AMERICAN INTERNATIONAL UNIVERSITY BANGLADESH

Faculty of Engineering

Laboratory Report Cover Sheet

Please submit all reports to your subject supervisor or the office of the concerned faculty.

Students must complete all details except the faculty use part.

Laboratory Title: Implementation of traffic runway lights using timer functions.

Experiment Number: 03 Due Date: 02/10/2023 Semester: Fall 2023-2024
Subject Code: COE 3104 Subject Name: Microprocessor & Embedded System. Section: L

Course Instructor: PROTIK PARVEZ SHEIKH Degree Program: B.sc CSE

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For faculty use only:

Total Marks:_____ Marks Obtained: _____

Faculty comments_____

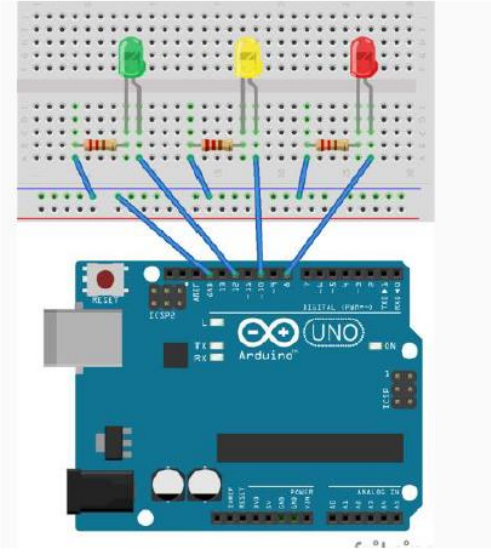
Title: Implementation of traffic runway lights using timer functions.

Introduction: The objective of this experiment is to get familiarized with Timers and use them for the implementation of a traffic control system.

Apparatus:

- Arduino Uno/ Arduino Mega
- LED lights (YELLOW, RED, and GREEN)
- Resistors (220 ohms)

Circuit Diagram:



Code implementation of a traffic system with Timer:

```
#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;

int delay_timer (int milliseconds)

{

   int count = 0;
```

```
while(1)
{
   if(TCNT0 >= 16)
{
   TCNT0=0;
   count++;
if (count == milliseconds)
{
   count=0;
   break;
}
}
}
   return 0;
}
void setup() {
   pinMode(RED_PIN, OUTPUT);
   pinMode(YELLOW_PIN, OUTPUT);
   pinMode(GREEN_PIN, OUTPUT);
   TCCR0A = 0b00000000;
   TCCR0B = 0b00000101;
   TCNT0=0;
}
void loop() {


digitalWrite(RED_PIN, HIGH);
delay_timer(red_on);
```

```
digitalWrite(YELLOW_PIN, HIGH);

delay_timer(red_yellow_on);

digitalWrite(RED_PIN, LOW);

digitalWrite(YELLOW_PIN, LOW);

digitalWrite(GREEN_PIN, HIGH);

delay_timer(green_on);

digitalWrite(GREEN_PIN, LOW);

for(int i = 0; i < 3; i = i+1)

{  delay_timer(green_blink);

   digitalWrite(GREEN_PIN, HIGH);

   delay_timer(green_blink);

   digitalWrite(GREEN_PIN, LOW);

}

digitalWrite(YELLOW_PIN, HIGH);

delay_timer(yellow_on);

digitalWrite(YELLOW_PIN, LOW);

}
```

Questions- Answer:

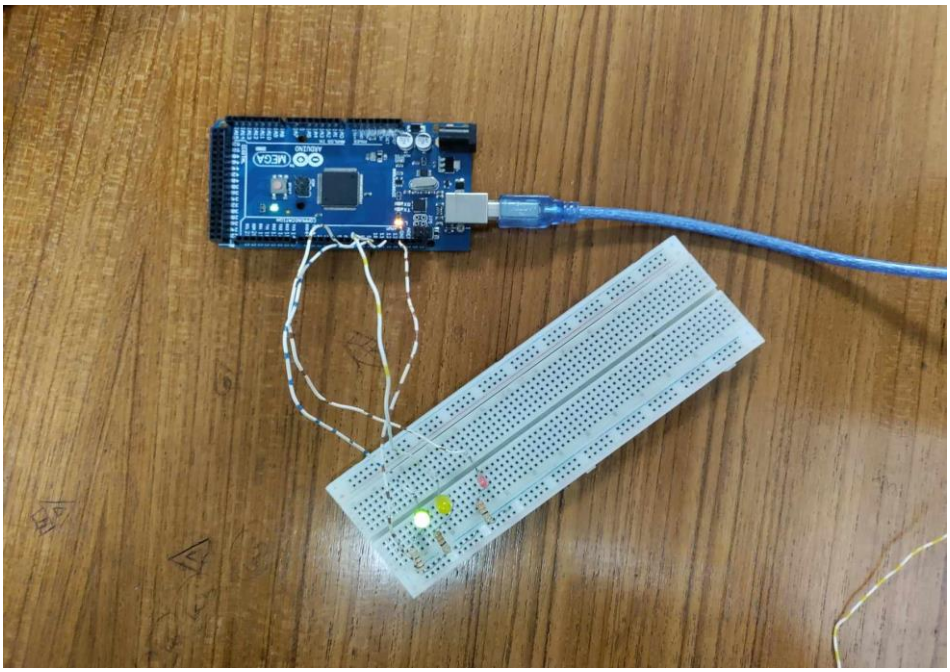
3. Code:

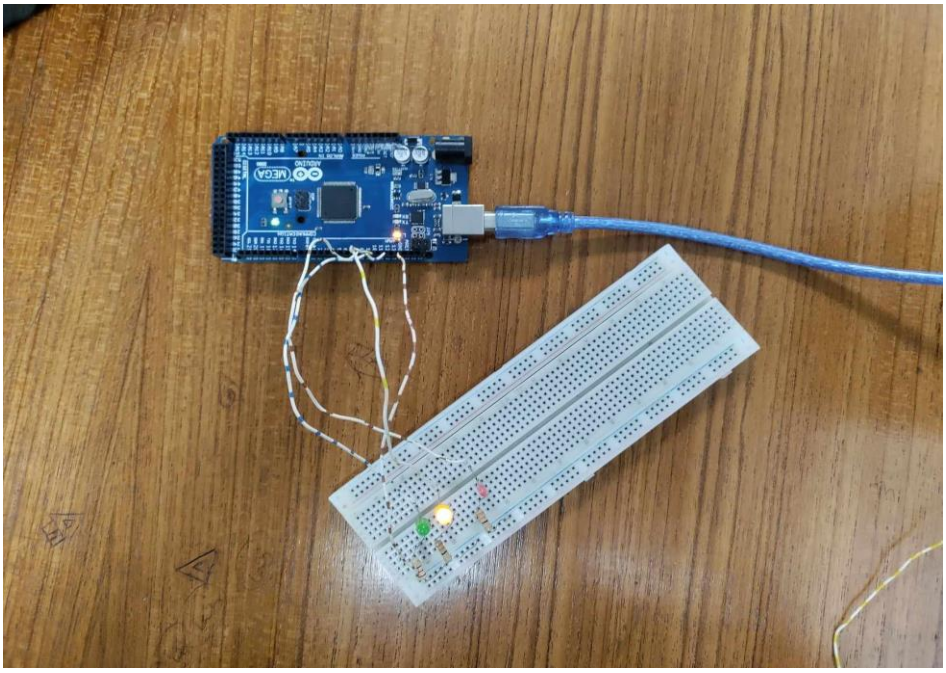
```
#define RED_PIN 8
#define YELLOW_PIN 10
#define GREEN_PIN 12

int red_on = 2000;
int red_yellow_on = 1000;
int green_on = 8000;
int green_blink = 500;
int yellow_on = 2000;
int delay_timer (int milliseconds)
{
int count = 0;
while(1)
{
if(TCNT0 >= 16)
{
TCNT0=0;
```

