AMERICAN INTERNATIONAL UNIVERSITY-BANGLADESH (AIUB)
Faculty of Engineering
Department of EEE and CoE
Undergraduate Program

Course: MICROPROCESSOR AND EMBEDDED SYSTEMS **Summer 2021-22, MID**

Expt 1: Familiarization with microcontroller, study of blink test using and implementation of a traffic control system using microcontrollers**.**

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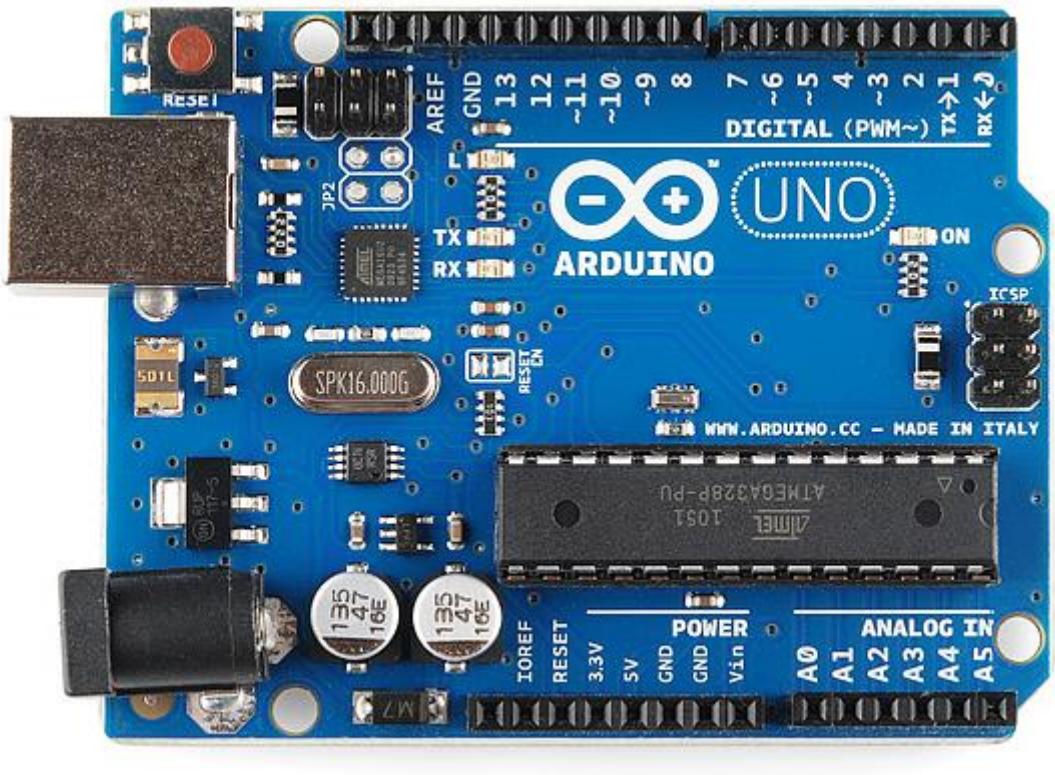
Introduction:

A microcontroller is embedded inside of a system to control a singular function in a device. It does this by interpreting data it receives from its I/O peripherals using its central processor. The temporary information that the microcontroller receives is stored in its data memory, where the processor accesses it and uses instructions stored in its program memory to decipher and apply the incoming data. It then uses its I/O peripherals to communicate and enact the appropriate action. Microcontrollers are used in a wide array of systems and devices. Devices often utilize multiple microcontrollers that work together within the device to handle their respective tasks. Microcontrollers are found in vehicles, robots, office machines, medical devices, mobile radio transceivers, vending machines and home appliances, among other devices. They are essentially simple miniature personal computers designed to control small features of a larger component, without a complex front-end operating system.

Theory and Methodology:

Arduino is an open-source electronics platform based on easy-to use hardware and software. Arduino boards can read inputs - light on a sensor, a finger on a button and turn it into an output - activating a motor, turning on an LED. The software framework used to program Arduinos isn't quite strict C/C++ (although it can be if you want), but instead, it is a simplified version that removes most of the boilerplate code to keep development as simple as possible. This is in contrast to traditional style embedded programming where quite a bit of initialization logic was needed just to get the device ready for operation.



