AMERICAN INTERNATIONAL UNIVERSITY-BANGLADESH

Faculty of Engineering

Lab Report

Experiment # 01

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

Date of Performance:	13 July 2025	**Date of Submission:**	20 July 2025
Course Title:	Microprocessor and Embedded Systems Lab		
Course Code:	EEE4103	**Section: L**	
Semester:	Summer 2024-25	**Degree Program:**	BSc in CSE
Course Teacher:	**Prof. Dr. Engr. Muhibul Haque Bhuyan**		

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FACULTY COMMENTS	**Marks Obtained**	
	Total Marks	

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Marking Rubrics (to be filled by Faculty):

Level Category	Excellent [5]	Proficient [4]	Good [3]	Acceptable [2]	Unacceptable [1]	No Response [0]
Title and Objectives	Able to clarify the understanding of the lab, no issues are missing, and formatting is good.	Able to clarify the understanding of the lab experiment, no issues are missing, but its formatting is not good.	Able to clarify the understanding of the lab experiment, but a few wrong issues, and its formatting is not good.	Able to clarify the understanding of the lab experiment, but it lacks a few important issues of the experiment, without maintaining the format.	Unable to clarify the understanding of the lab experiment.	No Response/ copied from others/ identical submissions with gross errors/image file printed
Codes and Methods	Able to explain the experimental codes and simulation methods using Proteus very well.	Able to explain the experimental codes and simulation methods using Proteus, but it is not formatted well.	Able to explain the experimental codes, but the simulation method using Proteus is not explained well.	Presents the experimental code but doesn't explain the simulation methods using Proteus.	Presents the experimental code but doesn't explain the simulation methods using Proteus.	
Results	Key results and images are there. Figures/Tables have all identifications and refer to them properly in the text.	Key results and images are there. Figures/Tables have all identifications, such as the axis labels, numbers, and captions, with a few minor errors; the texts refer to them.	Key results and images are there. Figures/Tables lack a few identifications, such as the axis labels, numbers, and captions; the texts refer to them.	Misses several key results and images. Figures/Tables lack identification, such as the axis labels, numbers, and captions; the texts don't refer to them.	Major results, such as experimental and simulation results' images, are not included. Figures and tables are poorly constructed or not presented.	
Discussion and Conclusion	Proper interpretation of results and summarizes the results to conclude, discusses its applications in real-life situations to connect with the report's conclusion.	Proper interpretation of results and summarizes the results to conclude, but didn't discuss its applications in real-life situations to connect with the conclusion of the report.	The interpretation of results is presented. However, there is a disconnect between the results and the discussion.	Misses the interpretation of key results. There is little connection between the results and the discussion.	Very poor interpretation of the results. No connection between results and discussions.	
Question and Answer	Able to produce all questions' answers correctly, maintaining the lab report format.	Able to produce all questions' answers but didn't maintain the lab report format.	Able to produce all questions' answers but wrong answers to a few questions.	Able to produce all questions' answers, but wrong/missing answers to multiple questions.	Unable to produce all the questions' answers, and completely wrong answers.	
Comments						**Total Marks (25)**

Objectives:

The objective of this experiment is to get familiarized with Microcontrollers. Besides, the specific objectives of this experiment are to-

- Make an LED blink using an Arduino and its delay function.
- Implement a traffic control system using Arduino and its delay function and LEDs.

Equipment List:

- Arduino IDE (any version)
- Arduino Uno (R3) board or Arduino mega 2560 board
- LED lights (RED, GREEN, and YELLOW)
- Three 100 ohms resistors, and
- Jumper wires

Circuit Diagram:

