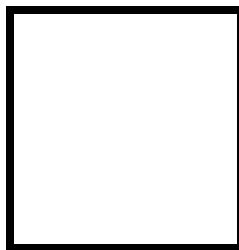**PAMANTASAN NG LUNGSOD NG MAYNILA**
(University of the City of Manila)
Intramuros, Manila

Microprocessor Lab

Laboratory Activity No. 2

Binary Representation of 8 LEDs in TinkerCad and Arduino Programming

Score

Submitted by:
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Sat 10:00AM - 1:00PM / CPE 0412-1 Microprocessors

Date Submitted
14-10-2023

Submitted to:

Engr. Maria Rizette H. Sayo

I.   Objectives

This laboratory activity aims to implement the principles and techniques of hardware programming using Arduino through:

-    creating an Arduino circuit of Binary representation (decimal 0-255 using 8 LEDs)

II.   Method/s

-    Perform a task problem given in the presentation.

-    Write a code and perform an Arduino circuit diagram of a binary counter that display using 8 LEDs with decimals equivalent from 0-255.

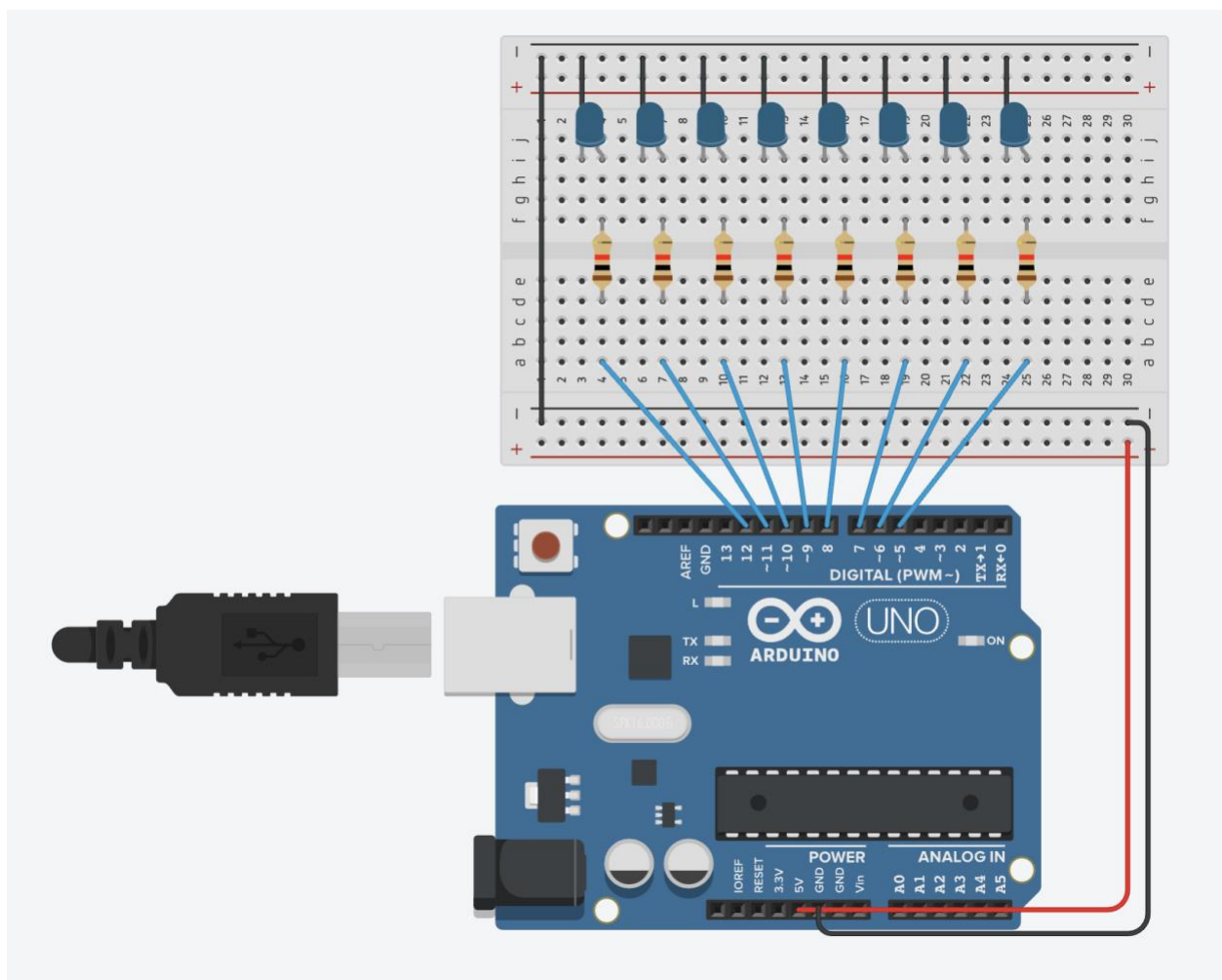III.   Results

TinkerCad Setup

Figure 1. Binary Counter Display Circuit Diagram

Components Used

1.   8 LEDs

2.   1k resistor

3.   Breadboard

4.   Arduino UNO

CODE:

```
1    int ledPins[8] = {12, 11, 10, 9, 8, 7, 6, 5};
2
3    void setup(){
4      Serial.begin(9600);
5      for (int i = 0; i < 8; i = i + 1){
6        pinMode(ledPins[i], OUTPUT);
7      }
8    }
9
10   void loop(){
11     int count = 0;
12     for (int dec = 0; dec < 256; dec++) {
13       int bin = dec;
14       count++;
15       // Turn on the LEDs corresponding to the binary value
16       for (int i = 0; i < 8; i++) {
17         digitalWrite(ledPins[i], (bin & (1 << i)) != 0);
18       }
19       Serial.print("Decimal value = ");
20       Serial.print(dec);
21       Serial.print("\n");
22       delay(100);
23     }
24   }
```

