American International University- Bangladesh

Department of Computer Science

Lab Report Cover Sheet

Course Name	MICROPROCESSOR AND EMBEDDED SYSTEMS
Lab Report No.	01
Lecturer Name	**MD. ALI NOOR**
Semester	SUMMER 2021-22
Submission Date	02/06/2022
Section	O
Group No.	03

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Experiment No

01

TITLE

Familiarization with microcontroller, study of blink test using and implementation of a traffic control system using microcontrollers.

OBJECTIVE

The objective of this experiment is to get familiarized with Microcontroller.

- Learning to make the LED blink using Arduino and the delay functions.
- Implementation of a traffic control system using Arduino.

Introduction

A microcontroller is a small computer on a single metal-oxide-semiconductor integrated circuit chip. A typical microcontroller includes a processor, memory and input/output peripherals on a single chip. Sometimes referred to as an embedded controller or microcontroller unit (MCU), microcontrollers are found in vehicles, robots, office machines, medical devices, mobile radio transceivers, vending machines and home appliances, among other devices. They are essentially simple miniature personal computers designed to control small features of a larger component, without a complex front-end operating system.

A microcontroller is embedded inside of a system to control a singular function in a device. It does this by interpreting data it receives from its I/O peripherals using its central processor. The temporary information that the microcontroller receives is stored in its data memory, where the processor accesses it and uses instructions stored in its program memory to decipher and apply the incoming data. It then uses its I/O peripherals to communicate and enact the appropriate action. Microcontrollers are used in a wide array of systems and devices. Devices often utilize multiple microcontrollers that work together within the device to handle their respective tasks.

Abstract

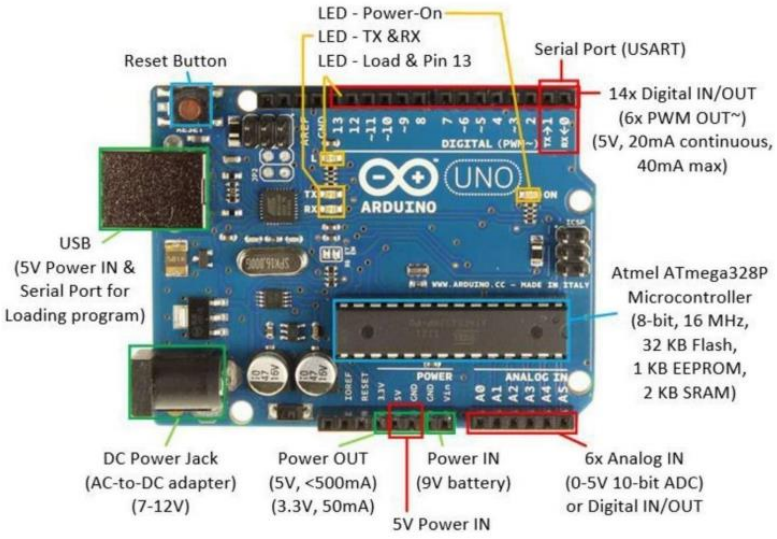
In this experiment, we were introduced with microcontroller. We got to know about the structure of the microcontroller and how it works. Arduino Uno (R3), Lilypad Arduino, Red Board, Arduino Mega (R3), Arduino Leonardo, etc. we saw as introduction. The components of Arduino Uno are - Reset button, USB controller, Serial-to-USB circuitry, 7-12V DC input, Power and auxiliary pins, Analog-to-Digital converter (ADC) inputs, AT Mega 328 MCU, MCU programming controller, Debug LED, General I/O. As this is a pandemic situation and we are attending our classes remotely, we used Autodesk Tinkercad to perform this task. To get used to with Arduino Uno, we implemented a simple traffic control system via Autodesk Tinkercad. We used to the sample code given on the lab report to control the blinking of the LED.

Using this knowledge, we tried to implement a Temperature monitoring system.

