AMERICAN INTERNATIONAL UNIVERSITY-BANGLADESH (AIUB)
Faculty of Engineering
Department of Electrical and Electronic Engineering

American International University-Bangladesh (AIUB)

MICROPROCESSOR AND EMBEDDED SYSTEM LAB

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***Report should be handwritten and PDF in format.**
***Topics to be covered: Title >> Objectives >> Theory & Methodology >> Apparatus >> Results & Simulations >> Discussion & Conclusion >> Reference.**
***Submit the report before the next lab class in the provided link (check portal notice).**
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SUBMITTED BY	
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CLASS SERIAL NUMBER: 38	CONTACT:

LAB NO: 04
TITLE: Study of a Digital Timer using millis() function of Arduino to avoid problems associated with the delay() function.

SECTION: G	SEMESTER: SPRING 2024-25
GROUP NUMBER: 03	DATE OF SUBMISSION: 24/02/2024

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SUBMITTED TO:

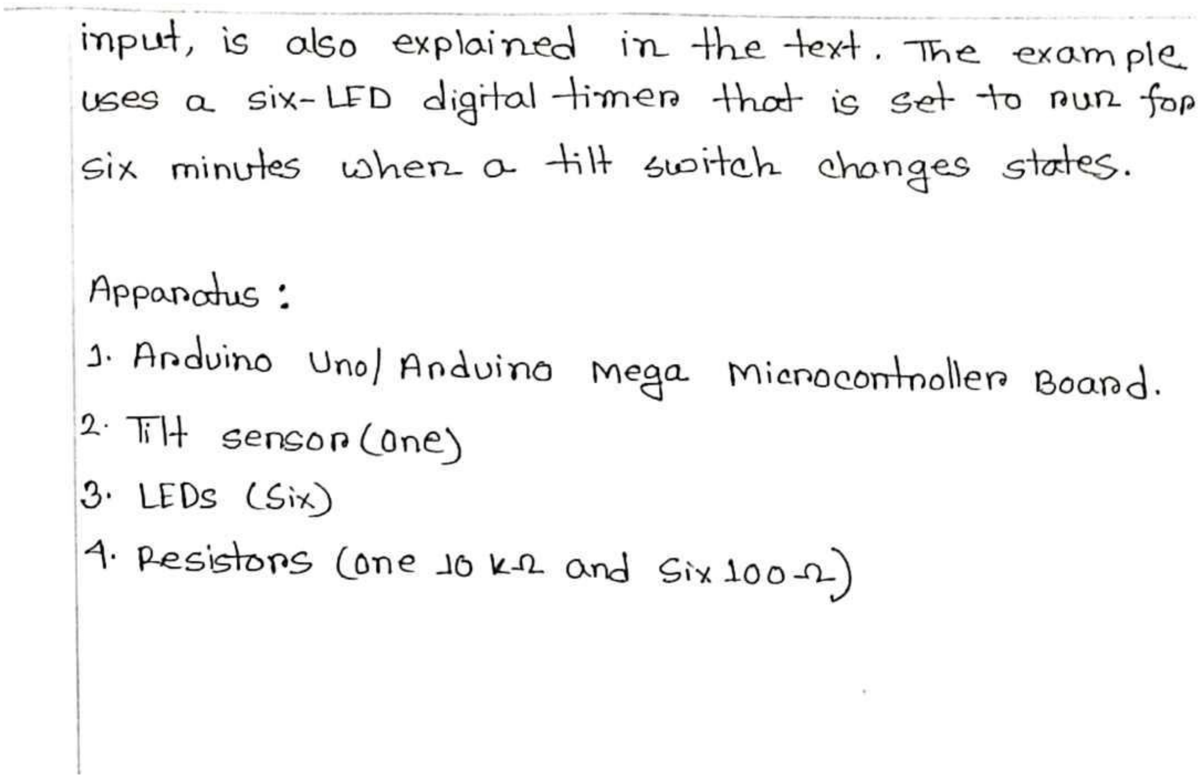
SUJAN HOWLADER (ESSAN), ASSISTANT PROFESSOR
DEPARTMENT OF EEE, FACULTY OF ENGINEERING

Title : Study of a Digital Timer using millis () function of Arduino to avoid problems associated with the delay () function.

Objective : In this project, we will build a digital timer that turns on an LED every minute. Besides, we will be able to know how long we are working on our project by using Ardunio's built-in Timer.

