

Lab Report Sheet

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

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Course Title: Microprocessor And Embedded Systems

Course Code: 00499 Section: F

Semester: Spring 2021-22 Course Teacher: Dr. Nadia Anam

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	Total Marks	

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

Introduction:

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.

Theory and Methodology:

Interactive electronics projects are created using Arduino which is an open-source platform. 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 to load a new code into the board. We can easily load a C++ code into the board just using a USB cable and the Arduino IDE.

Arduino-Family:

Arduino makes several different boards, each with different capabilities. In addition, part of being open-source hardware means that others can modify and produce derivatives of Arduino boards that provide even more form factors and functionality. Here are a few options that are well-suited to someone new to the world of Arduino.

Configuration & Features Arduino Uno (R3):

The Uno is a great choice for first Arduino project. It's got everything to get started, and nothing don't. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a USB connection, a power jack, a reset button and more. It provides everything needed to support the microcontroller; simply just connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get your work done.



Figure 1: Arduino Uno (R3)

Overview of the board (Arduino Uno R3):

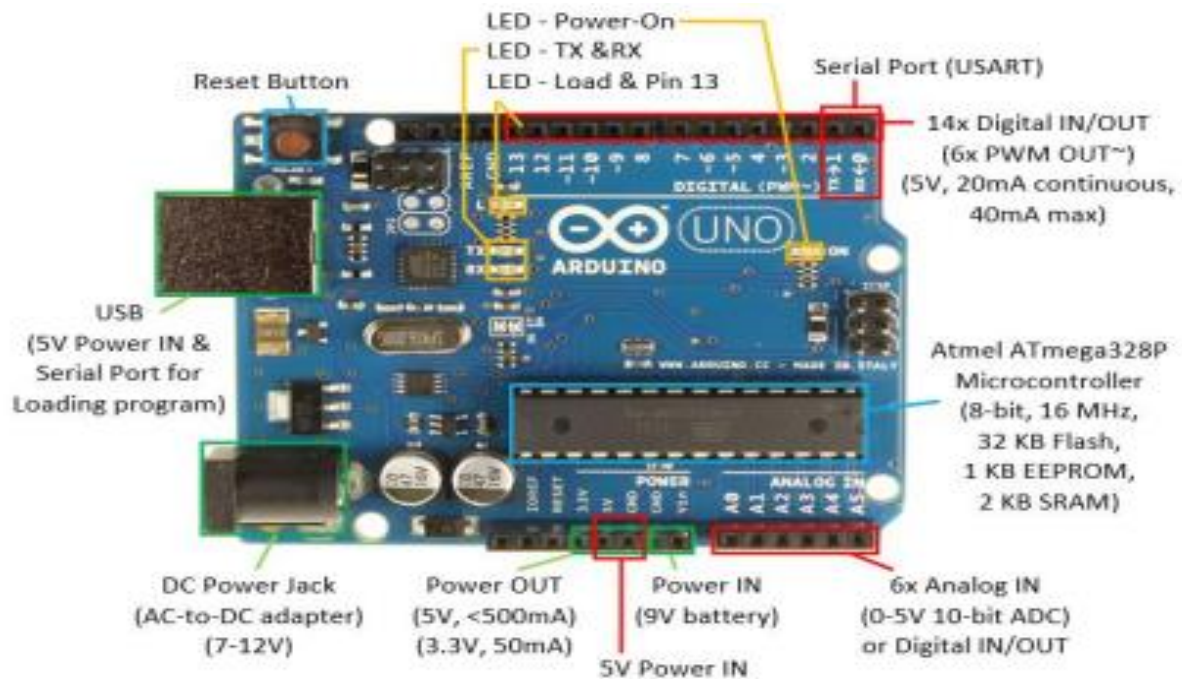


Figure 2: Arduino Uno components

Arduino Uno components List:

- I. **DC Power Jack and USB connector**
- II. **Pins (5V, 3.3V, GND, Analog, Digital, PWM, AREF)**
- III. **Reset Button**
- IV. **Power LED indicator**
- V. **TX RX LEDs**
- VI. **Main IC**
- VII. **Voltage Regulator**

Apparatus:

- Arduino IDE (any version)
- Arduino Uno (R3) board or Arduino mega 2560 board
- LED lights (RED, GREEN and YELLOW) and three 200 ohms resistors and jumper wires

Familiarization with the Arduino Commands

In this section,

1. We will learn about some common Arduino commands that will help write code.
2. This section also focuses on the standard Library functions associated with the IDE.

a) **pinMode(X, INPUT) or pinMode(X,OUTPUT) ******

this command will configure any pin at the Arduino board as either input/output.

b) **digitalWrite(X, LOW) or digitalWrite(X, HIGH) ******

this command will provide a HIGH/LOW value to any digital output pin at the Arduino board .

