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

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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LAB NO: 02
TITLE: Familiarization with an STM32, the study of blink test and implementation of a light- controlling system using microcontrollers.

SECTION: G	SEMESTER: SPRING 2024-25
GROUP NUMBER: 03	DATE OF SUBMISSION: 10/02/2024

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Title: Familiarization with an STM32, the study of blink test and implementation of a light-controlling system using microcontrollers.

Objective: The objective of this experiment is to get familiarized with Microcontroller. Here, we will learn how to make the LED blink using a STM32. The experiment will be conducted through STM32 Nucleo-F401RE Board in STM32 Cube IDE and simulation will be done by Proteus software.

Theory and Methodology: STM32 microcontrollers are commonly used in embedded systems. The blink test is a basic program to toggle an LED, demonstrating the microcontroller functionality. Light-controlling system utilize microcontrollers to regulate the intensity or on/off state of lights based on input conditions, such as sensors or user commands.

To familiarize with STM32, study its datasheet, reference manual and development environment. Implement the blink test by configuring GPIO pins to control an LED's state. For a Light-controlling system, integrate sensors or user inputs to determine the desired light state and use employ appropriate communication protocols if needed. Test and iterate for desired functionality. Program in a language like C using an Integrated Development Environment (IDE) and flash the code onto STM32.
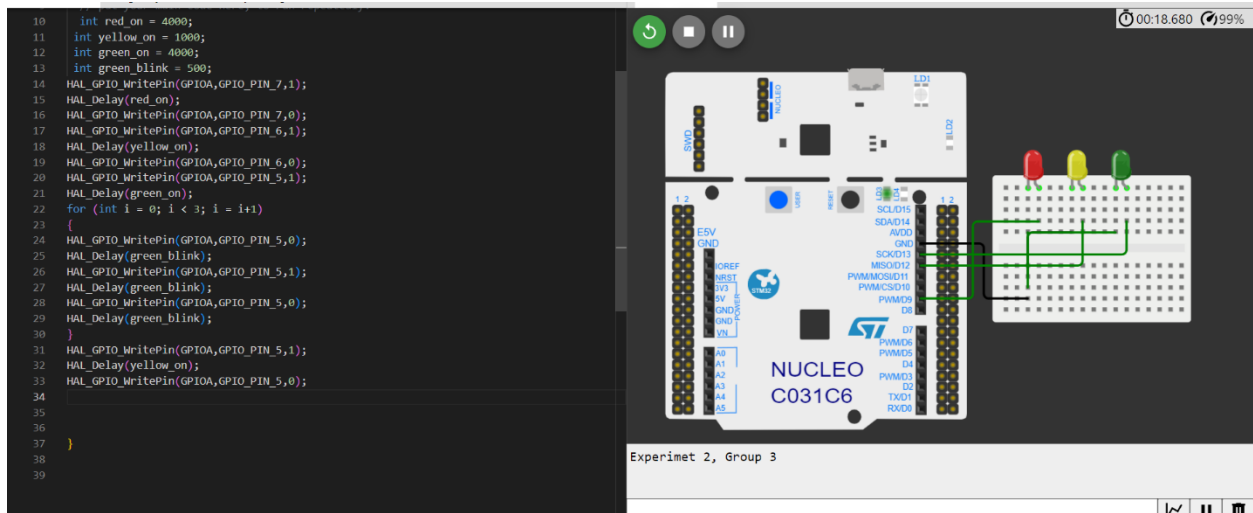
Apparatus:

(i) STM32 Cube IDE (1.0.1 or any recent version)

(ii) STM32 Cube IDE board.

(iii) LED lights (Red, Green, or Yellow) and three 200 ohms Resistors and jumper wires.

Results and Simulations:

To get the LEDs working like a traffic light system, we typed in necessary codes in the STM32 IDE and then connected the board to the PC with a USB cable.


```
10    int red_on = 4000;
11    int yellow_on = 1000;
12    int green_on = 4000;
13    int green_blink = 500;
14    HAL_GPIO_WritePin(GPIOA,GPIO_PIN_7,1);
15    HAL_Delay(red_on);
16    HAL_GPIO_WritePin(GPIOA,GPIO_PIN_7,0);
17    HAL_GPIO_WritePin(GPIOA,GPIO_PIN_6,1);
18    HAL_Delay(yellow_on);
19    HAL_GPIO_WritePin(GPIOA,GPIO_PIN_6,0);
20    HAL_GPIO_WritePin(GPIOA,GPIO_PIN_5,1);
21    HAL_Delay(green_on);
22    for (int i = 0; i < 3; i = i+1)
23    {
24    HAL_GPIO_WritePin(GPIOA,GPIO_PIN_5,0);
25    HAL_Delay(green_blink);
26    HAL_GPIO_WritePin(GPIOA,GPIO_PIN_5,1);
27    HAL_Delay(green_blink);
28    HAL_GPIO_WritePin(GPIOA,GPIO_PIN_5,0);
29    HAL_Delay(green_blink);
30    }
31    HAL_GPIO_WritePin(GPIOA,GPIO_PIN_5,1);
32    HAL_Delay(yellow_on);
33    HAL_GPIO_WritePin(GPIOA,GPIO_PIN_5,0);
34
35
36
37    }
38
39
```