Theory and Methodology : The limitation of using the delay () function in Arduino for time intervals and introduces the millis () function as a solution The Arduino may continue processing input and output throughout time intervals using millis (), in contrast to delay (). The millis () method measures the amount of time that has passed since the Arduino began operating in milliseconds. Because the unsigned long data type can accept greater positive values, it is advised to use it to record the millis () duration.

The idea of a tilt switch, which detects changes in orientation to operate as a digital



input, is also explained in the text. The example uses a six-LED digital timer that is set to run for six minutes when a tilt switch changes states.

Apparatus :

1. Arduino Uno/ Arduino Mega Microcontroller Board.
2. Tilt sensor (one)
3. LEDs (Six)
4. Resistors (one 10 kΩ and Six 100-Ω)

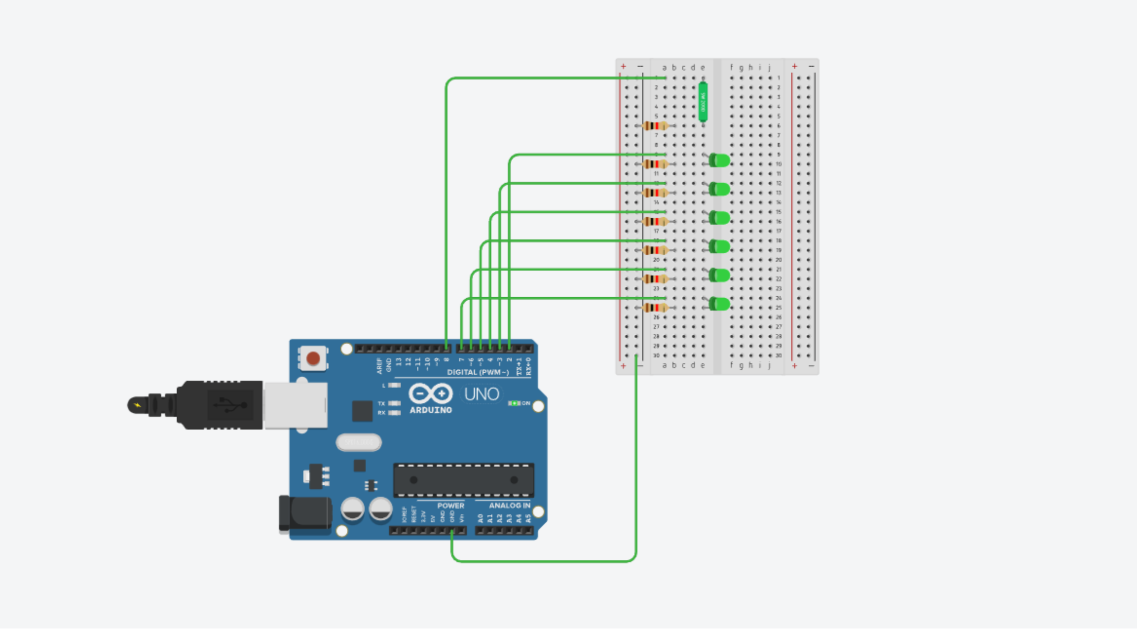
Results and Simulations:

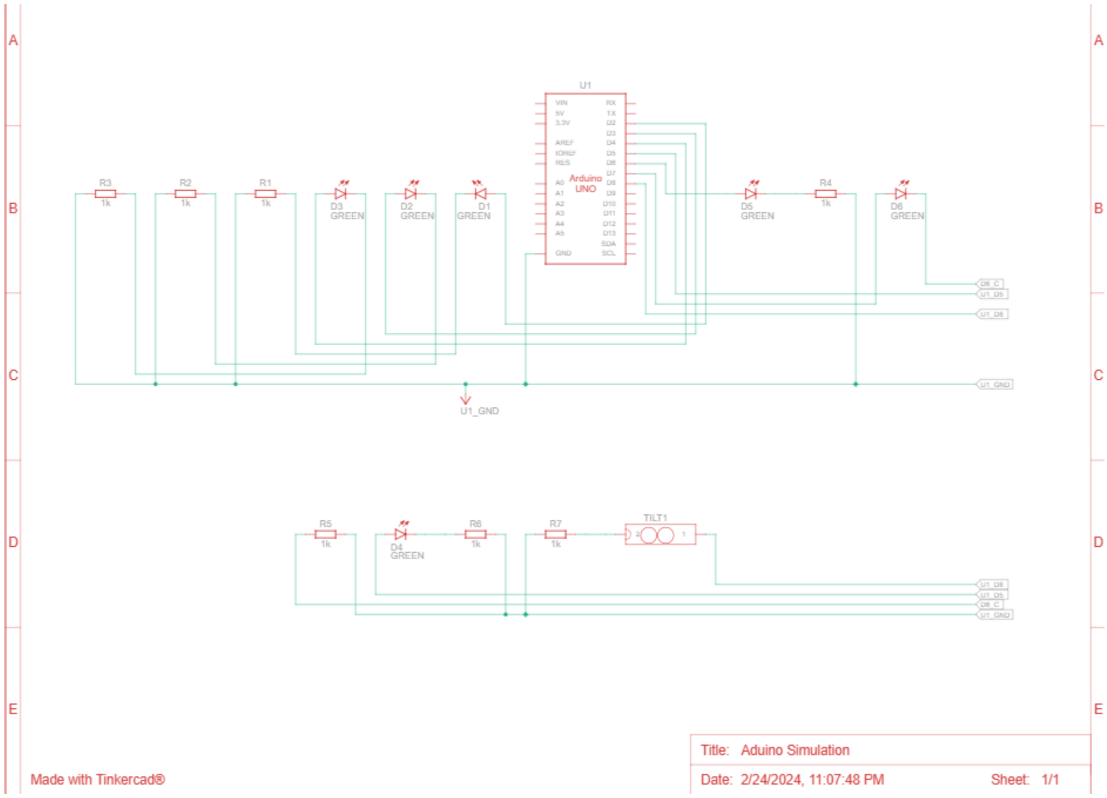
Code:

```
const int SwitchPin = 8;
unsigned long PreviousTime = 0;
int SwitchState = 0;
int PrevSwitchState = 0;
int led = 2;
long interval = 2000;
void setup() {
for (int x = 2; x < 8; x++) {
pinMode(x, OUTPUT);
}
pinMode(SwitchPin, INPUT);
}
```

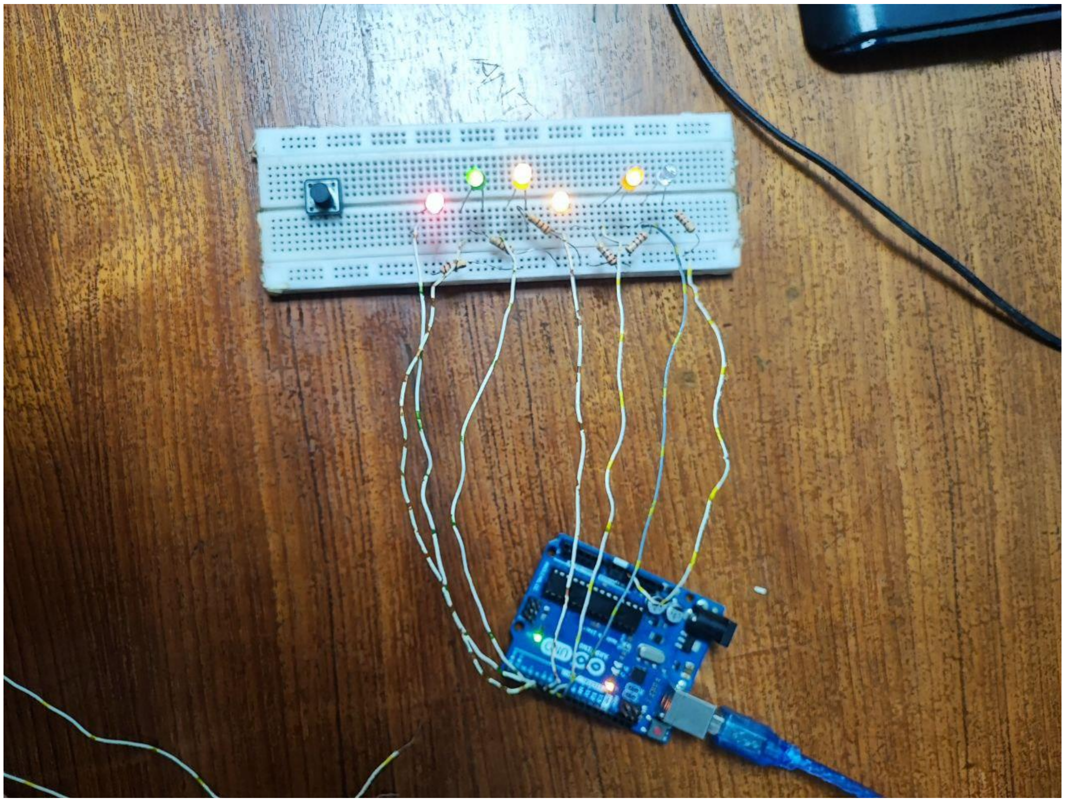
```
void loop() {
unsigned long CurrentTime = millis();
if (CurrentTime - PreviousTime > interval) {
PreviousTime = CurrentTime;
digitalWrite(led, HIGH);
led++;
if (led == 7){ }
}
SwitchState = digitalRead(SwitchPin);
if (SwitchState != PrevSwitchState){
for (int x = 2 ; x < 8; x++) {
digitalWrite(x, LOW);
}
led = 2;
PreviousTime = CurrentTime;
}
PrevSwitchState = SwitchState;
}
```