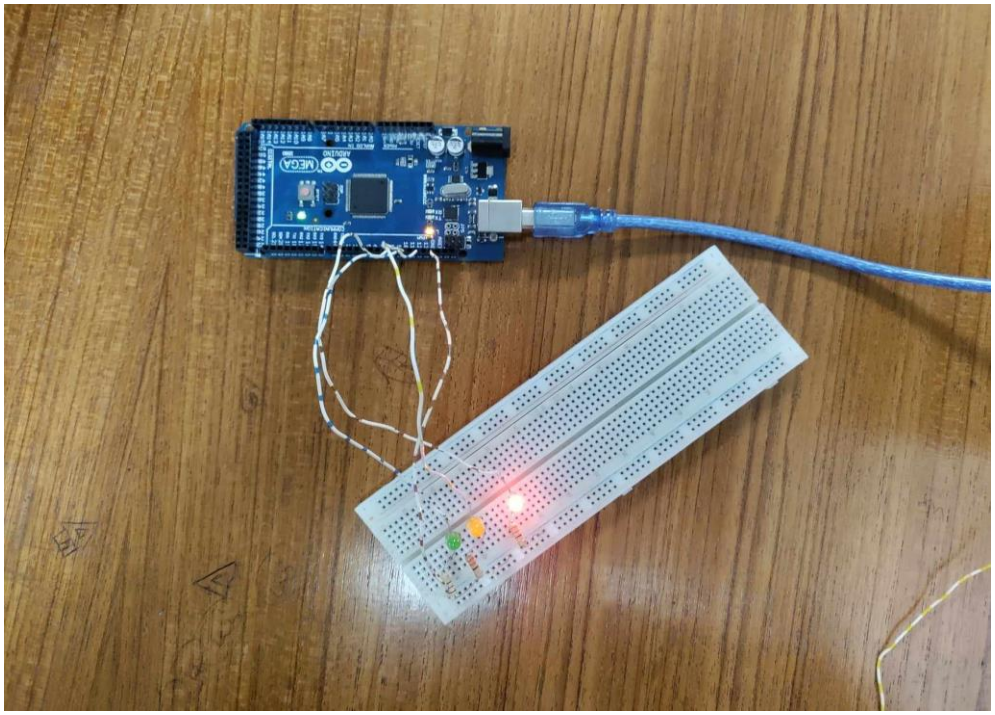
```
count++;
if (count == milliseconds)
{
count=0;
break;
}
}
}
return 0;
}
void setup() {

pinMode(RED_PIN, OUTPUT);
pinMode(YELLOW_PIN, OUTPUT);
pinMode(GREEN_PIN, OUTPUT);

TCCR0A = 0b00000000;
TCCR0B = 0b00000101;
TCNT0=0;
}

 void loop() {

digitalWrite(RED_PIN, HIGH);
delay_timer(red_on);

digitalWrite(YELLOW_PIN, HIGH);
delay_timer(red_yellow_on);

digitalWrite(RED_PIN, LOW);
digitalWrite(YELLOW_PIN, LOW);
digitalWrite(GREEN_PIN, HIGH);
delay_timer(green_on);
digitalWrite(GREEN_PIN, LOW);

for(int i = 0; i < 3; i = i+1)
{
delay_timer(green_blink);
digitalWrite(GREEN_PIN, HIGH);
delay_timer(green_blink);
digitalWrite(GREEN_PIN, LOW);
}

digitalWrite(YELLOW_PIN, HIGH);
delay_timer(yellow_on);
digitalWrite(YELLOW_PIN, LOW);
}
```

