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CS412

Week 6: Traffic Light Prototype

About this Assignment:

This assignment will show how to implement three different colored LEDs on an Arduino board.

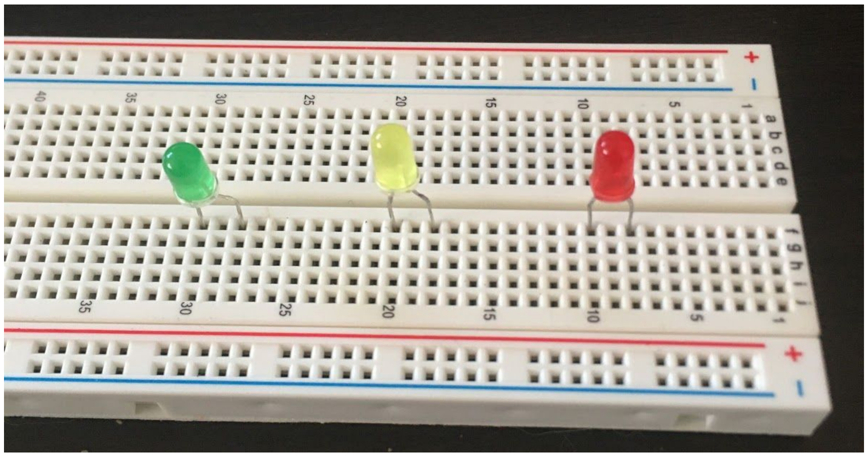
Supplies:

- 1 x 830 Tie-Points Breadboard
- 1 x UNO R3 Controller Board
- 3 x (330 Ohm) Resistors
- 3 x LED lights -- To make a traffic light prototype, choose Red, Yellow, Green colors
- 4 X Breadboard Jumper Wires

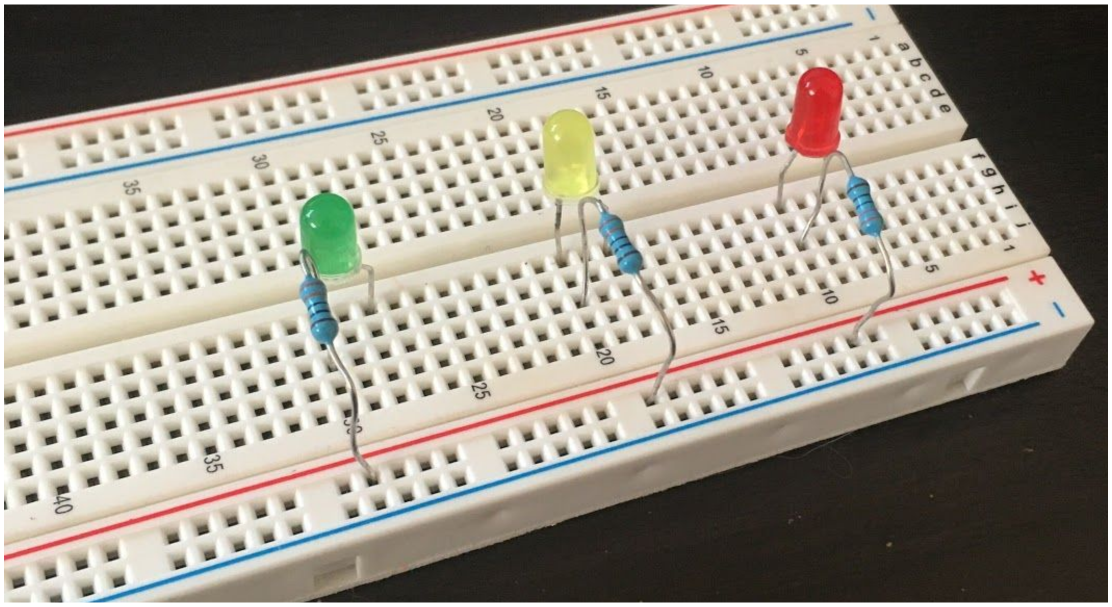
For this prototype, I will implement flashing lights, where all three LEDs will be flashing at different rates.