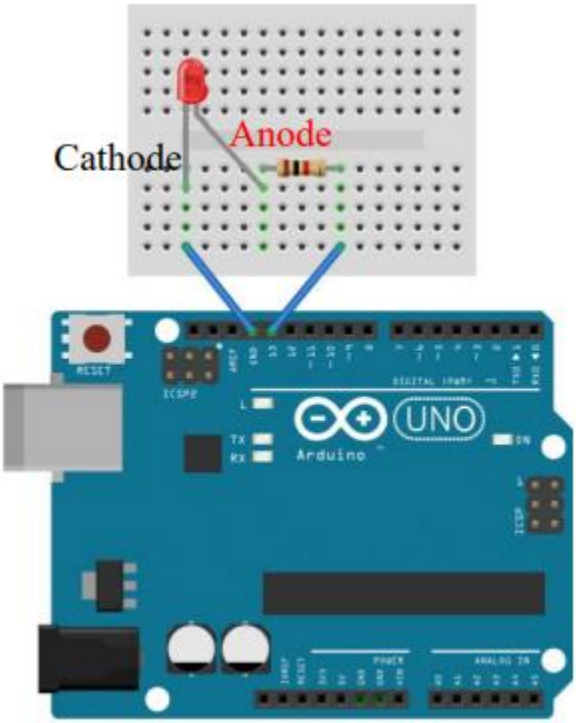


Figure 1.1: LED blink test

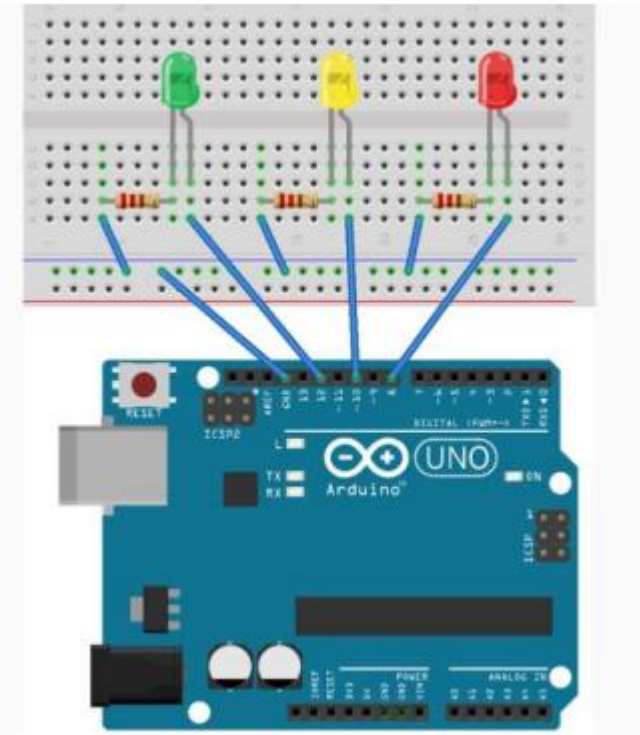


Figure 1.2: Traffic light control system

Experimental Output Results:

The main task of this lab is to understand and implement a traffic control system after understanding how to blink a LED light. Make the circuits first using the following connection system between all the elements.

- **LED Blink test:**

  Circuit Explanation:

  The circuit is constructed as follows:

  1. **LED**: The longer leg (anode) of the LED is connected to digital pin 13 of the Arduino Uno through a current-limiting resistor.
  2. **Resistor**: A 220Ω resistor is connected in series with the LED to limit the current and protect the LED from burning out.
  3. **Cathode (short leg)** of the LED is connected to **GND** (ground) on the Arduino.
  4. **Breadboard** is used to hold and connect components easily.
  5. The Arduino is powered and programmed through the USB cable.

Working Principle:

The Arduino Uno is programmed to turn pin 13 HIGH (which sends 5V) to light up the LED, then turn it LOW (0V) to turn the LED off. This happens repeatedly with a delay of 1 sec to creating a blinking effect.

Circuit Diagram:

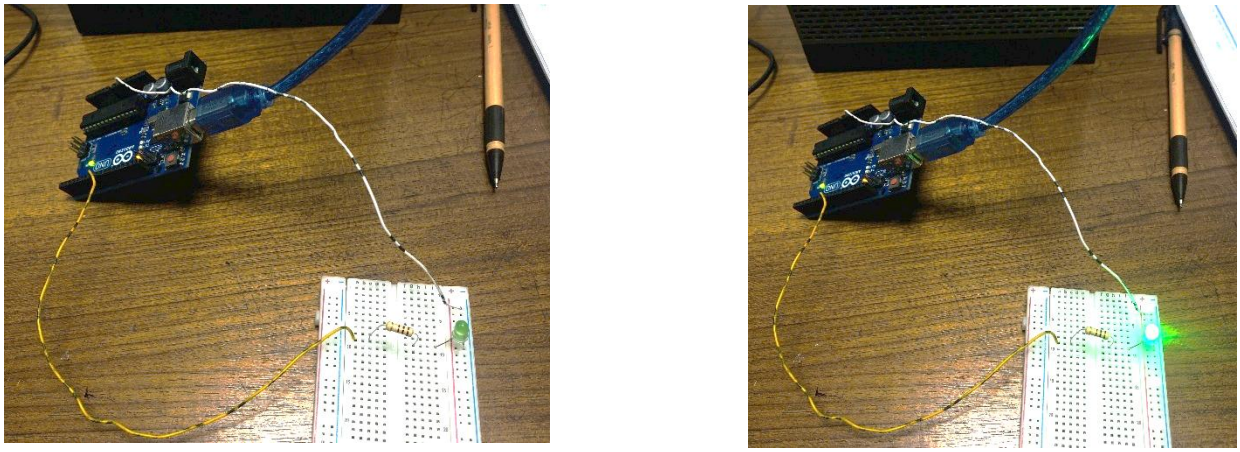


Figure 2.1: Circuit diagram of blink led.

- **Traffic control system:**

  Circuit Explanation:

  This circuit simulates a simple traffic signal where:

  - Red LED is connected to digital pin 12 through a 220Ω resistor.
  - Yellow LED is connected to digital pin 10 through a 220Ω resistor.
  - Green LED is connected to digital pin 8 through a 220Ω resistor.
  - The anode (long leg) of each LED is connected to its respective Arduino pin.
  - The cathode (short leg) of all LEDs is connected to GND.
  - A breadboard is used for organizing connections easily.

  Working Principle:

  This project simulates the standard traffic light sequence:

  1. Green light ON → Vehicles can go.
  2. Yellow light ON → Get ready to stop.
  3. Red light ON → Vehicles must stop.

  Each light stays ON for a specific duration before switching to the next, mimicking how real traffic lights work at intersections.

