TED UNIVERSITY

2023 Fall

CMPE 453 Embedded Systems

LAB REPORT # 1

Lab Name: Binary Game of the Leds and 7-segment Display

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I.   Tasks

The steps followed to fulfill the tasks required in this laboratory can be listed as follows. Firstly, a working physical circuit was established with Arduino Uno, a breadboard, a 7-segment display, resistors, LEDs, and jumpers. Then, the ATMEGA328p microcontroller was programmed in C programming language with Arduino IDE to select a random number between 0-7 and print it on the 7-segment display. It was also taken into consideration which LED lights would or would not light up when specific numbers were shown.

II.   Hardware Implementation

Connections were made as per the provided instructions. In the image below, you can observe that 11 of the 220Ω resistors were connected to the 7-segment display as specified. Additionally, digital pins on the Arduino (PORTD and PORTB) were utilized to establish communication between the breadboard and the Arduino. These pins can have two distinct values: HIGH (1) or LOW (0). With these values, the 7-segment display and LEDs operated in accordance with our code. Furthermore, GND pins were used for grounding.
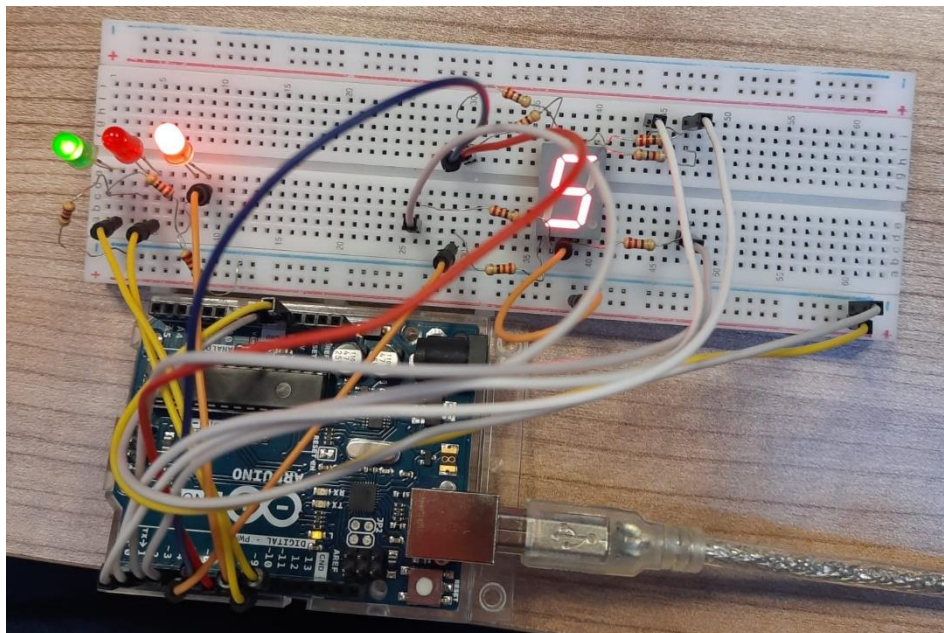

Figure 1 - Arduino and breadboard, with the necessary connections provided and working as desired. (October 23, 2023 Lab-1)

III. Code

display_number(int number): This function is used to display a number on a 7-segment display and control LEDs to create a binary representation of that number. It uses conditional statements to set the appropriate values on PORTD and PORTB, which control the segments of the 7-segment display and the LEDs, respectively.

setup(): initializes the microcontroller by setting up the data direction registers (DDRB and DDRD) for output.
enters an infinite loop (while(1)) to continuously perform the following steps:

- Generate a random number between 0 and 7 using the random(0, 8) function.
- Call *display_number(random_number)* to display the generated number on the 7-segment display and control the LEDs.
- Delaying the display for 3 seconds *using _delay_ms(3000)* before repeating the process.

Overall, the code consists of many if/else statements that allow to performs continuous port manipulation in Arduino.

IV. Critical Analysis / Conclusion

In conclusion, the experiment met its objectives by effectively displaying random numbers on the 7-segment display and representing them in binary using LEDs. The setup and code implementation worked as expected, providing a binary game of leds and 7-segment display.