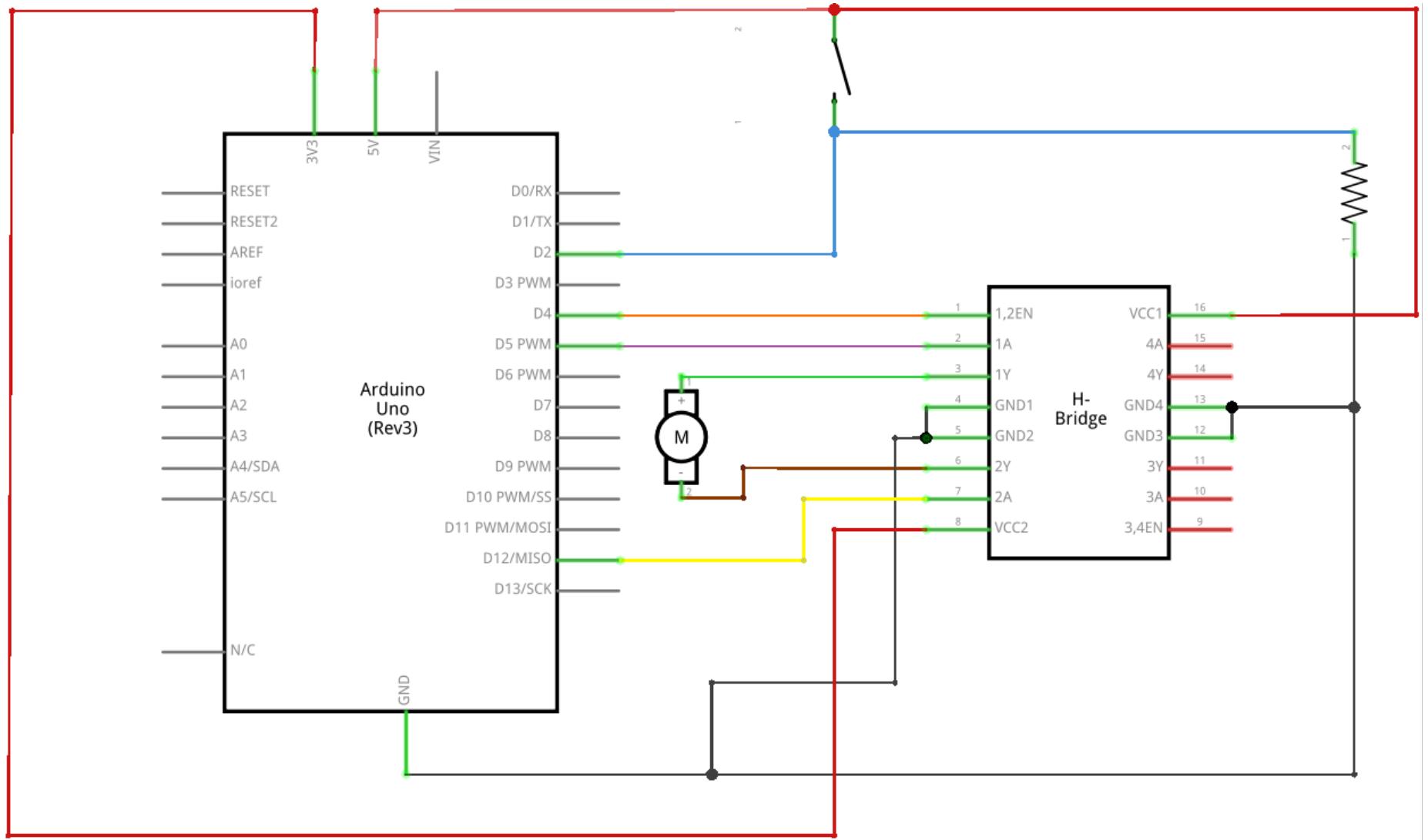


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