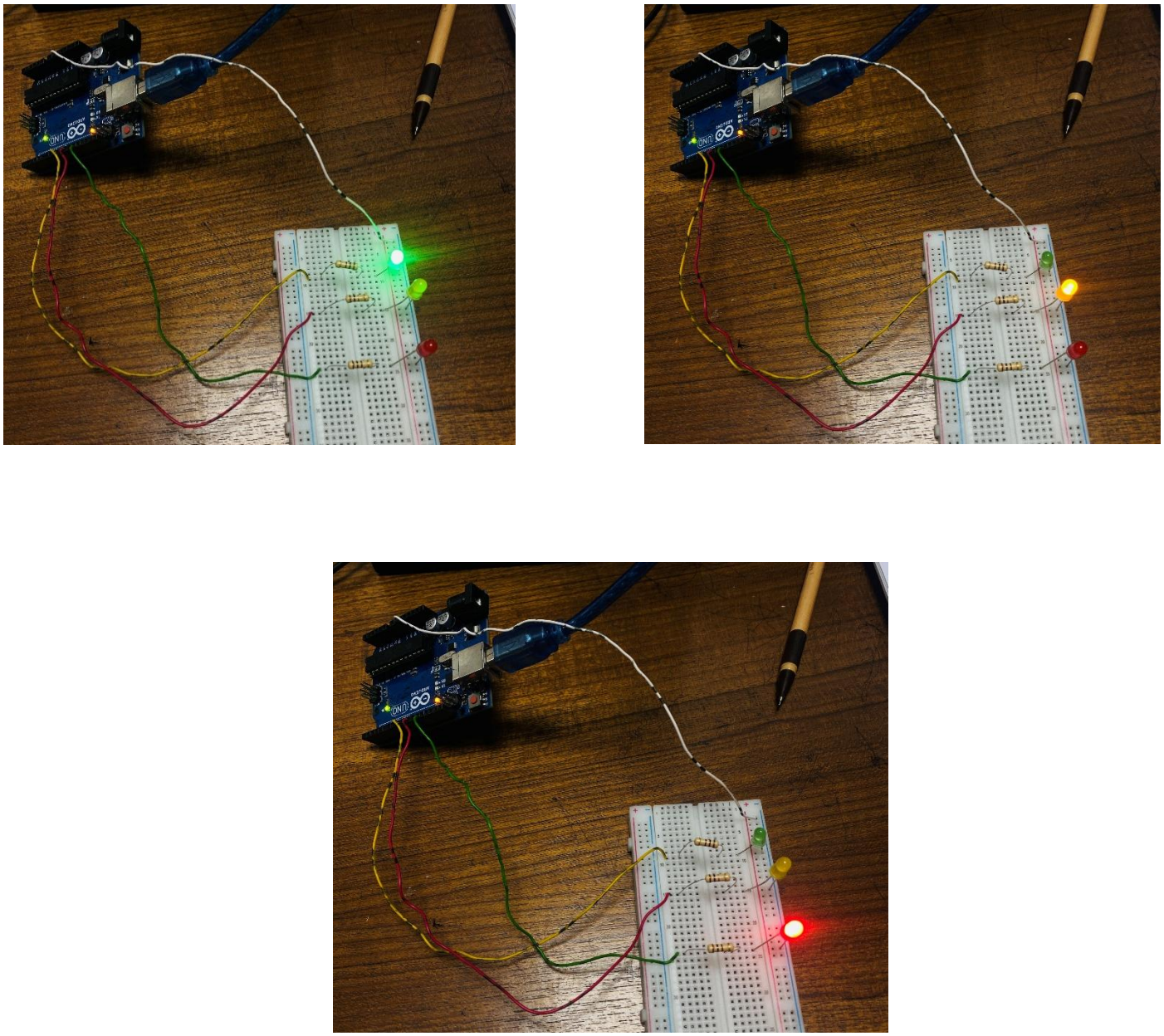


Figure 2.2: Circuit diagram of the traffic control system.

Simulation Output Results:

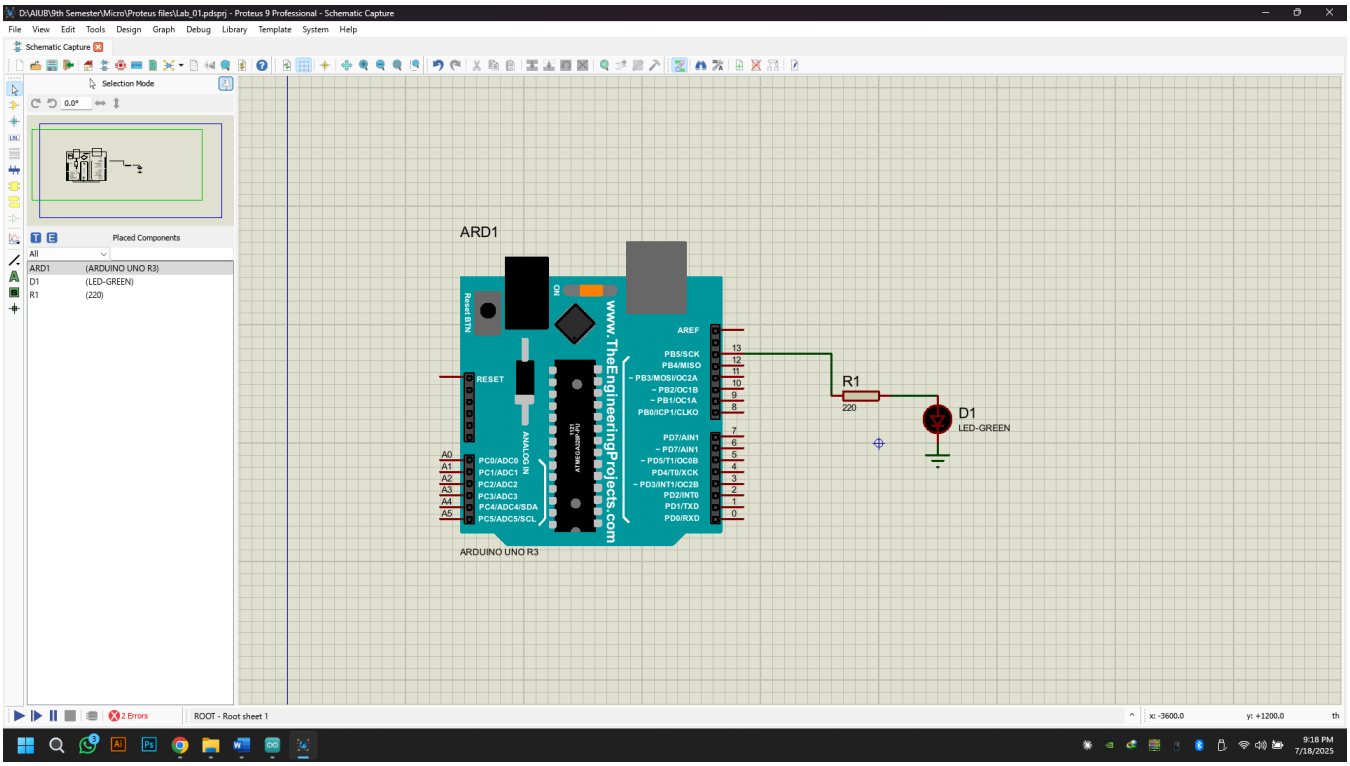


Figure 3.11: Circuit schematic of LED Blink test (OFF)

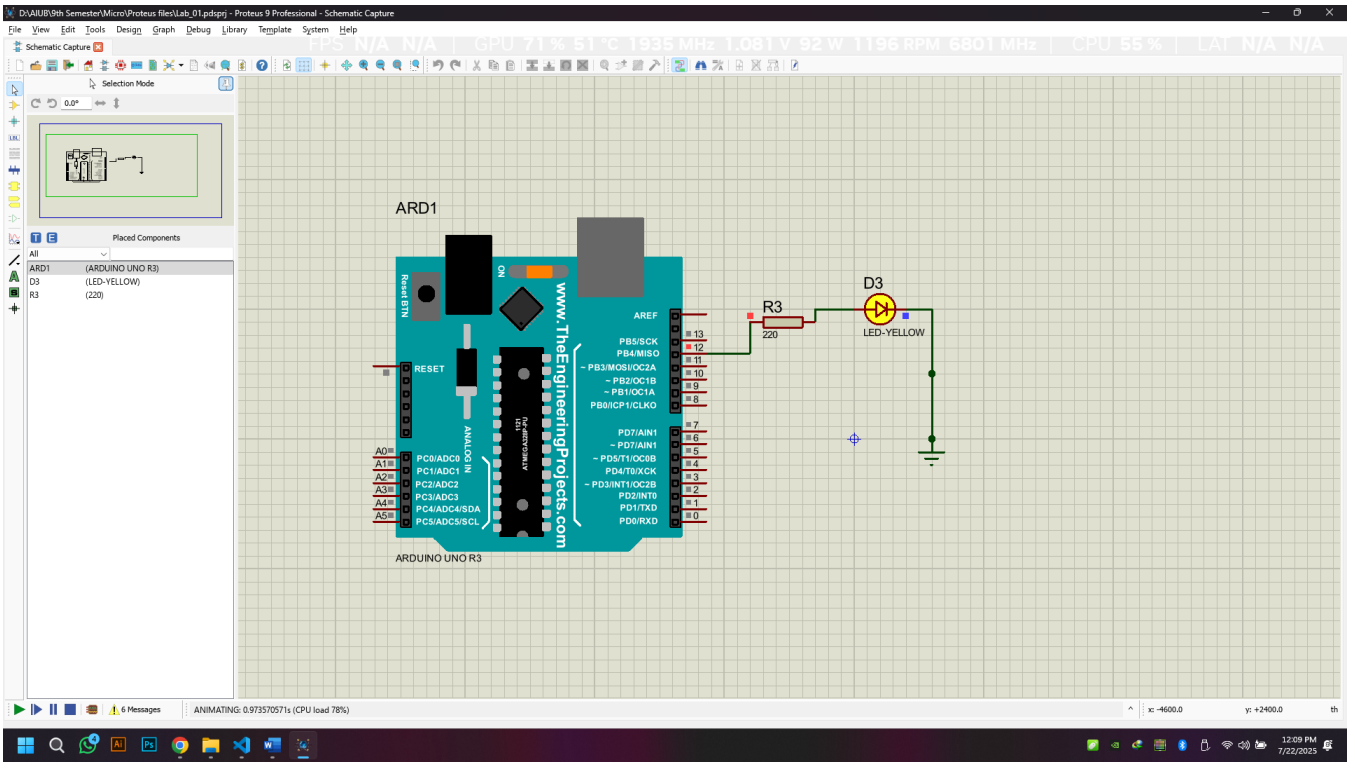


Figure 3.12: Circuit schematic of LED Blink test (ON)