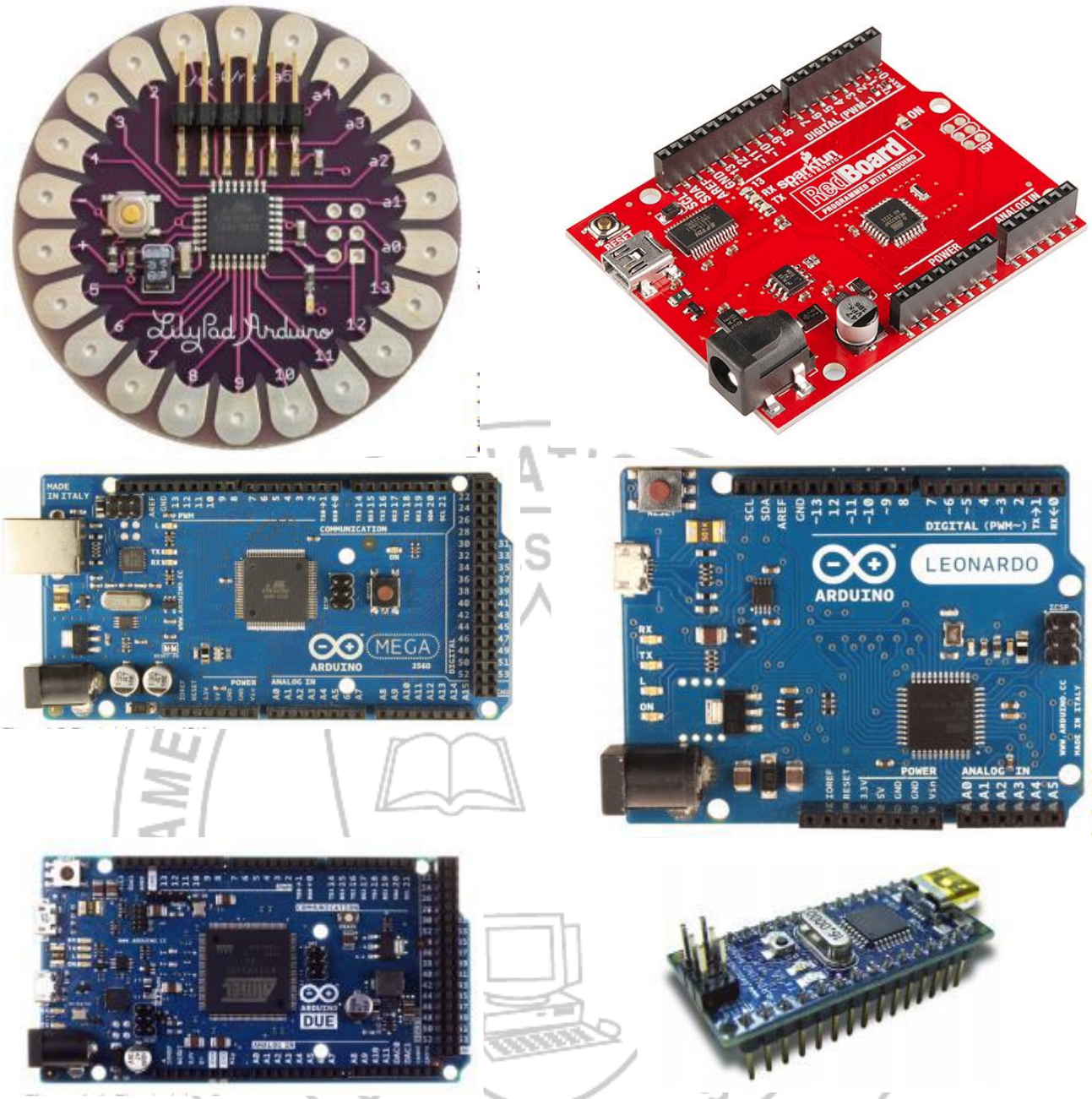


Fig 2: Different kind of Arduino boards

Equipment List:

1) Arduino board
2) Breadboard
3) LED lights (red, yellow, green)
4) Jumper wires

Circuit Diagram:

The Arduino platform is made up of the following components.