The Circuit:

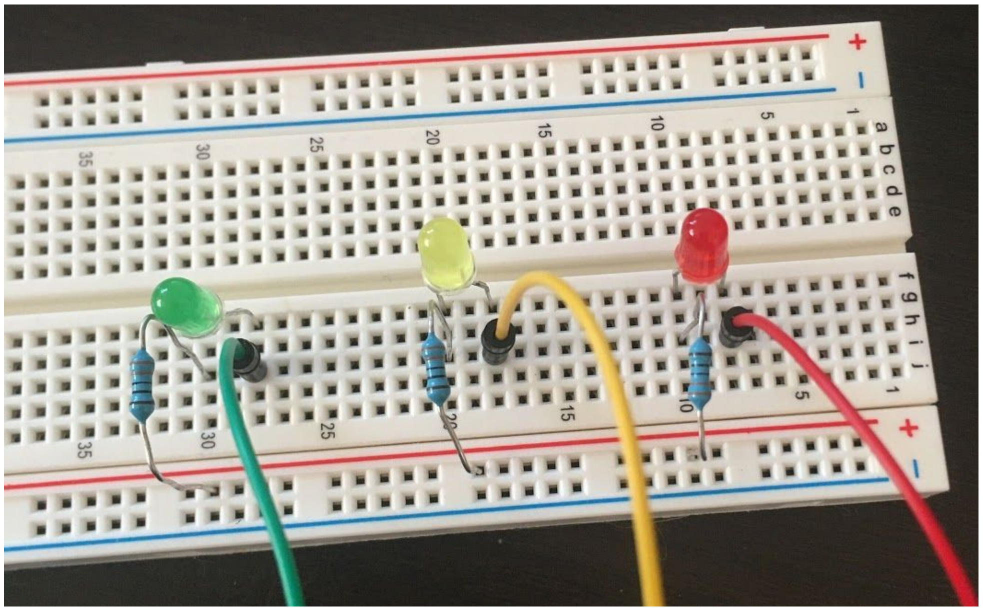
First, place the LEDs on the breadboard, with enough room to work comfortably. Be aware of where the negative lead (shorter end) and the positive lead (longer end) are placed. LEDs are polarized, which means that they have a certain way they need to be connected.



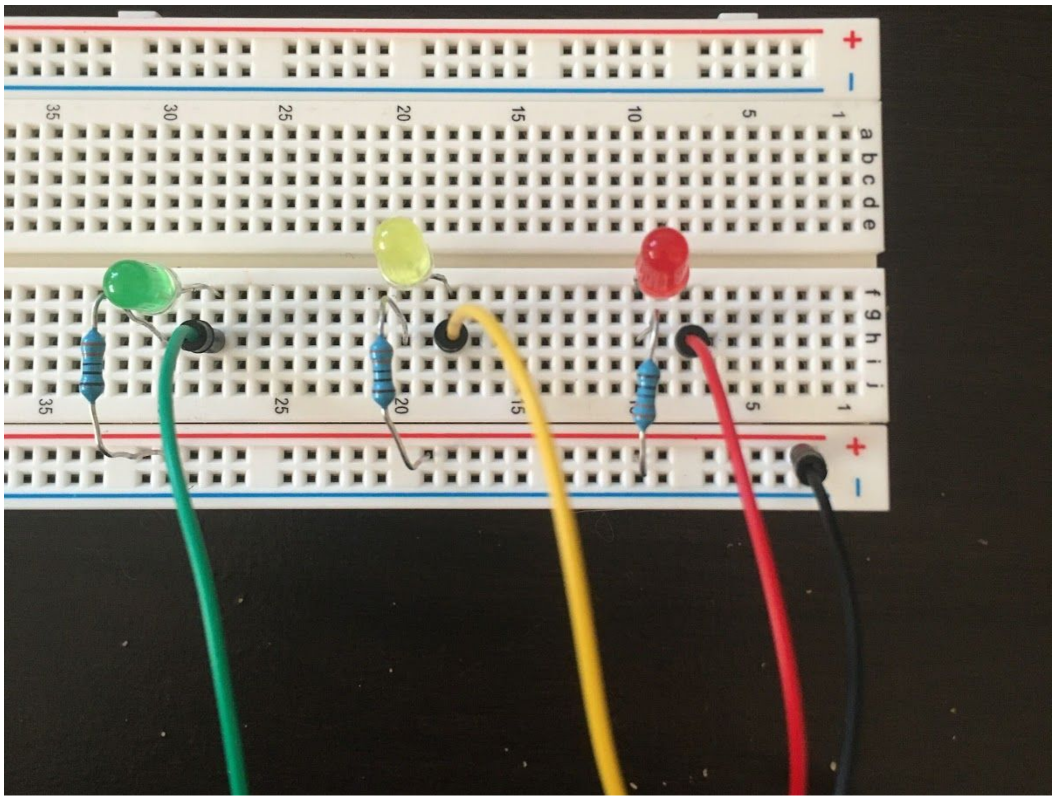
Next, place the three 330 Ohm resistors with one lead connected with the negative lead of the LED, and the other with the positive long row of the breadboard.