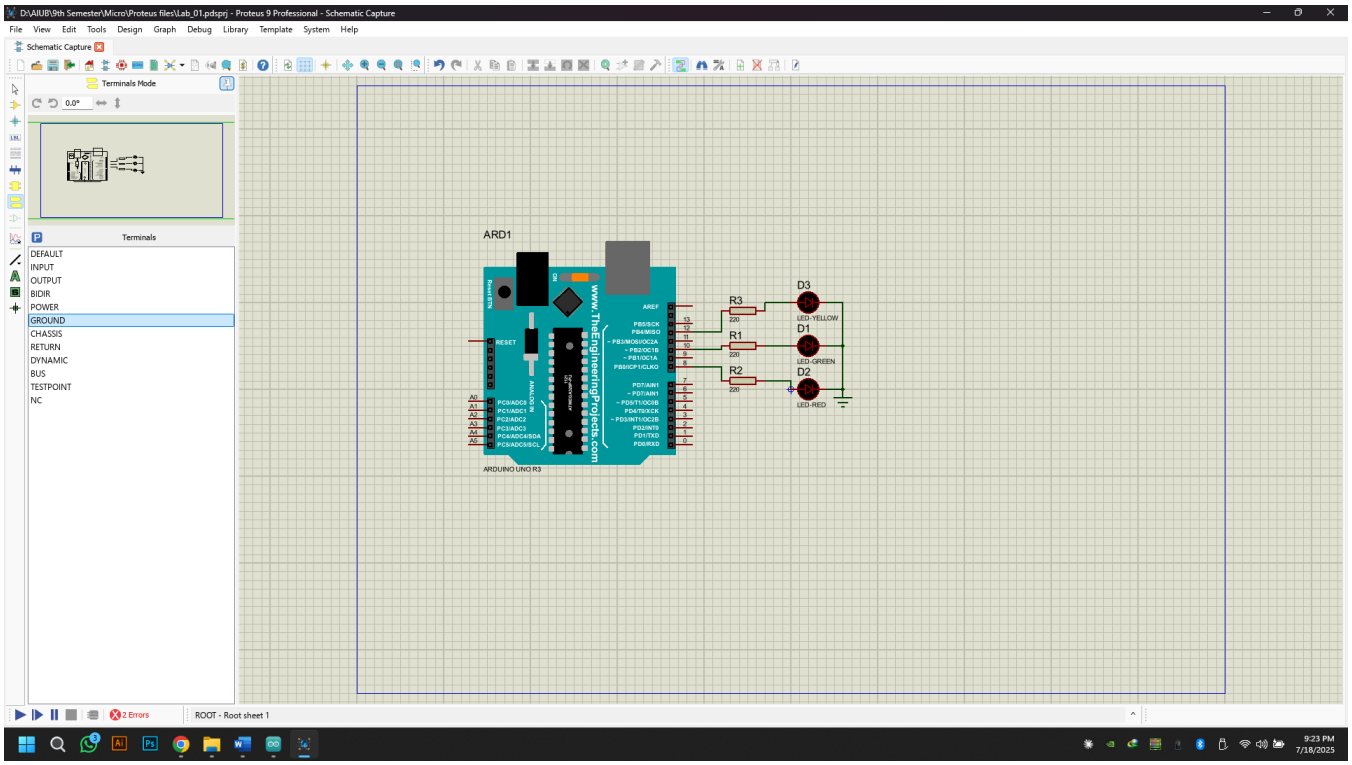


Figure 3.21: Circuit schematic of the traffic control system (OFF)