THEORY AND METHODOLOGY

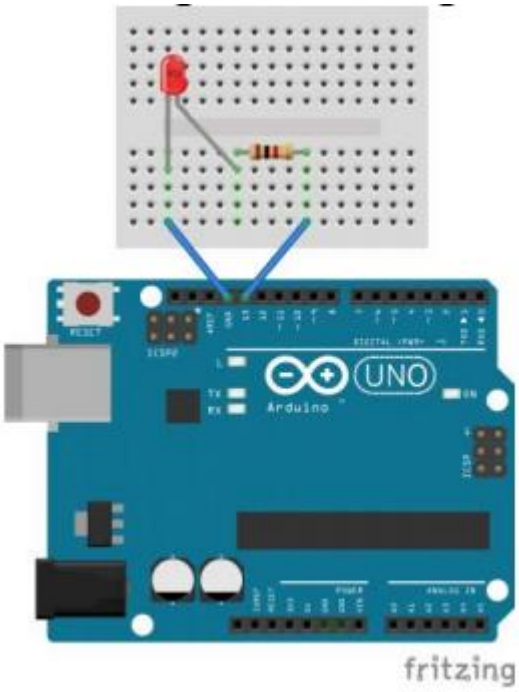
Arduino is an open-source platform used for creating interactive electronics projects. Arduino consists of both a programmable microcontroller and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the microcontroller board. Arduino Uno also doesn't need a hardware circuit (programmer/ burner) to load a new code into the board. We can easily load a code into the board just using a USB cable and the Arduino IDE (that uses an easier version of C++ to write a code).