Figure 1: Arduino Uno (R3)

Hardware Setup:

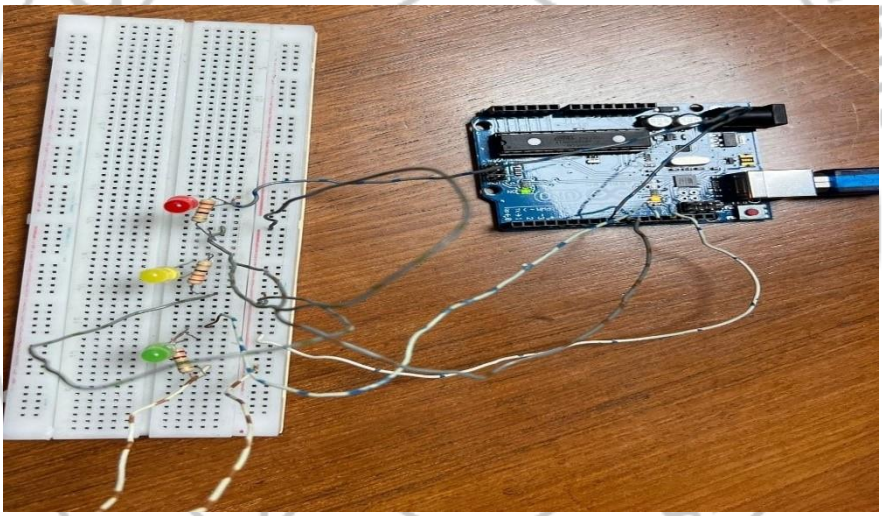


Figure 4 Hardware Set-up for Traffic Control system

Experimental Result :

In Single LED (Red) :

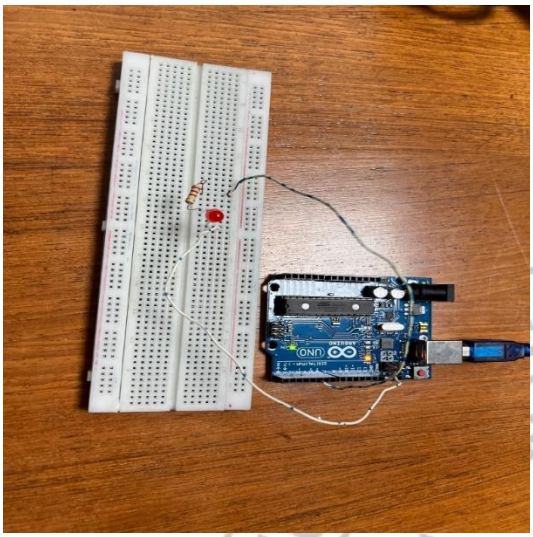


Figure 5.1: Red LED off

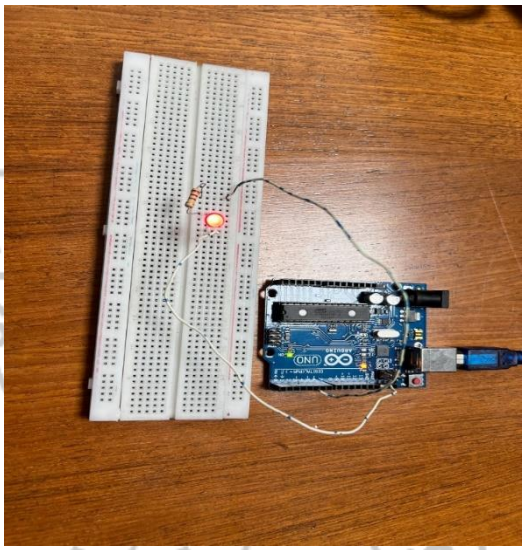


Figure 5.2:Red LED on

In Multiple LED (Traffic Control system):