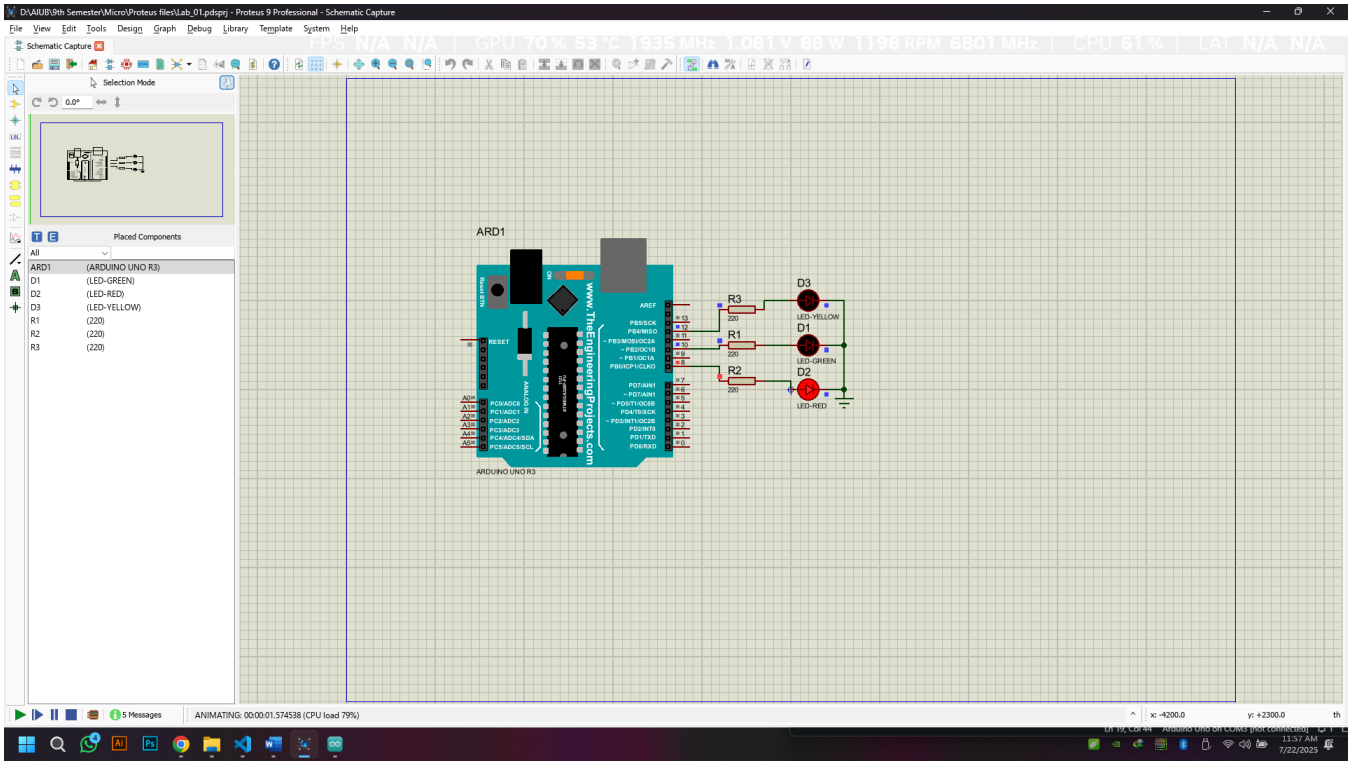


Figure 3.22: Circuit schematic of the traffic control system (RED LED ON)

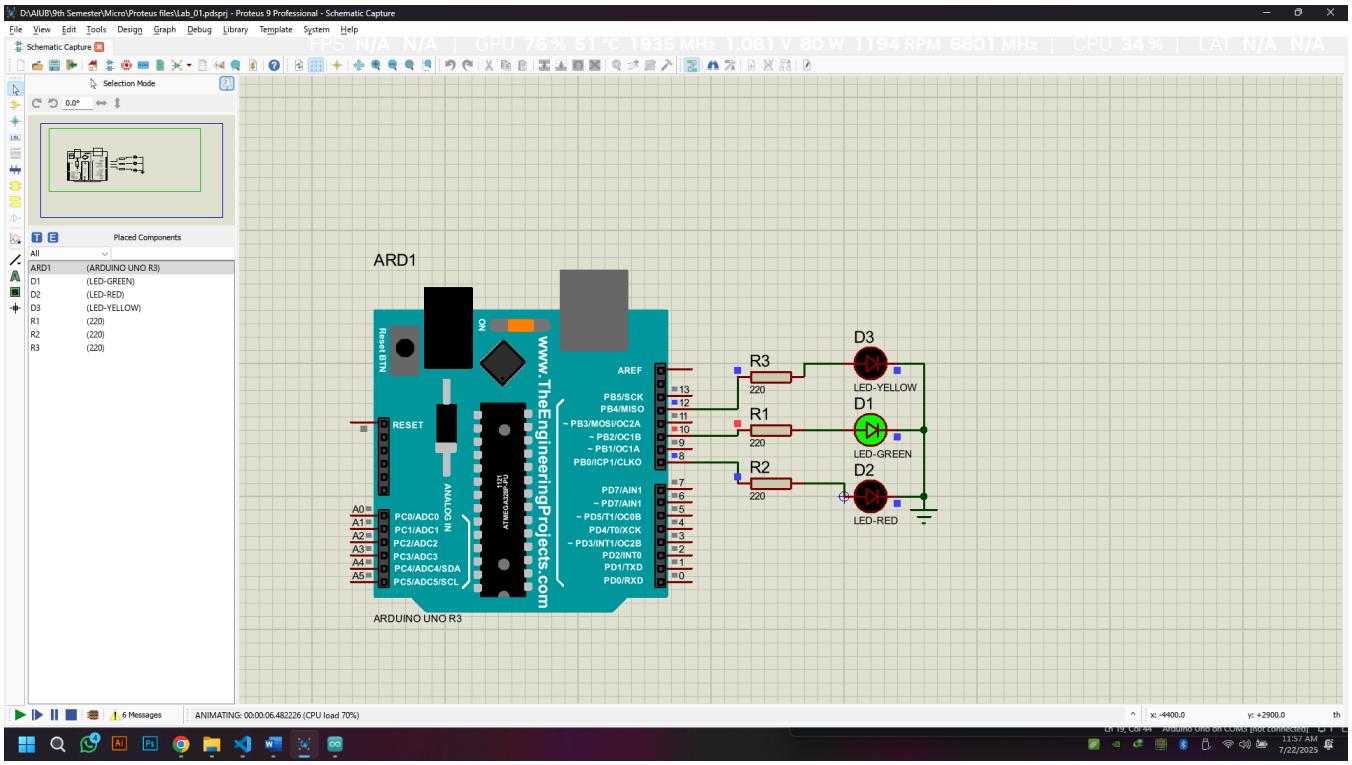


Figure 3.23: Circuit schematic of the traffic control system (GREEN LED ON)