Figure 1: Arduino UNO R3

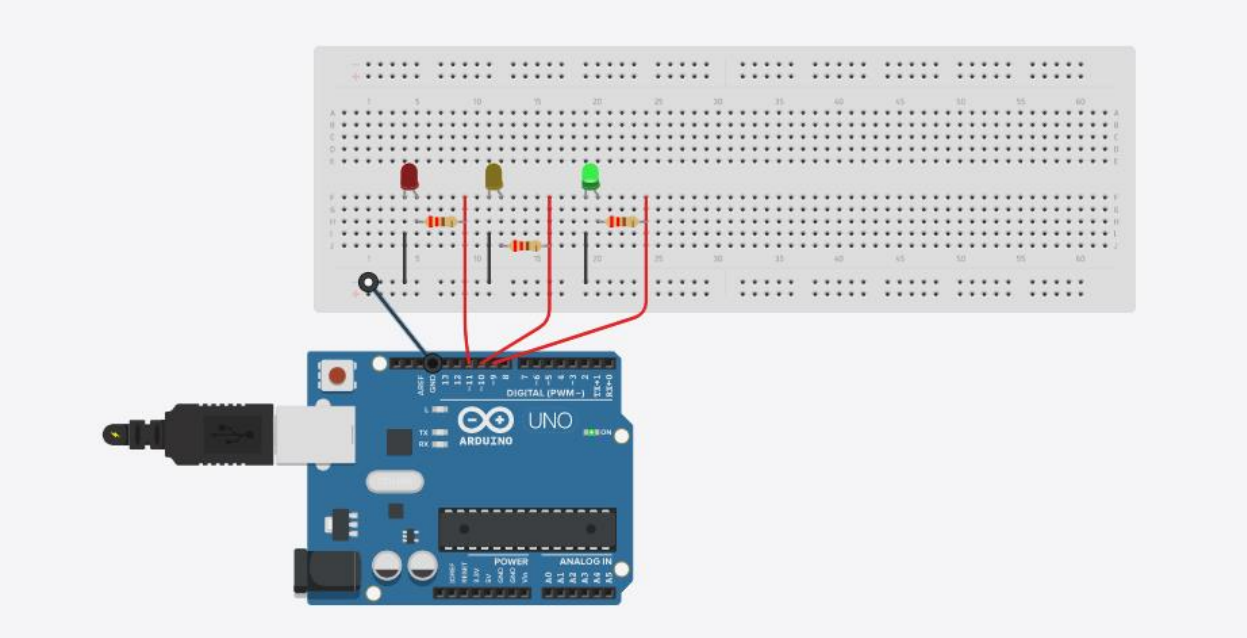


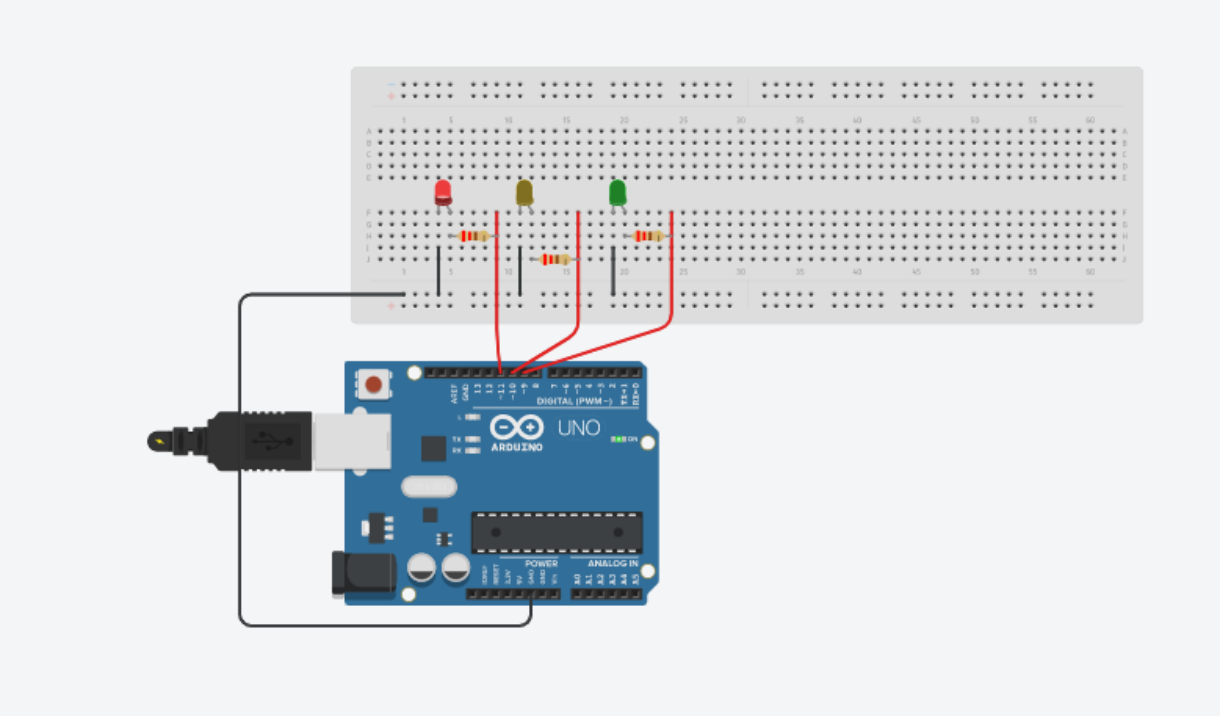
EXPERIMENT AND RESULT

1.Atfirst, Making the circuit first using the following connection system between all the elements.