Setting up the Circuit The main task of our lab is to understand and implement a traffic control system after understanding to blink a LED light.

Simulation And Code:

Blink Test:

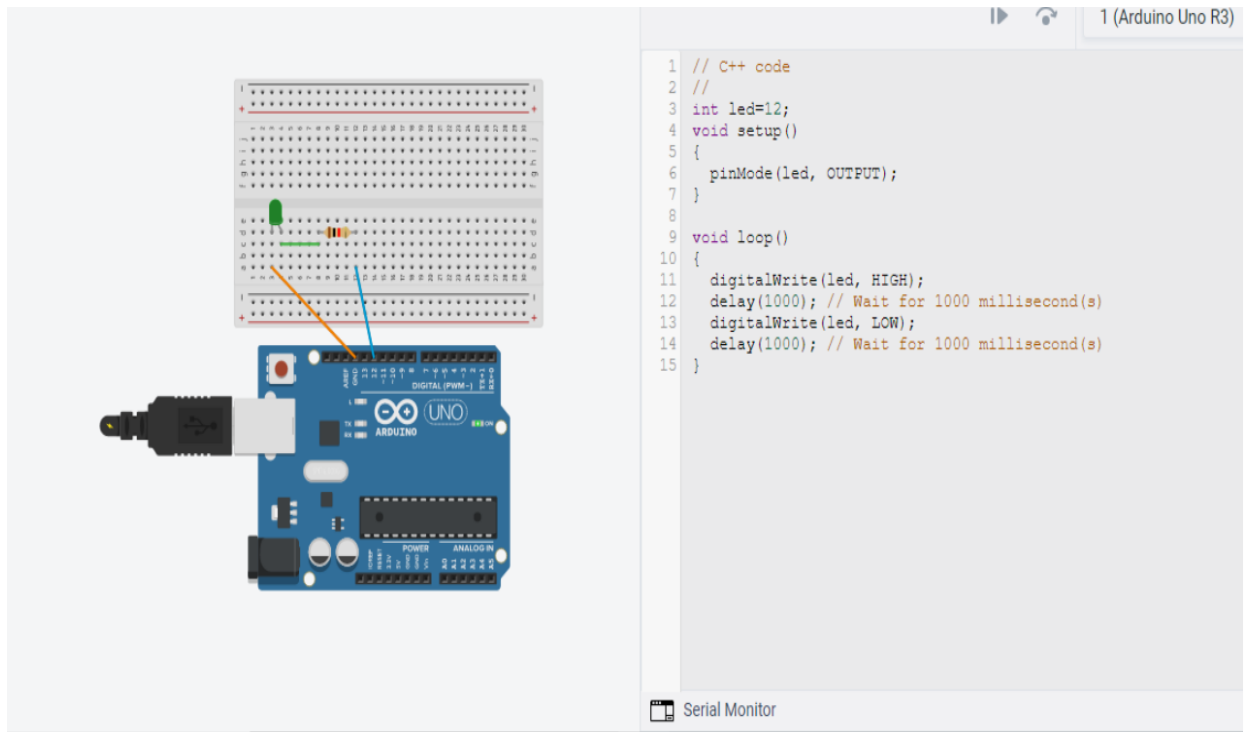


Figure 3: Blink Test Hardware

Blink Test Code:

```
// C++ code
int led=12;
void setup()
{
  pinMode(led, OUTPUT);
}
void loop()
{
  digitalWrite(led, HIGH);
  delay(1000); // Wait for 1000 millisecond(s)
  digitalWrite(led, LOW);
  delay(1000); // Wait for 1000 millisecond(s)
}
```

TRAFFIC CONTROL SYSTEM:

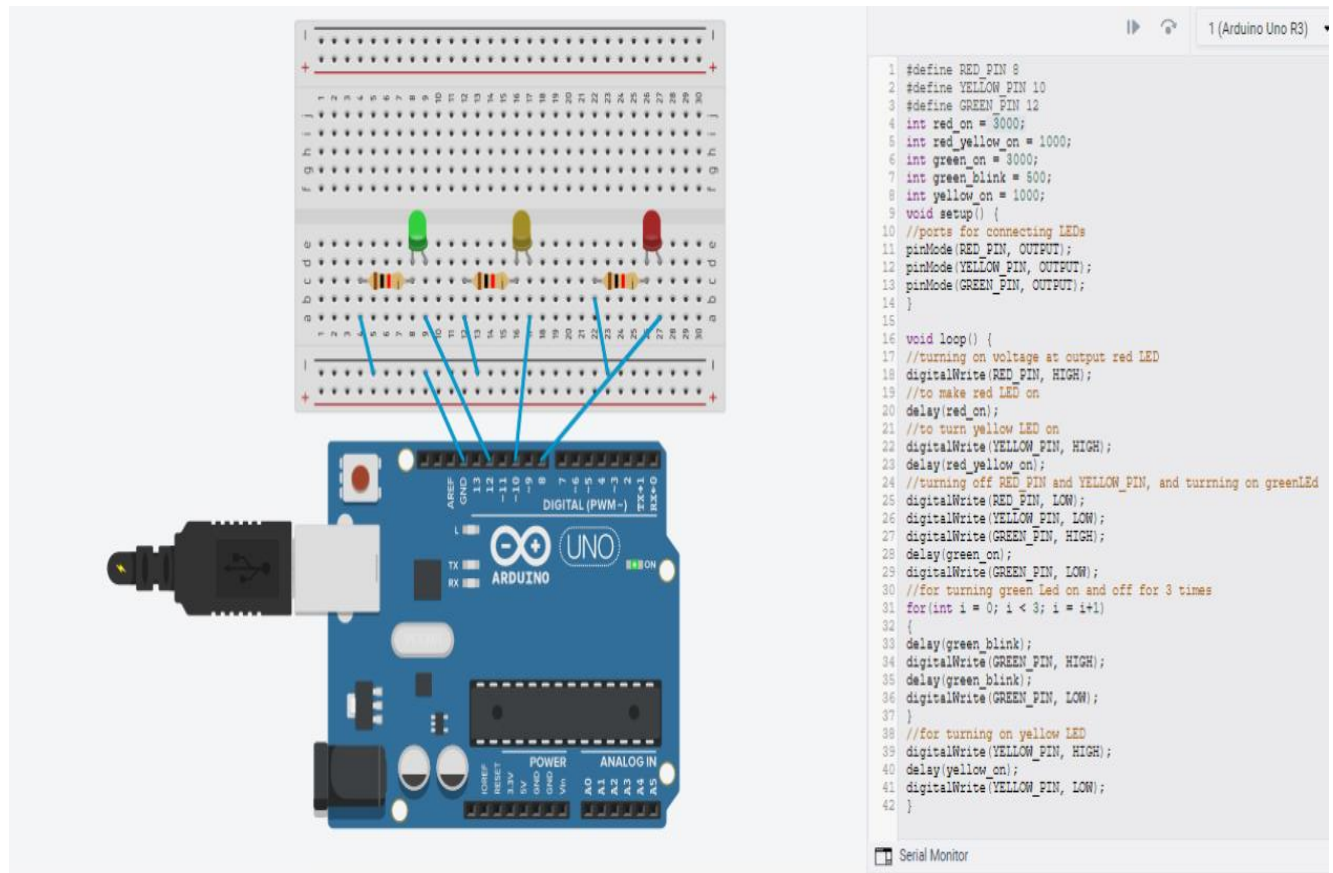


Figure 4: Hardware for traffic light

Traffic Control System Code:

```
#define RED_PIN 8
#define YELLOW_PIN 10
#define GREEN_PIN 12
int red_on = 3000;
int red_yellow_on = 1000;
int green_on = 3000;
int green_blink = 500;
int yellow_on = 1000;
```

```
void setup() {
//ports for connecting LEDs
pinMode(RED_PIN, OUTPUT);
pinMode(YELLOW_PIN, OUTPUT);
pinMode(GREEN_PIN, OUTPUT);
}
void loop() {
//turning on voltage at output red LED
digitalWrite(RED_PIN, HIGH);
//to make red LED on
delay(red_on);
//to turn yellow LED on
digitalWrite(YELLOW_PIN, HIGH);
delay(red_yellow_on);
//turning off RED_PIN and YELLOW_PIN, and turning on greenLED
digitalWrite(RED_PIN, LOW);
digitalWrite(YELLOW_PIN, LOW);
digitalWrite(GREEN_PIN, HIGH);
delay(green_on);
digitalWrite(GREEN_PIN, LOW);
//for turning green Led on and off for 3 times
for(int i = 0; i < 3; i = i+1)
{
delay(green_blink);
digitalWrite(GREEN_PIN, HIGH);
delay(green_blink);
digitalWrite(GREEN_PIN, LOW);
}
//for turning on yellow LED
digitalWrite(YELLOW_PIN, HIGH);
delay(yellow_on);
digitalWrite(YELLOW_PIN, LOW);
}
```


DISCUSSION:

We learned how to use Arduino and the delay functions to make an LED blink. Initially, the system was built by a website called tinkercad.com. Then we arranged all the components. One Arduino Uno R3 was used for the connection of the circuit with 1 breadboard and 3 LED resistors and 1 LED resistors. The system was controlled by code. After clicking on the run option, the simulation was successfully performed. The green light was blinking for blink test. For traffic control system the red light was initially switched on and the other two LEDs were off for 3 seconds, the yellow light was turned on for 1 seconds and the green light was switched on for 3 seconds. Following the code, the simulation ran successfully.

REFERENCES:

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