LAB 3 – MAKERSPACE LABS – LED SEQUENCE WITH A PUSHBUTTON

Use Lab 0 as a reference to this Lab

Click hyperlinks (blue underlined text) to learn more about a particular topic or concept.

Objectives

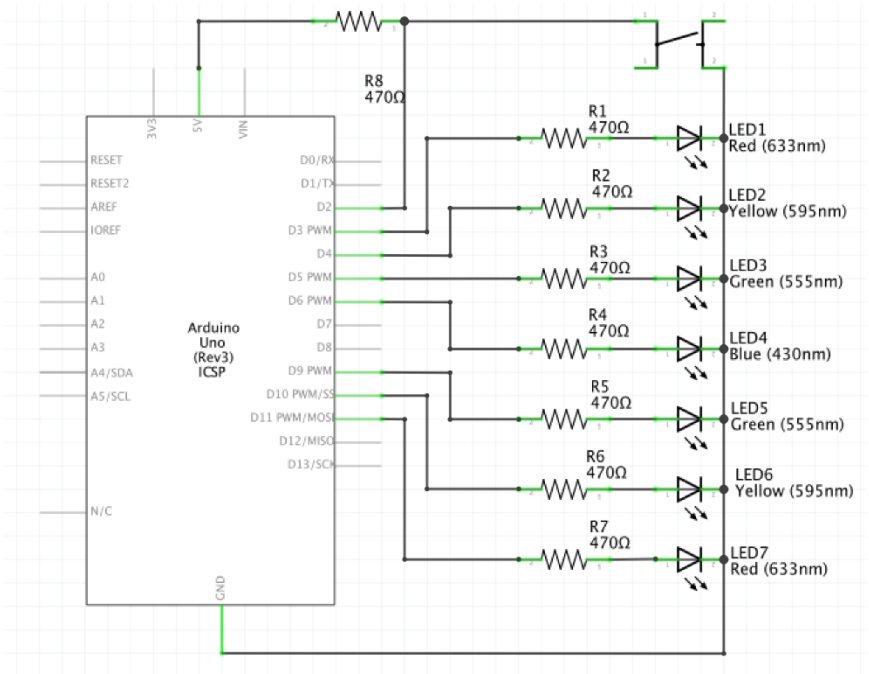
- Connect 7 LEDs in a sequence
- Control the sequence with a Pushbutton

Parts/Equipment Required

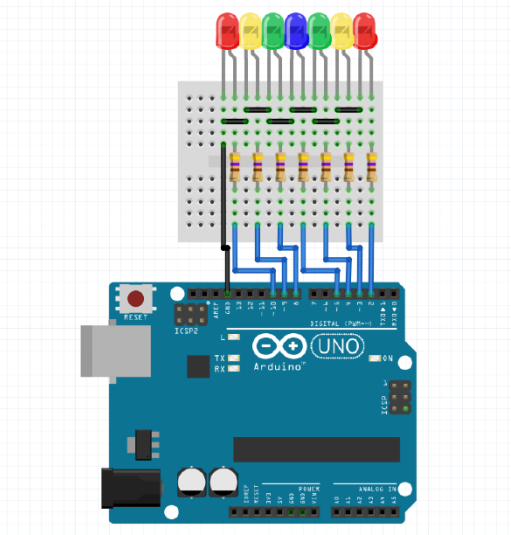
- Arduino Uno
- Breadboard
- Laptop
- USB Cable
- Several LEDs
- Several 470Ω Resistors
- Pushbutton
- Various Wires

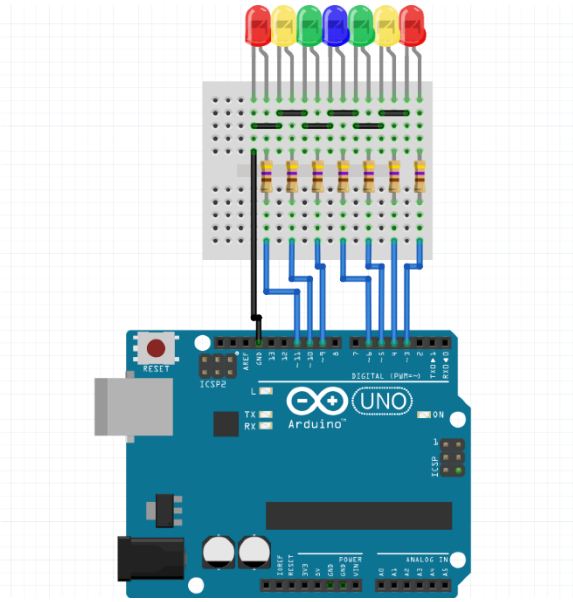
Harware

In this lab, we are going to be wiring a circuit that looks like this:



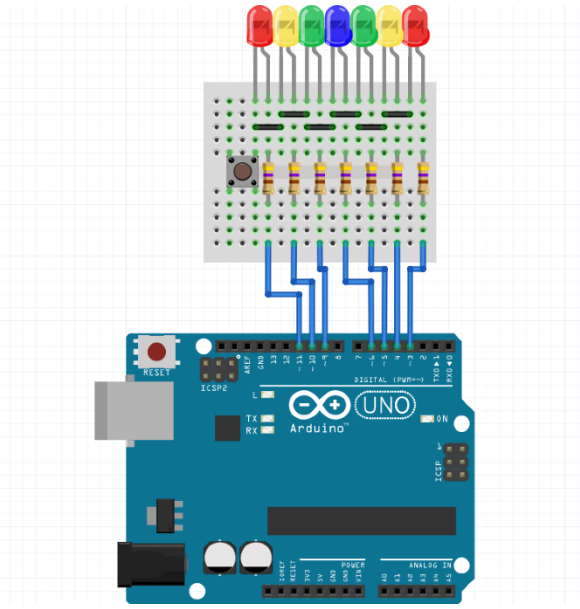
1. This lab is an extension on Lab 2, using the ending product.

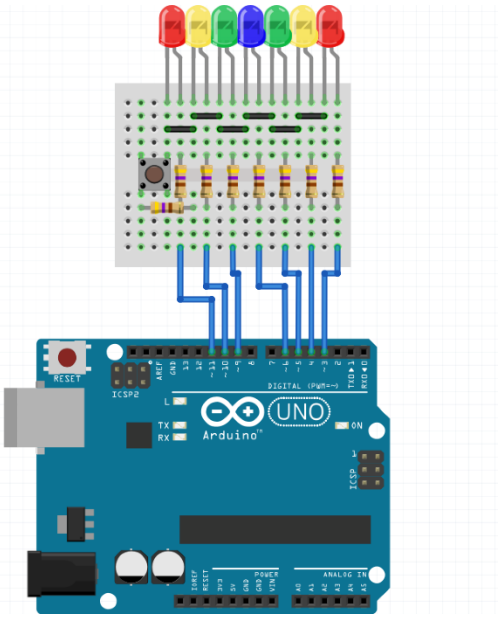




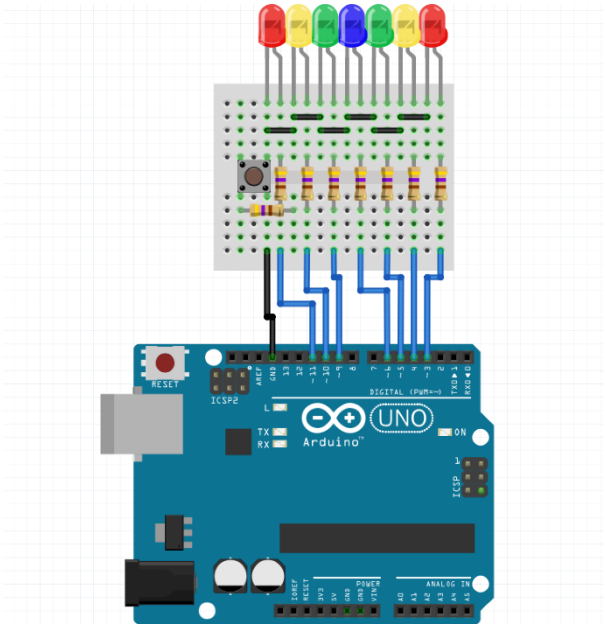
2. Now change the pins to 3,4,5,6 & 9,10,11 to make room for the pushbutton.