2. Understand the normal operation of a traffic control system .





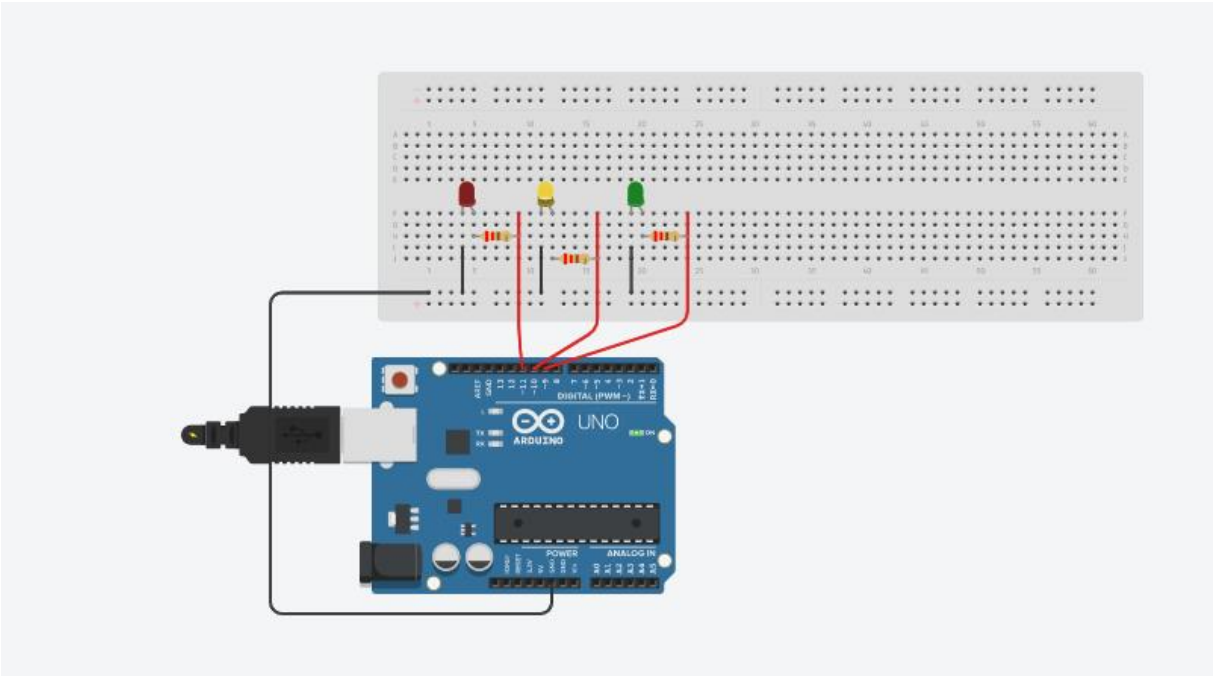