After connecting the microcontroller to the PC and uploaded the code and the microcontroller started functioning.
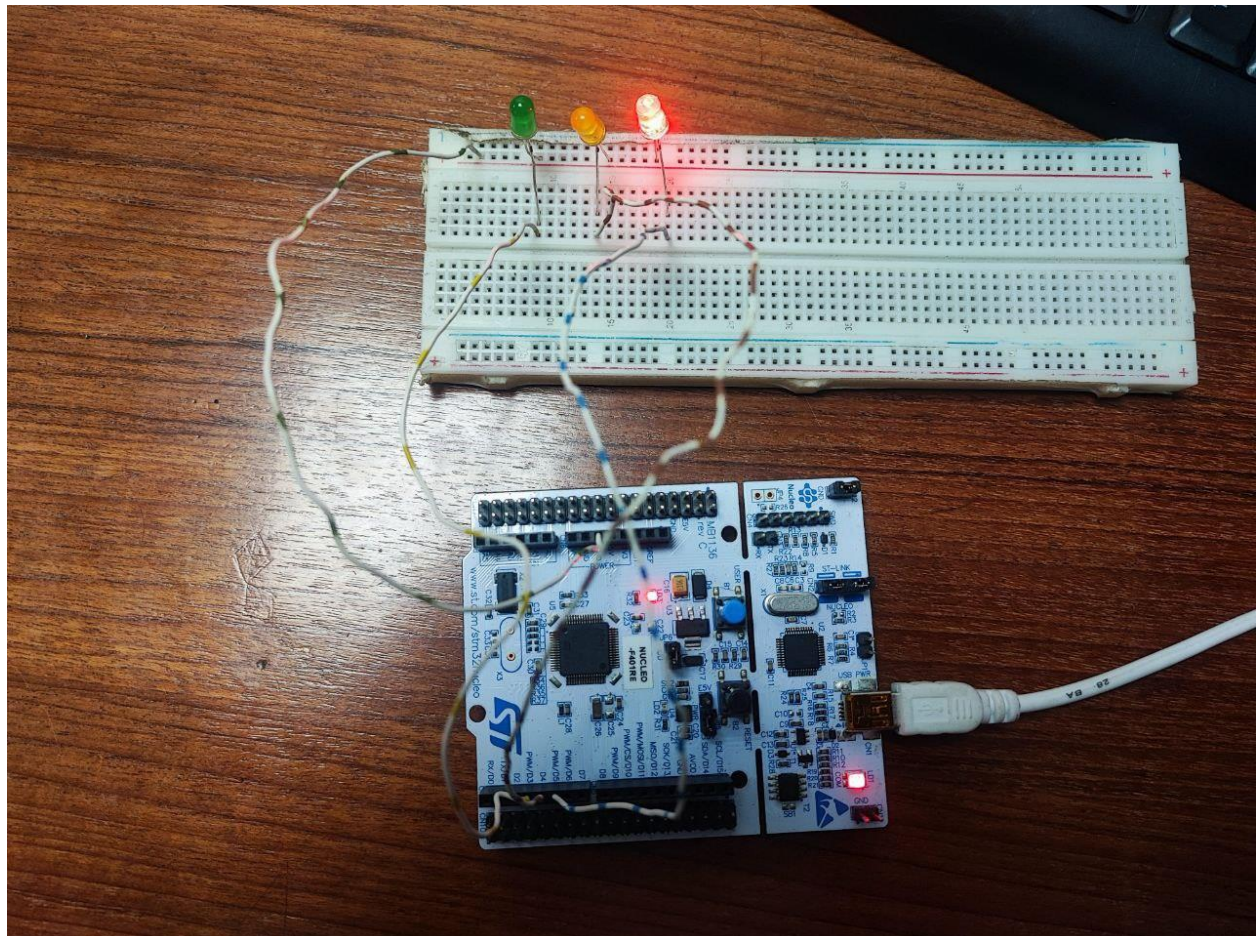
Discussion and Conclusion: In this experiment, using the necessary components and STM32, at first a LED blinking test was done. At And then a traffic system was made using 3 color LED. According to traffic system, In this experiment, it was shown that red light turns on for 4 sec, meanwhile yellow light turns on and both stay for 1 sec, then both go off and after that green light on for 4 sec, and in that time blinks for 0.5 sec for 3 times, green goes off and yellow turns on and off again.

In this lab, about STM32 Nucleo-F401RE board configuration was learnt which consists of a programmable microcontroller and how it can work for traffic control system which was used and got successful results using STM32CubeIDE. Also, the logic of this lab was tested by simulating accordingly. So the objectives of this lab were achieved.

References:

- https://www.st.com/en/evaluation-tools/nucleo-f401re.html for
- STM32F401RE,datasheet
- www.st.com
- https://www.st.com/resource/en/user_manual/dm00105879-description-of-stm32f4- hal-and-ll-drivers-stmicroelectronics.pdf
- www.st.com/en/development-tools/stm32cubeide.html