3. Remove the Ground Wire, and insert the pushbutton, connecting with the last LED on the left.

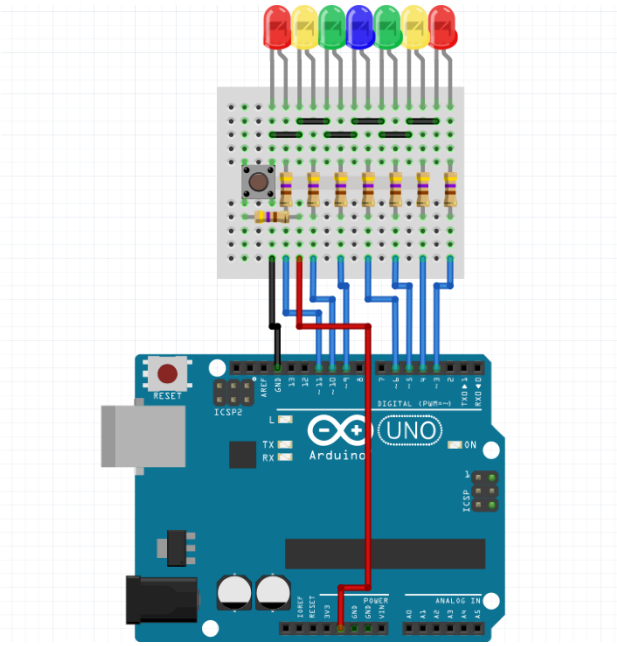




6. Add a 470Ω resistor from the pushbutton to a part of the Breadboard with no wire.

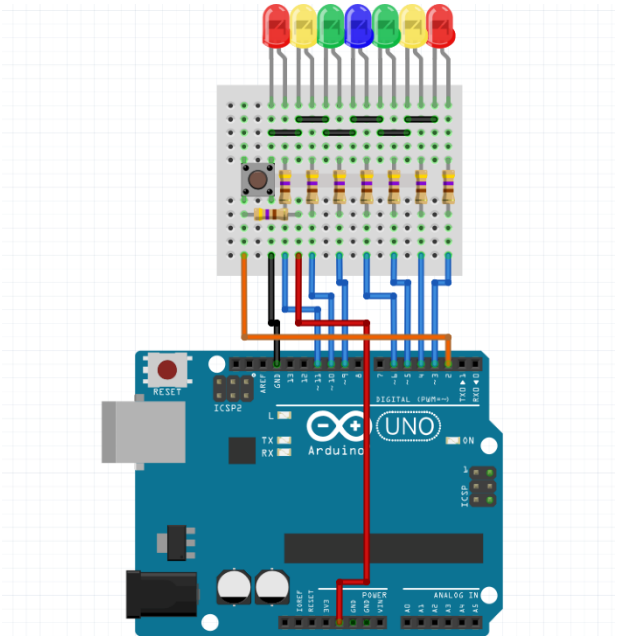


5. Add a new black ground wire to the right side of the pushbutton.



4. Connect the 5V power supply the end of the 470Ω resistor connected to the pushbutton.

7. Connect Pin 2 of the Arduino to the left side of the pushbutton with a different coloured wire. Must be in Pin 2 for the Pushbutton.



Software

Type the code on the next page into the Arduino IDE. Because there is a lot of code, it might be a good idea to copy and paste it from https://arudino.zaugg.ca /code/Lab3_Code.html instead. Once you've copied the code, flashed the Arduino, and verified that things are working correctly, feel free to mess around with different parts of the code to see what they do. There are a lot of interesting and advanced components to this code.

```
/** Advanced Sequence
 *  @author Torin Zaugg
 *  @date 02/12/2018
 *  @comments Working with Arduino UNO
 */

int lamps[] = {3, 4, 5, 6, 9, 10, 11}; //This array contains the pins of all the LEDs
#define Button 2            //This defines which pin the button is on

int sequenceRuns = 5;       //The number of times the sequence should run when the button is pressed
int sequenceDirection = 1;  //Which direction the sequence should run in
boolean doSequence = false; //Wether or not the sequence should run, by default it should not (thus false)

/*
 * The setup function - this code is only ran once
 * Use it to setup the interrupt from the butotn, set the direction of the LED pins and button pin
 */
void setup() {

  /*
   * attachInterrupt() tells the arduino to run a function each time the button is pressed (this is called an interrupt.
   * It takes 3 parameters:
   * The first is the pin that triggers the interrupt
   * The second is the name of the function to run
   * The thrid is what to watch for - falling is the pin going to ground, rising is the pin going to +5V.
   */
  attachInterrupt(digitalPinToInterrupt(Button), runSequence, FALLING);

  //Set the direction of the LEDs to output by running through the array with a for loop
  for (int i = 0; i < 7; i = i + 1){
    pinMode(lamps[i], OUTPUT);
  }

  pinMode(Button, INPUT);   //Set the button to an output

  //Turn off all the LEDs buy running through the array with a for loop
  for (int i = 0; i < 7; i = i + 1){
    digitalWrite(lamps[i], LOW);
  }

}
```

```
/*
 * The runSequence function - this code is ran each time the interrupt is run.
 * The interrupt is run by pressing the button
 */
void runSequence(){
  doSequence = true;      //Next time loop() is called, the sequence will run
}

/*
 * The loop function - this code is run repeatedly
 */
void loop() {
  if(doSequence){         //If doSequence is true (the button has been pressed)

    //Repeat as many times as the value of sequenceRuns
    for(int i = 0; i < sequenceRuns; i = i + 1){

      if(sequenceDirection == 1){            //If sequenceDirection is set to 1
       for (int i = 0; i < 7; i = i + 1){     //For each LED in the array
          digitalWrite(lamps[i], HIGH);       //Turn the LED on
          delay(250);                         //Wait 250 miliseconds
        }
        for (int i = 0; i < 7; i = i + 1){    //For each LED in the array
         digitalWrite(lamps[i], LOW);         //Turn off the LED
         delay(250);                          //Wait 250 miliseconds
       }

      }else{                                  //If sequenceDirection is not set to 1
        for (int i = 7; i > -1; i = i - 1){   //For each LED in the array in reverse order
          digitalWrite(lamps[i], HIGH);       //Turn on the LED
          delay(250);                         //Wait 250 miliseconds
        }
        for (int i = 7; i > -1; i = i - 1){   //For each LED in the array (stil in reverse)
         digitalWrite(lamps[i], LOW);         //Turn off the LED
         delay(250);                          //Wait 250 miliseconds
       }
      }
    }
    doSequence = false; //set doSequence to false to the sequence only runs the number of times
                        //of sequenceRuns and doesn't run every time loop() is called.
  }

}
```