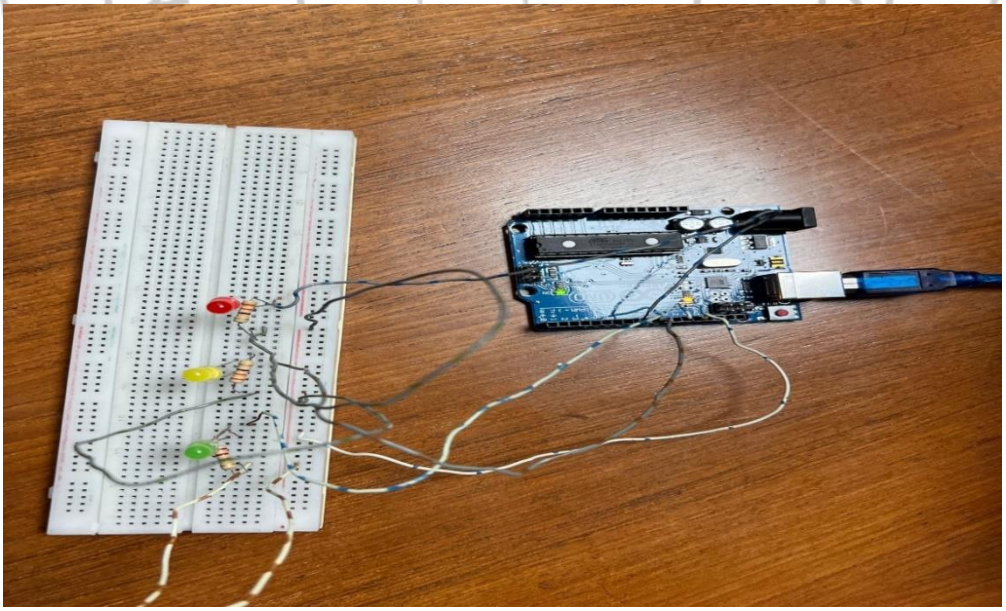


Figure 6.1: All LED off

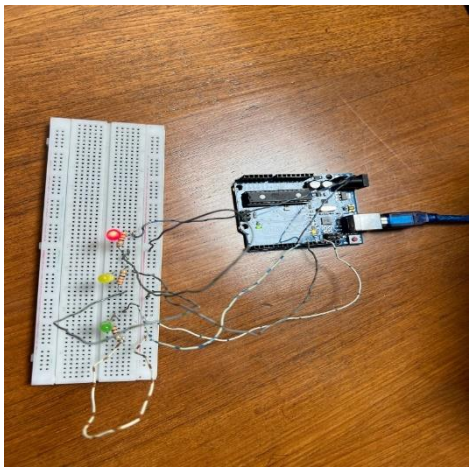


Figure 6.2: Red LED on

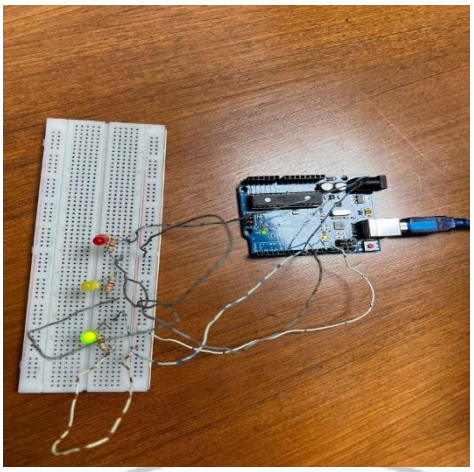


Figure 6.3: Green LED on

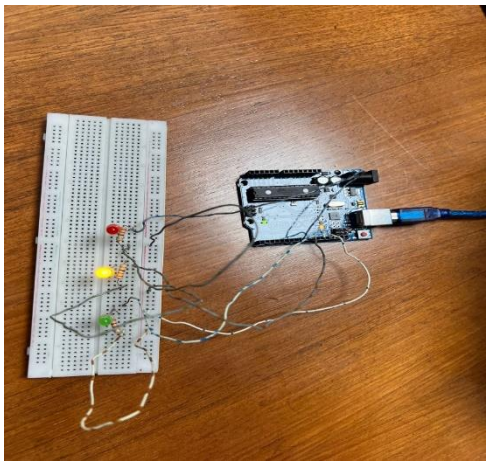


Figure 6.4: Yellow LED on

Code Analysis:

In single LED:

```
void setup() {
  // pin connections for the LED light
pinMode(13,OUTPUT);
}

void loop() {
  // turning on voltage at output 8(for red LED)
digitalWrite(13,HIGH);
delay(1000);     //  LED is on for 1 seconds
digitalWrite(13,LOW);
delay(1000);     //  LED is off for 1 seconds
}
```

In Multiple LED

```
void setup() {

 // pin connections for the LED lights
pinMode(8,OUTPUT);
pinMode(10,OUTPUT);
pinMode(12,OUTPUT);
}

void loop() {
  // turning on voltage at output 8(for red LED)
digitalWrite(8,HIGH);
delay(3000);     // red LED is on
digitalWrite(8,LOW);
```

```
digitalWrite(10,HIGH);
delay(3000);     // yellow LED is on
digitalWrite(10,LOW);

digitalWrite(12,HIGH);
delay(3000);     // green LED is on
digitalWrite(12,LOW);

digitalWrite(10,HIGH);
delay(3000);     // yellow LED is on
digitalWrite(10,LOW);


}
```

Discussion:

In this experiment the Arduino uno microcontroller was introduced for the single led and multiple leds. The LED blink was implemented through Arduino code using delay function. Then the same thing was implemented for 3 separate LEDs, Red, Yellow and Green, to make a traffic light system. The LED blink occurred after a specific time as the delay function was coded to work like a traffic light system, red to yellow, yellow to green and again green to yellow. The working principle of an Arduino uno was learned through this.