Serial Monitor ▲

Result:
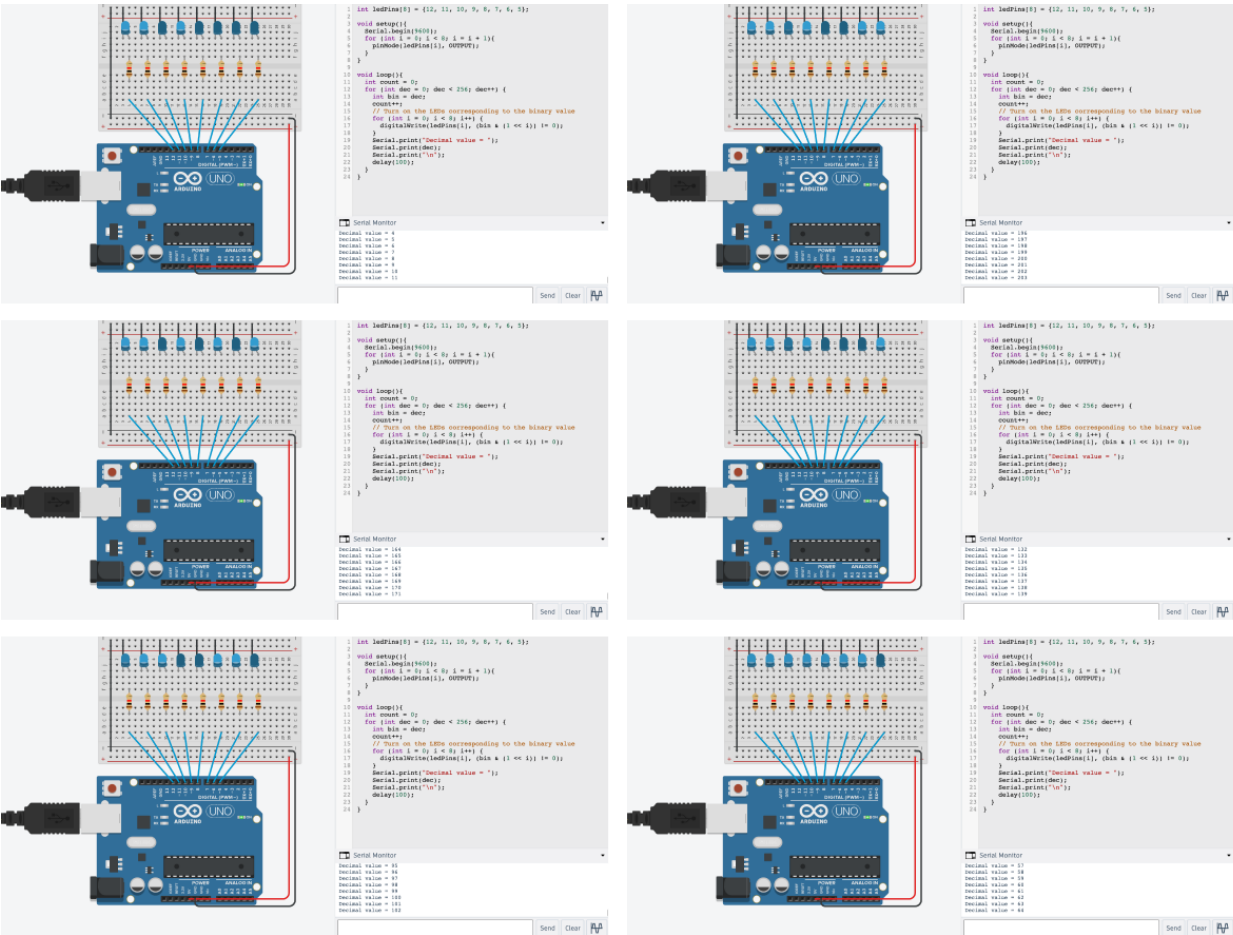
IV. Conclusion

In conclusion, this experiment effectively demonstrates the functionality of a Binary Counter circuit with 8 LEDs arranged on a breadboard, representing decimal values from 0 to 255. The binary values are easily deduced by considering the power of two, which can be expressed as (2^n - 1), where n is the number of LEDs used in the setup. With 8 LEDs, the circuit encompasses 2^7, equal to 128, which is the highest-value LED when illuminated. When all LEDs are lit, the sum of their values reaches the maximum value of 255.

The significance of the left shift operator (<<) in this context cannot be understated, as it effectively illustrates the binary addition process. The left shift operator shifts bits to the left by a number specified on the right operand, mirroring the process of adding ones in binary, such as 1 + 1 = 10.

Furthermore, the inclusion of the "Serial.begin(9600)" statement in the setup is crucial for monitoring and displaying the current decimal value. This ensures that the Binary Counter's operation can be observed and understood more easily.

References

[1] D.J.D. Sayo. "University of the City of Manila Computer Engineering Department Honor Code," PLM-CpE Departmental Policies, 2020.

[2] J. D. Brown and Z. G. Vranesic, "Foundations of Digital Logic Design," [Online]. Available: URL.

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