Figure : Circuit of traffic control system

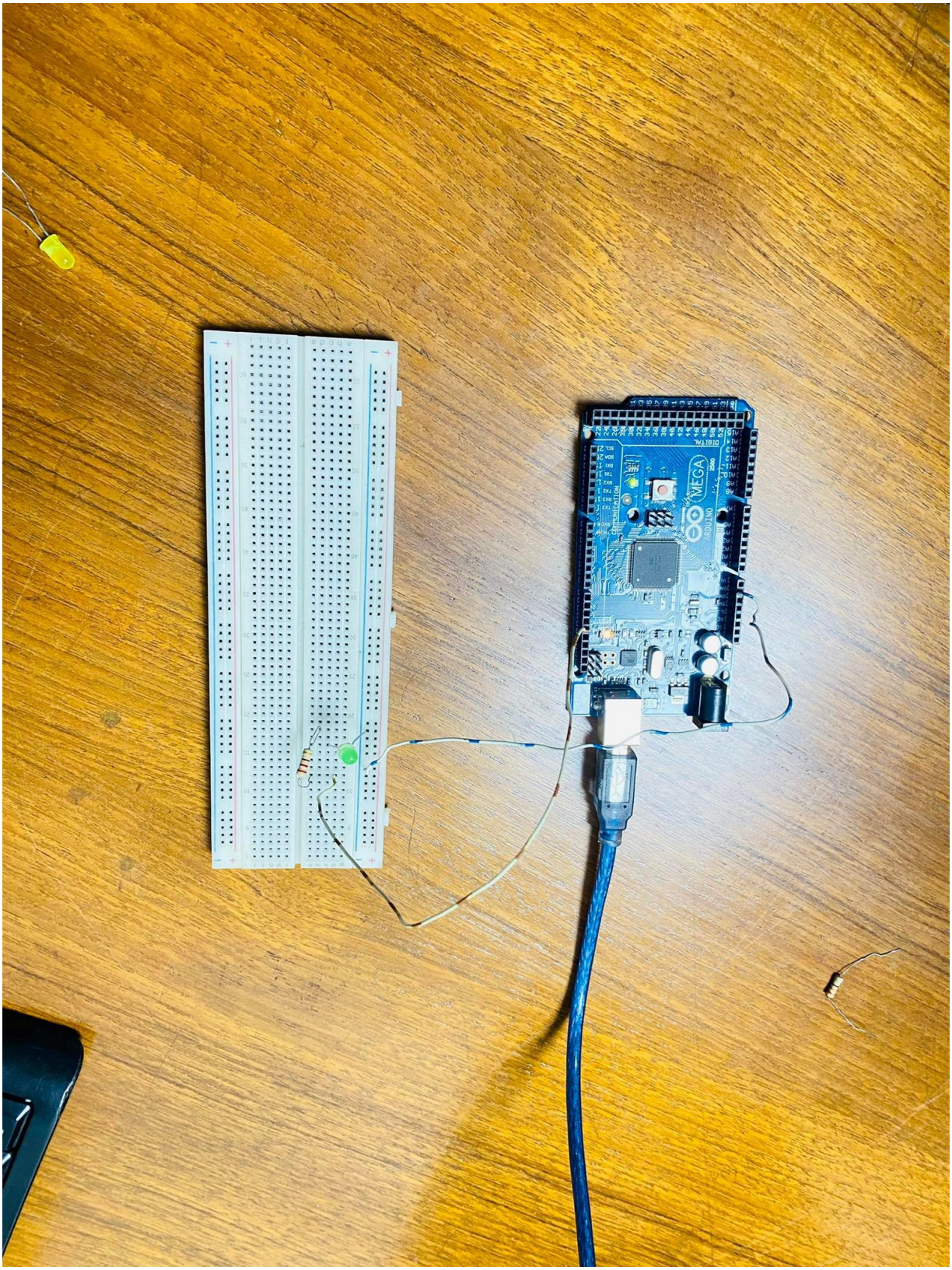
CODE WRITING

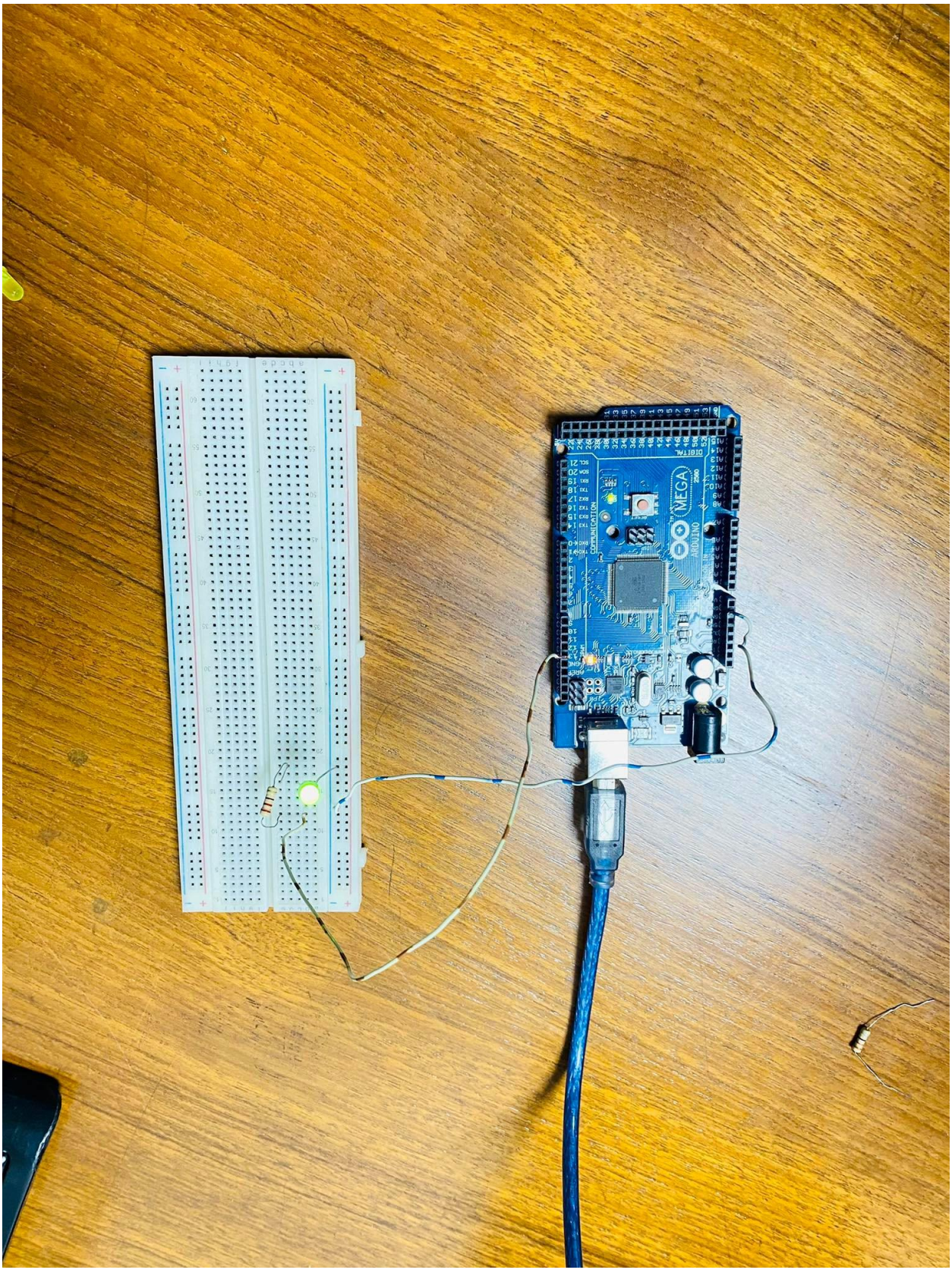
CODE:

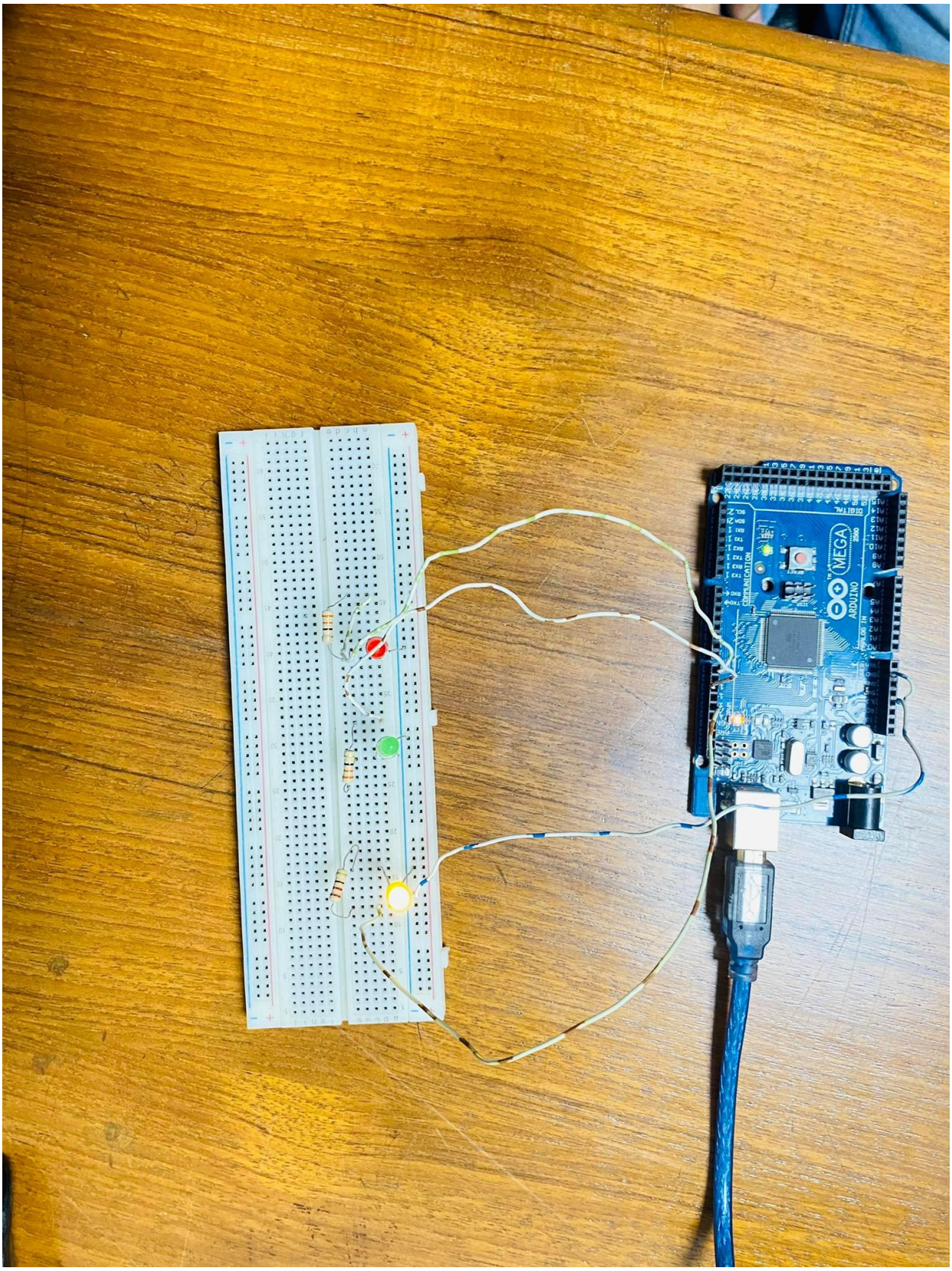
```
void setup() {
// pin connections for the LED lights
pinMode(8,OUTPUT);
pinMode(10,OUTPUT);
pinMode(12,OUTPUT);
}
void loop() {
// turning on voltage at output 8(for red LED)
digitalWrite(8,HIGH);
delay(3000); // red LED is on
// turning on voltage at output 8(for red LED)
digitalWrite(10,HIGH);
delay(1000); // yellow LED is on
//for turning off red and yellow and turning on green
digitalWrite(8,LOW);
digitalWrite(10,LOW);
digitalWrite(12,HIGH);
delay(3000);
digitalWrite(12,LOW); //green is off for blinking next
//to make green on and off for 3 times
delay(500);
digitalWrite(12,HIGH);
delay(500);
digitalWrite(12,LOW);
delay(500);
digitalWrite(12,HIGH);
delay(500);
```