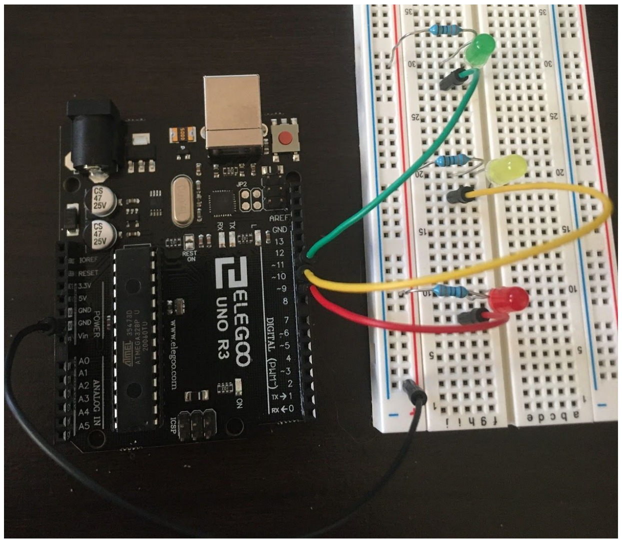
Next, connect three jumper wires on your breadboard, connecting to the positive lead (longer end) of your LEDs. To follow along with the traffic lights, red jumper wire will be connected to the red LED, yellow to yellow, and green to green.



Next, place the last jumper wire on the positive row of your breadboard. Since this jumper wire will connect to the ground, I chose the color black to correspond to the ground state.



Next, connect your ground (black) wire to the “GND” on your Arduino. For this prototype, we’ll be using pins 9, 10, 11, for red LED, yellow LED, and green LED , respectively. Find the digital pins 9, 10, 11 on the arduino board and connect them.



Connect your Arduino to your computer via the USB cable, and run the code below.

Code:

```
const int redLightPin = 9;
const int greenLightPin = 11;
const int yellowLightPin = 10;
void setup() {
  // put your setup code here, to run once:
  pinMode(redLightPin, OUTPUT);
  pinMode(greenLightPin, OUTPUT);
  pinMode(yellowLightPin, OUTPUT);
}

void loop() {
  // put your main code here, to run repeatedly:
  digitalWrite(redLightPin, LOW);
  digitalWrite(yellowLightPin, LOW);
  digitalWrite(greenLightPin, HIGH);
  delay(50);
  digitalWrite(redLightPin, LOW);
  digitalWrite(yellowLightPin, HIGH);
  digitalWrite(greenLightPin, LOW);
  delay(50);
  digitalWrite(redLightPin, HIGH);
  digitalWrite(yellowLightPin, LOW);
  digitalWrite(greenLightPin, LOW);
  delay(50);
  digitalWrite(redLightPin, LOW);
  digitalWrite(yellowLightPin, LOW);
  digitalWrite(greenLightPin, LOW);
  delay(50);
}
```

Explanation:

Every Arduino program needs two things for it to work, namely: `void setup() {}` and `void loop() {}`. When you run your Arduino, the code within the `setup()` method will run, once that's done the `loop()` method will run until power is removed from the Arduino.

Before the `setup()`, we assign pins 9, 10, 11 a name so that we know which pins we are controlling, namely so:

```
int redLightPin = 9;
```

Doing this also for the other pins. Then every time we write redLightPin in our code, Arduino will interpret it as 9. Within the `setup()` method, we write a line of code that will let Arduino know that pin 9 will act as an output. An output, in our case, is a pin with either HIGH or LOW values, which translates to ON or OFF, respectively. Hence, we write

```
pinMode(redLightPin, OUTPUT);
```