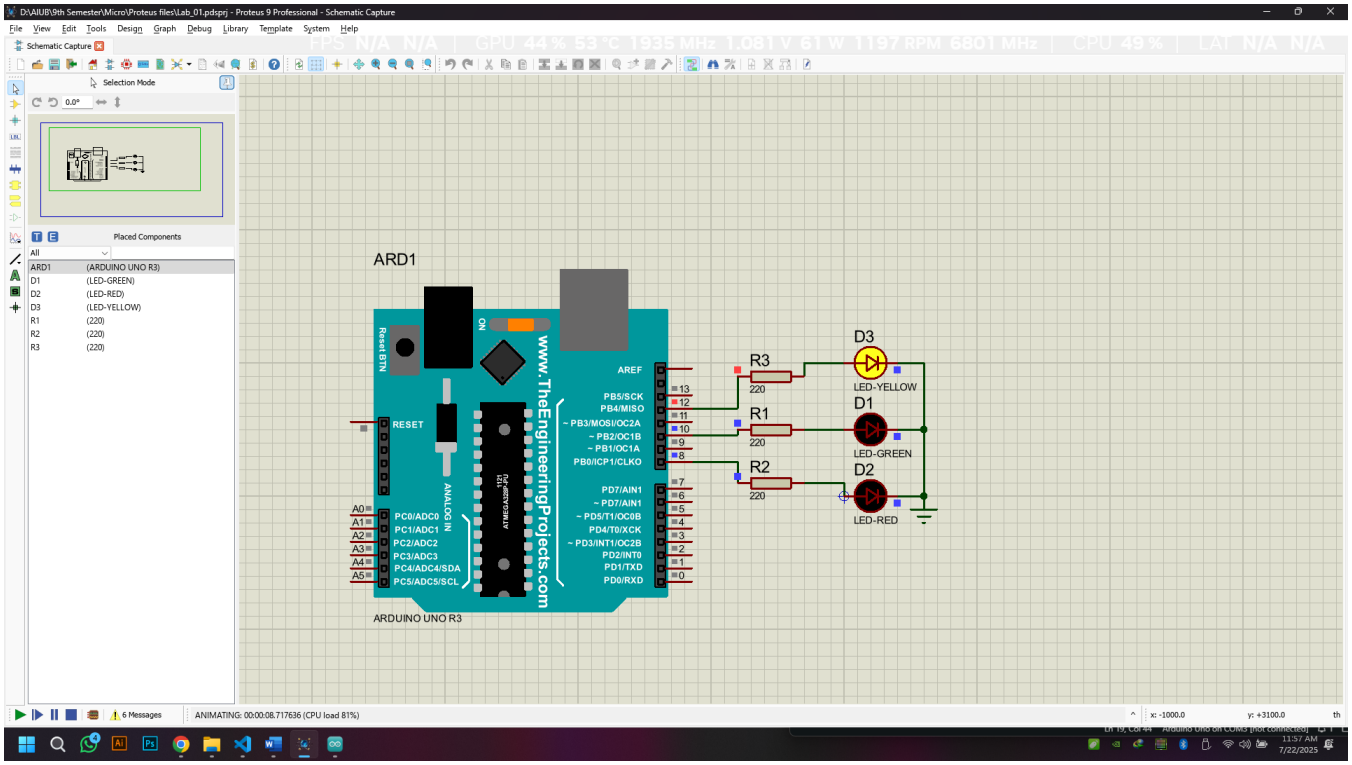


Figure 3.23: Circuit schematic of the traffic control system (YELLOW LED ON)

Code and Explanation:

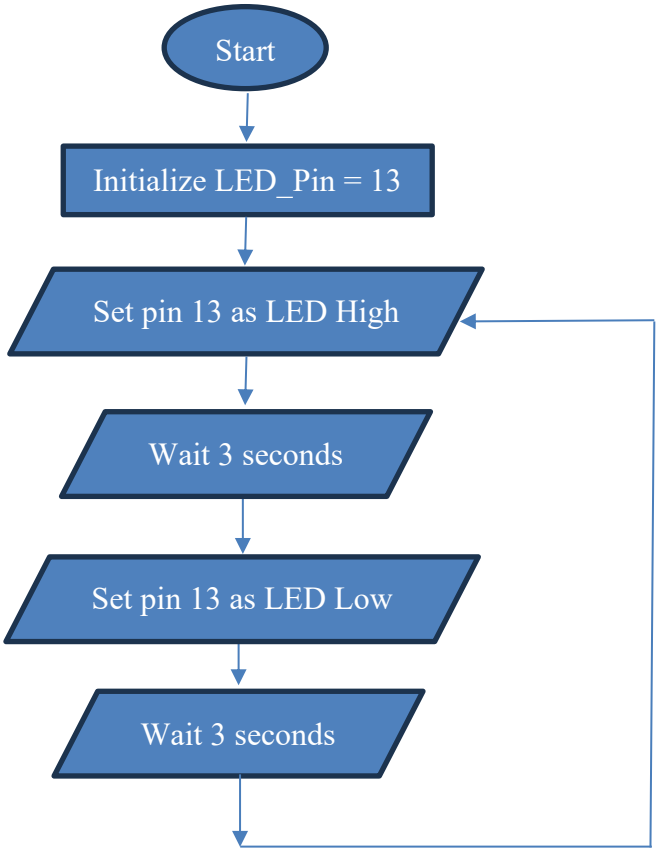
LED Blink test Code:

```
void setup()
        { pinMode(13, OUTPUT); }

void loop()
        { digitalWrite(13, HIGH);
        delay(1000);
        digitalWrite(13, LOW);
        delay(1000); }
```

Explanation:

void loop(): This function runs continuously in a loop after setup finishes. This is where the main program logic goes.
digitalWrite(13, HIGH): Turns ON the LED by sending 5V to pin 13 (sets it to HIGH).
delay(1000): Waits for 1000 milliseconds (1 second) with the LED ON.
digitalWrite(13, LOW): Turns OFF the LED by setting pin 13 to LOW (0V).
delay(1000): Waits another 1 second before repeating the loop.