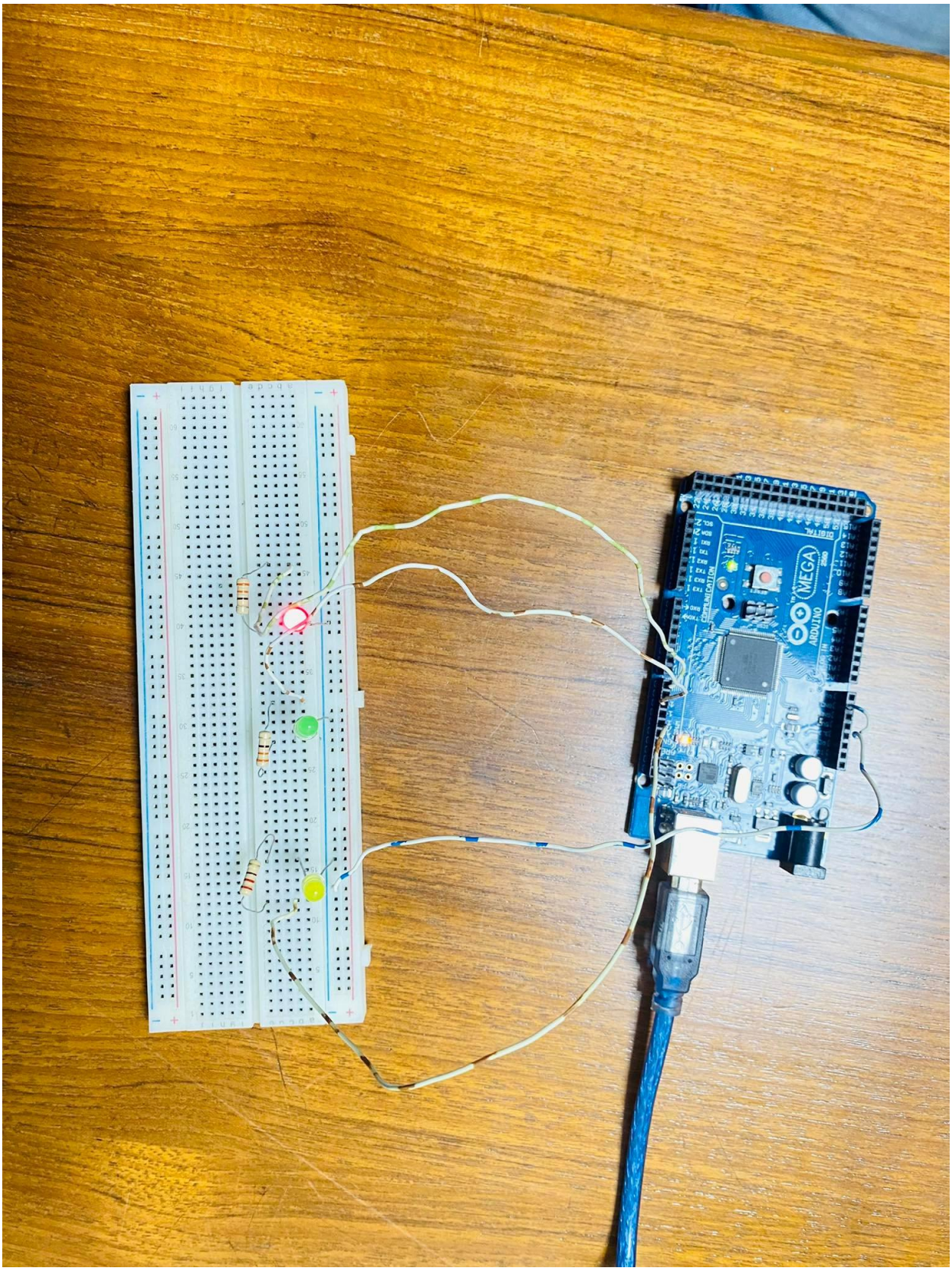
```
digitalWrite(12,LOW);
delay(500);
digitalWrite(12,HIGH);
delay(500);
digitalWrite(12,LOW);
//to turn yellow on once
digitalWrite(10,HIGH);
delay(1000);
digitalWrite(10,LOW);
}
```