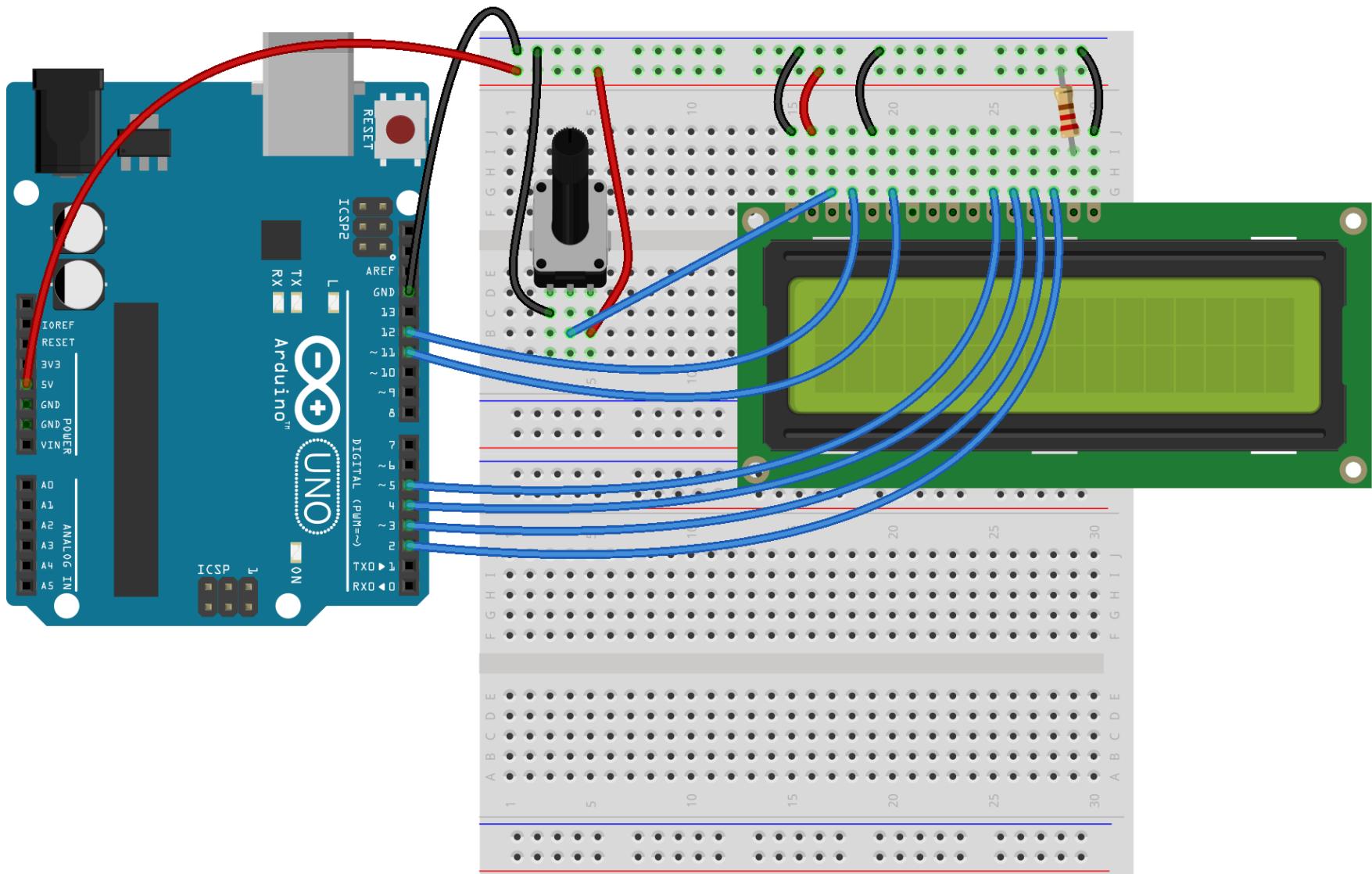
Lab 11: Dc motor controlling