Explanation Flowchart:



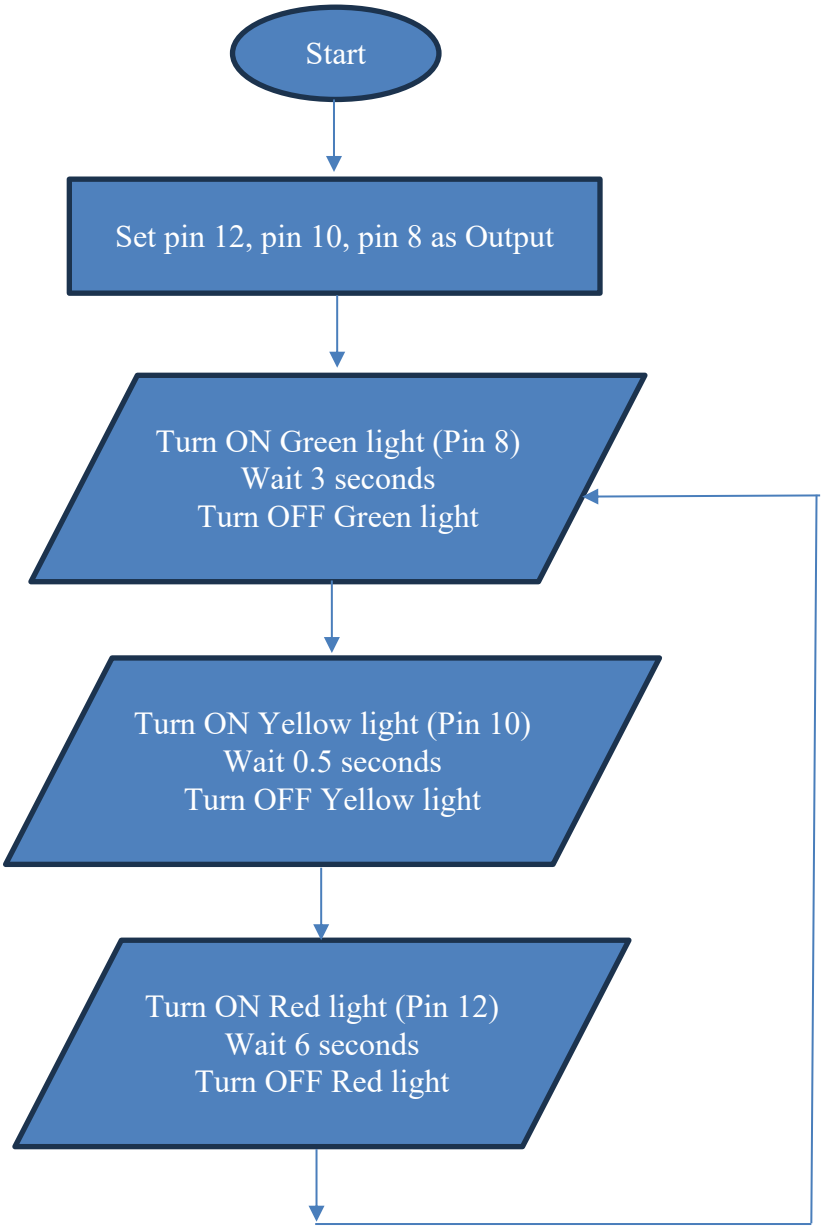
Traffic control system Code:

```
void setup() {
                    pinMode(12, OUTPUT); // Red
                    pinMode(10, OUTPUT); // Yellow
                    pinMode(8, OUTPUT); // Green
                   }

void loop() {
                  // Green ON
          digitalWrite(8, HIGH);
          delay(3000);
          digitalWrite(8, LOW);

                  // Yellow ON
          digitalWrite(10, HIGH);
          delay(500);
          digitalWrite(10, LOW);

                   // Red ON
          digitalWrite(12, HIGH);
          delay(6000);
          digitalWrite(12, LOW);
          }
```

Explanation:

This code simulates a basic traffic light control system using three LEDs: green (pin 8), yellow (pin 10), and red (pin 12). In the setup() function, each LED pin is configured as an output. Inside the continuously running loop(), the green light is turned on for 3 seconds to allow traffic to flow, then turned off. Next, the yellow light is activated for 0.5 seconds to signal that the light is about to change. After that, the red light turns on for 6 seconds to stop traffic, and then it's turned off. This cycle repeats indefinitely, mimicking a standard traffic light sequence.

Explanation Flowchart:



Discussion:

The experiment revealed that digital output pins on an Arduino board can be controlled effectively. This was achieved through two main tasks: blinking an LED and creating a basic traffic light system. The LED blink test demonstrated how to switch the LED on and off, as well as adjust its blinking speed. Subsequently, this knowledge was applied to simulate a traffic signal with red, green, and yellow lights. The results confirmed that timing control could be managed using simple Arduino functions.

However, there were some limitations. The traffic light system implemented was rather basic, and there might have been errors in the connections or code. To improve future experiments, more complex systems could be explored, and greater attention could be paid to ensuring accurate connections and code.

Moving forward, further exploration of advanced Arduino features and conducting experiments in controlled environments could provide more precise results. In summary, the experiment demonstrated the practical utility of Arduino boards for controlling various devices, suggesting promising avenues for future projects.

References:

1. Arduino website, [Cited: 09-06-2024], Available: https://www.arduino.cc
2. Project Hub website, [Online: Apr 17, 2022], [Cited: 09-06-2024], Available: https://rb.gy/w3jb4u
3. Arduino Docs, [Online: 09/02/2022], [Cited: 09-06-2024], Available: https://rb.gy/md0rgt
4. Dokumen PUB, [Online: 2020], [Cited: 09-06-2024], Available: https://rb.gy/z8ljl8