Lab Simulation:


ARDUINO
MEGA


MEGA
ARDUINO
ONEMORE
DIGITAL
COMMUNICATION


MEGA
ARDUINO


MEGA
ARDUINO

WORKING PROCEDURE

- First we familiarized with the different type Arduino family components. Arduino UNO Microcontroller is one of them.
- After that, we know the basic working principle of linkercad software.
- At first we need to open linkercad online software to implement the given circuit. Then we select different type of components to implement it.
- Next we write the code to run traffic light system.
- After that we implements the circuit in the bread board and connect this experiment in the hardware.

REPORT

1. Include all codes and scripts into lab report following the writing template mentioned in appendix A of Laboratory Sheet Experiment 1.

Answer – Attached above.

DISCUSSION

While doing this experiment, we were very careful on circuit connection. This experiment is done via Autodesk Tinkercad. Maybe for viewer internet issue or for some technical issue, there is a chance the link might not be opened. The code we gave as input was working properly.

CONCLUSION

This experiment was to get familiar with microcontroller. We implemented the given traffic control system and also completed our given task 'Temperature monitoring system' successfully. We followed our teacher's instruction on every step for this experiment.

REFERENCE(S)

1) https://www.arduino.cc
2) https://www.coursera.org/learn/arduino/lecture/ei4ni/1-10-first-glance-at-a-program
3) https://learn.adafruit.com
4) https://www.instructables.com
5) Jeremy Blue; Exploring Arduino: Tools and Techniques for Engineering Wizardry.