To get the LEDs working like a traffic light system, we typed in necessary codes in the Aurduino IDE and then connected the board to the PC with a USB cable.





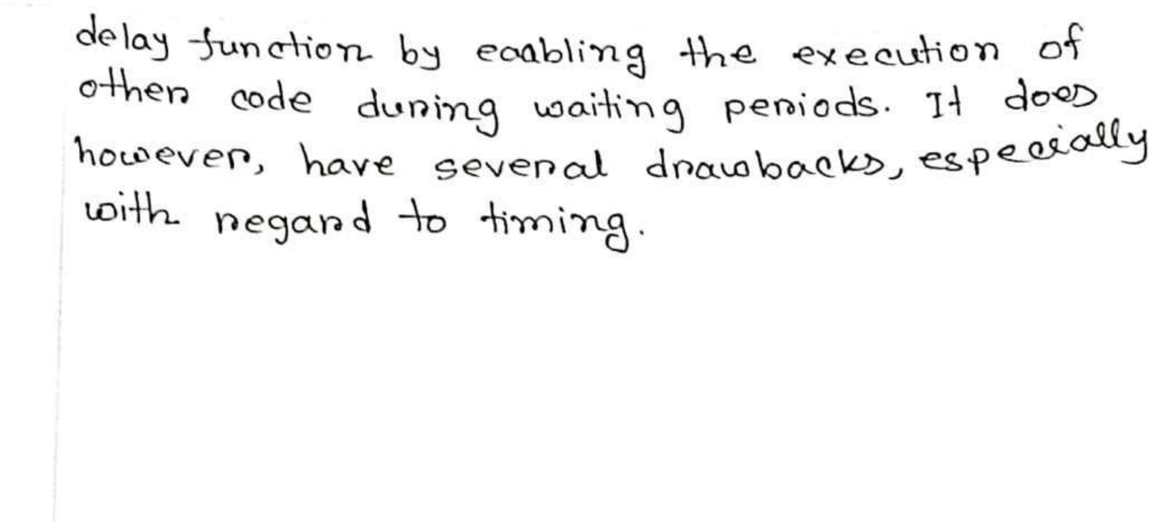
After connecting the microcontroller to the PC and uploaded the code and the microcontroller started functioning.



Discussion and conclusion:

In online classes we were taught theoritically and conducted simulations which were taken as performances. Then we implemented the hardware in the offline class for simulation or implemented. Firstly we have to collect six LEDs, one tilt sensor, six resistors and one Arduino UNO/Arduino mega microcontroller board Then we have connected the pin number 2, 3, 4, 5, 6, 7 and 8 of the microcontroller to the positive of the LED and connect to negative with a common ground on the ground pin. Then we connected to pe Arduino IDE of PC and select the microcontroller board and provided a lab manual that contained the instructions and codes to help us done the task. Then simulated results were verified accordingly.

In this experiment, the millis function which was investigated online and in study materials was used to develop a digital timer system. An Arduino library called Millis is used to track time and serves as a substitute for the



delay function by enabling the execution of other code during waiting periods. It does however, have several drawbacks, especially with regard to timing.

References:

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