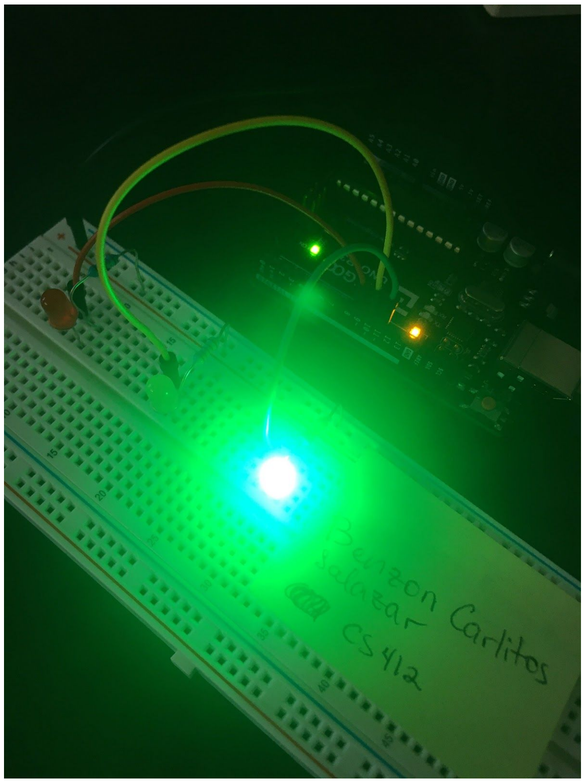
To control the LED, we write within the `loop()` method a `digitalWrite()` function that will set pin 9 HIGH, or ON, which means that while it is high, it should output a voltage.

```
digitalWrite(redLightPin, HIGH);
```

To create a blinking effect lasting a full second, we add a delay using the `delay()` function with 1000 as the given argument to stand for 1000 milliseconds. And then add another `digitalWrite()` pass with another delay.

```
digitalWrite(redLightPin, HIGH);
delay(1000);
digitalWrite(redLightPin, LOW); // to turn off
delay(1000);
```

The above code I provided will create flashing lights, instead of slow blinks, of the three LED colors. More images below: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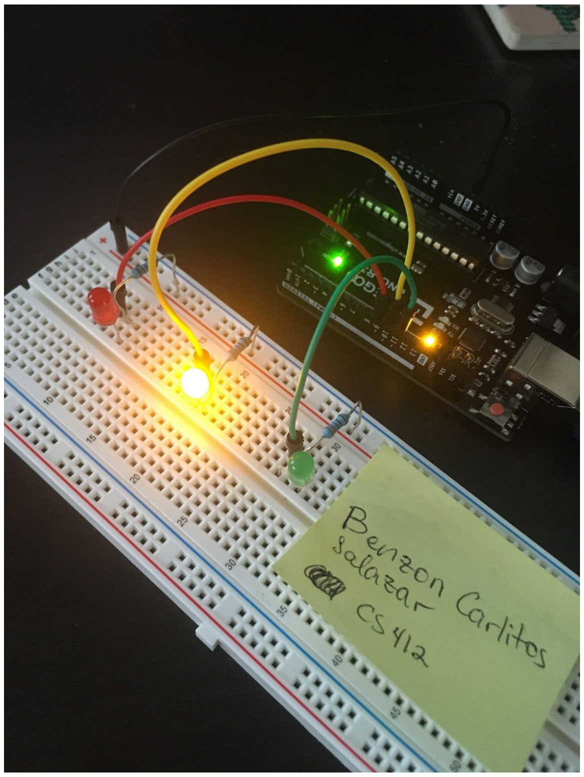
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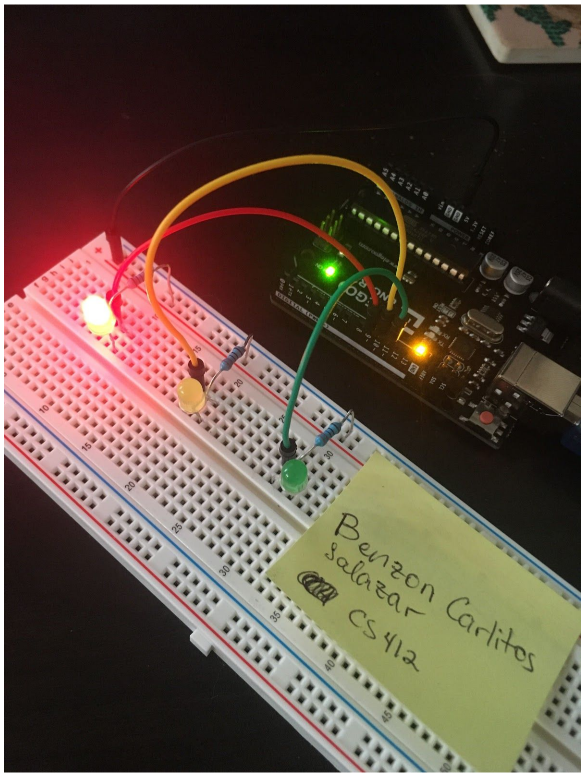
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