Alexandria University
Faculty of Engineering
Computer and Systems Engineering Department
CSE 233: Computer Organization

Microcontrollers - Lab 2

Team Members

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First: Problem Statement

Designing a Manual Pedestrian Traffic Lights system using an Arduino kit, 2 LEDs, and a push button.

The system should start with a red LED turned on and a green LED turned off, and whenever the push button is pressed the LEDs should switch states immediately.

Second: Tools and Procedures

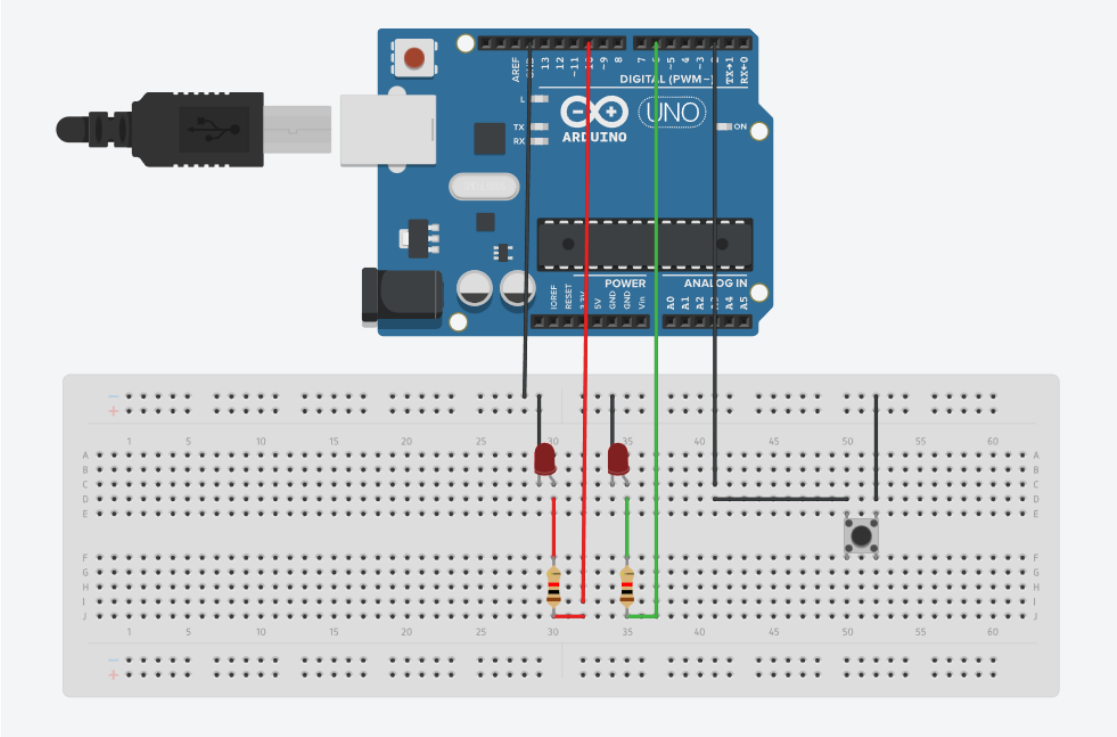
Tools: Arduino Uno kit, 2 LEDs, a push button, 2 resistances (1kOhm each), breadboard, wires.

Procedures:

- The LEDs are connected to the breadboard and then wired to the Arduino board into 2 different pins **(pin 6 for the green LED, and ping 10 for the red LED)**.
- The 2 resistances are connected to the circuit, where each LED is in series with exactly 1 resistance.
- The push button is connected to the breadboard and then wired to the Arduino board.
- Each component has one of the 2 terminals grounded, and the GND Arduino pin is connected to the ground pins of the breadboard.
- The Arduino board is supplied with power from a laptop.
- The code is written as follows:
    - The setup function: assigning pins and button behavior.
    - A debouncing algorithm is applied to detect false input and ignore it.
    - The loop function consists of two while loops for the state switching and two empty while loops to keep the LEDs from switching until the button is pressed.

Note that the LEDs change states after the button is pressed then released.
If we want to change states after the button is pressed only then we can just interchange the content of the second and third while loops and the content of the first and fourth while loops.

Third: Circuit diagram



Fourth: Code Snippets

```
1   void setup() {
2     pinMode(2, INPUT_PULLUP);
3     pinMode(10, OUTPUT);
4     pinMode(6, OUTPUT);
5
6   }
```

Setup Function

```
8   boolean debounce(int pin){
9     boolean state;
10    boolean previousState;
11    previousState = digitalRead(pin);
12    for(int i = 0; i < 10; ++i){
13      delay(1);
14      state = digitalRead(pin);
15      if(state != previousState){
16        i = 0;
17        previousState = state;
18      }
19    }
20    return state;
21  }
```

Button Debouncing

```
23  void loop() {
24    while(debounce(2)){
25      digitalWrite(10, HIGH);
26      digitalWrite(6, LOW);
27    }
28    while(!debounce(2)){
29
30    }
31    while(debounce(2)){
32      digitalWrite(10, LOW);
33      digitalWrite(6, HIGH);
34    }
35    while(!debounce(2)){
36
37    }
38
39  }
```

Loop Function