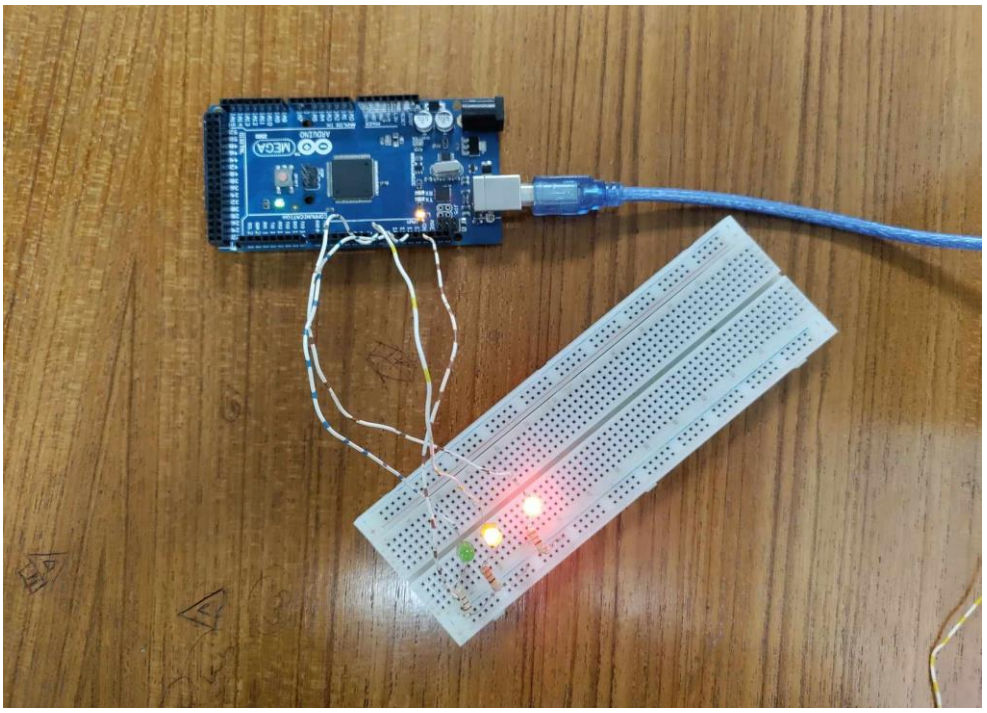
Hardware Implementation:

Traffic Control System

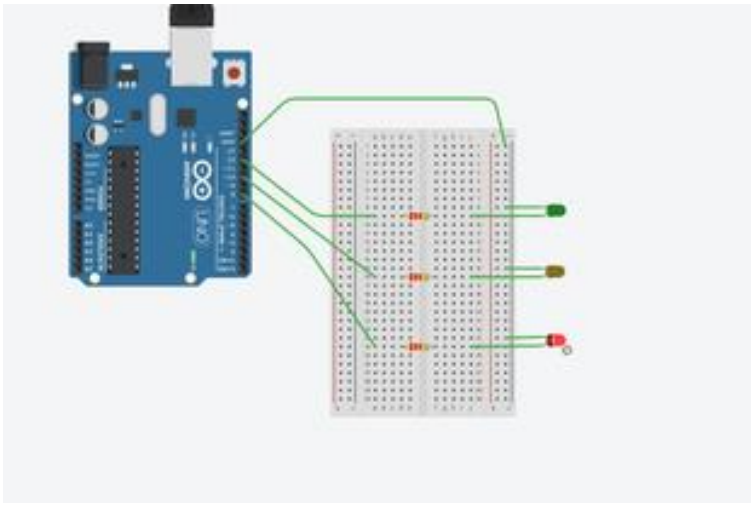


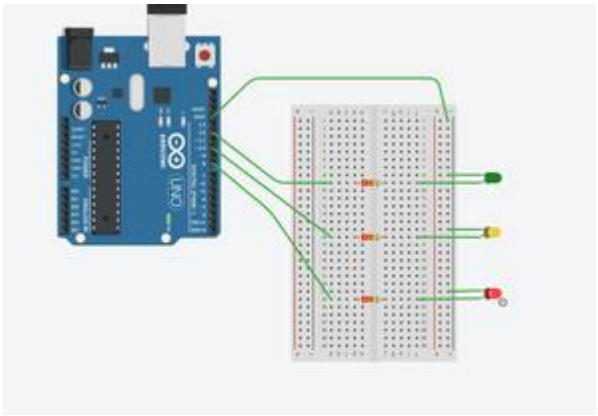


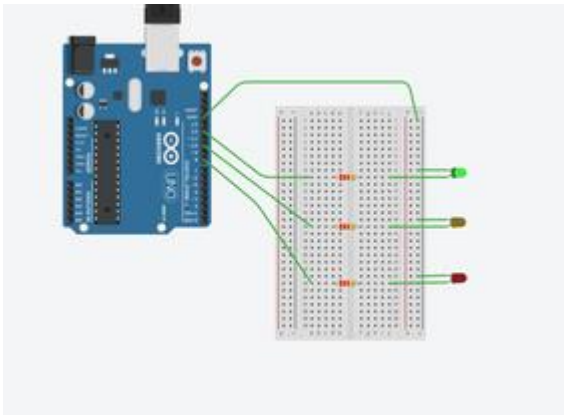


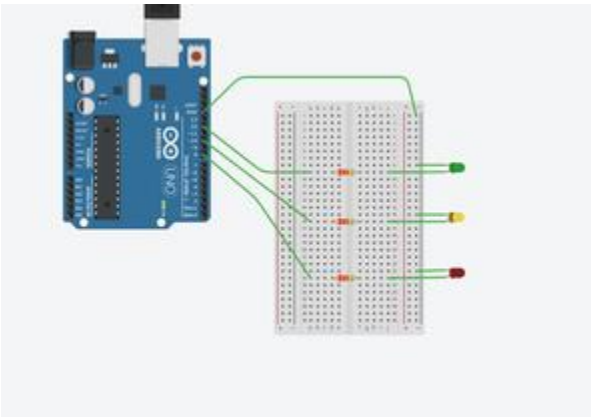


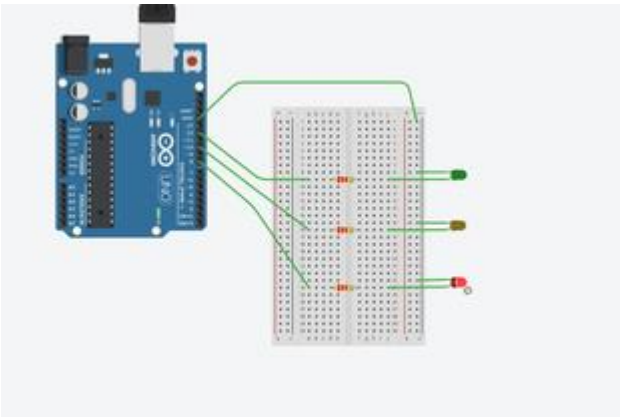
Simulation:











Discussion:

In this experiment, we successfully implemented a traffic runway lights system using an Arduino Mega microcontroller and Arduino IDE. The Arduino Mega, functioning as a robust physical device, allowed us to create an efficient traffic light system.

Through careful programming in Arduino IDE, we harnessed the timer functions to precisely manage the timing and sequencing of the traffic lights—emulating the phases of a traffic light: red, yellow, and green. This meticulous timing ensured a seamless transition, mimicking a real traffic scenario effectively.

This project underscores the practicality and adaptability of microcontrollers, particularly the Arduino Mega, in managing complex tasks like traffic light control. By highlighting the significance of microprocessor technology in traffic management systems, we envision potential enhancements like incorporating sensors for real-time adjustments or adaptive timing based on traffic conditions, further improving traffic efficiency and safety.

Reference(s):

1) https://www.arduino.cc/.
2) ATMega328 manual
3) https://www.avrfreaks.net/forum/tut-c-newbies-guide-avr-timers
4) http://maxembedded.com/2011/06/avr-timers-timer0/