Lab 11 : Dc motor controlling

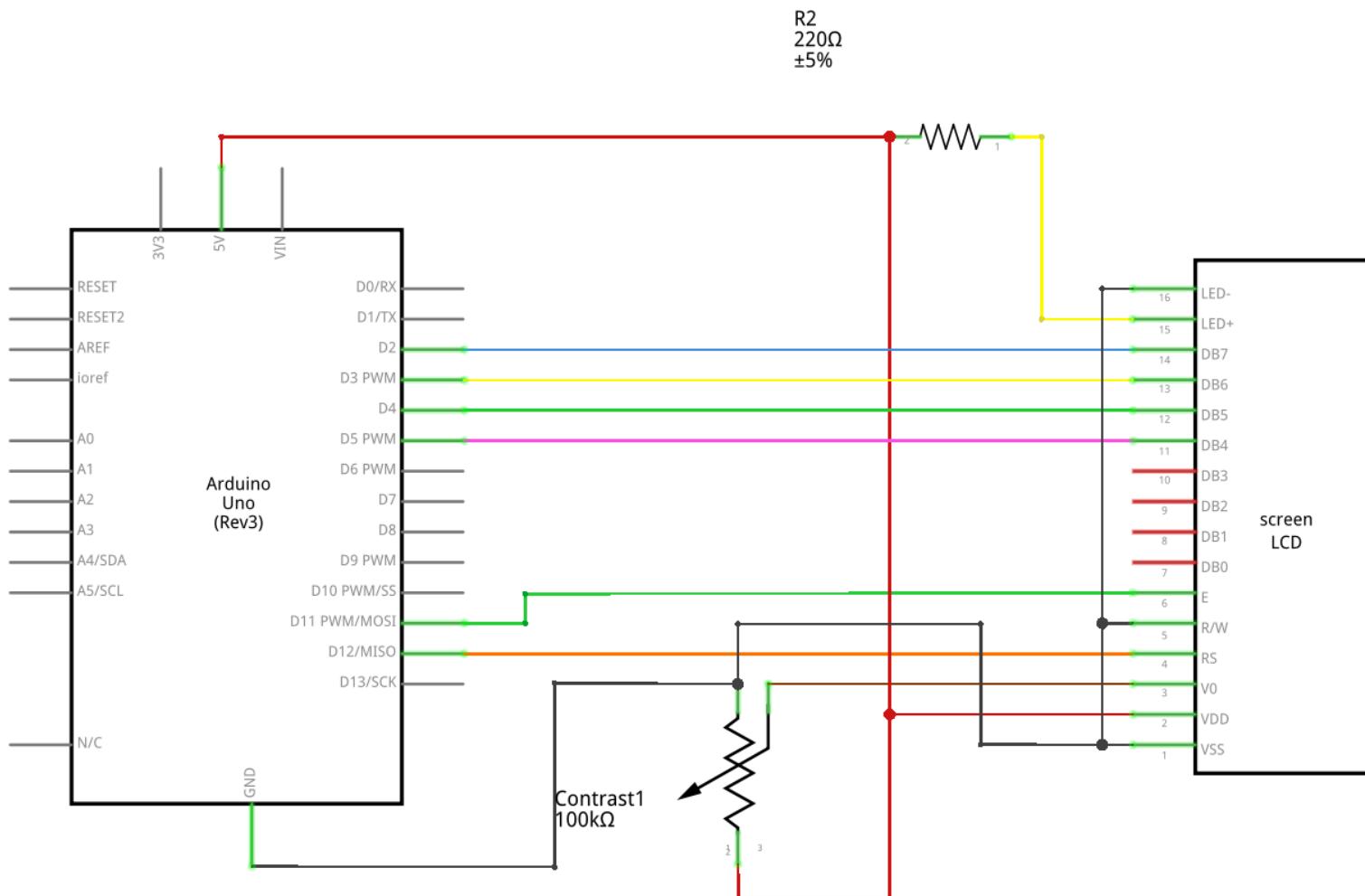


Lab 12 :Lcd



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Lab 12 : Lcd





Thank You