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

Microprocessor Lab

Laboratory Activity No. 2
Arduino and Tinkercad Interface

Score

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<Saturday | 01:00 PM – 07:00 PM> / <CPE 0412.1 – 2 >

Date Submitted
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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 programming and circuit diagram.

II. Method/s

- Perform a task problem given in the presentation.
- Write a code and perform an Arduino circuit diagram of a ring counter that display eight (8)LEDs starting from left.

III. Results

TinkerCad

Exercise 1: Write a code that does a ring counter display for eight (8) LEDs starting from left.

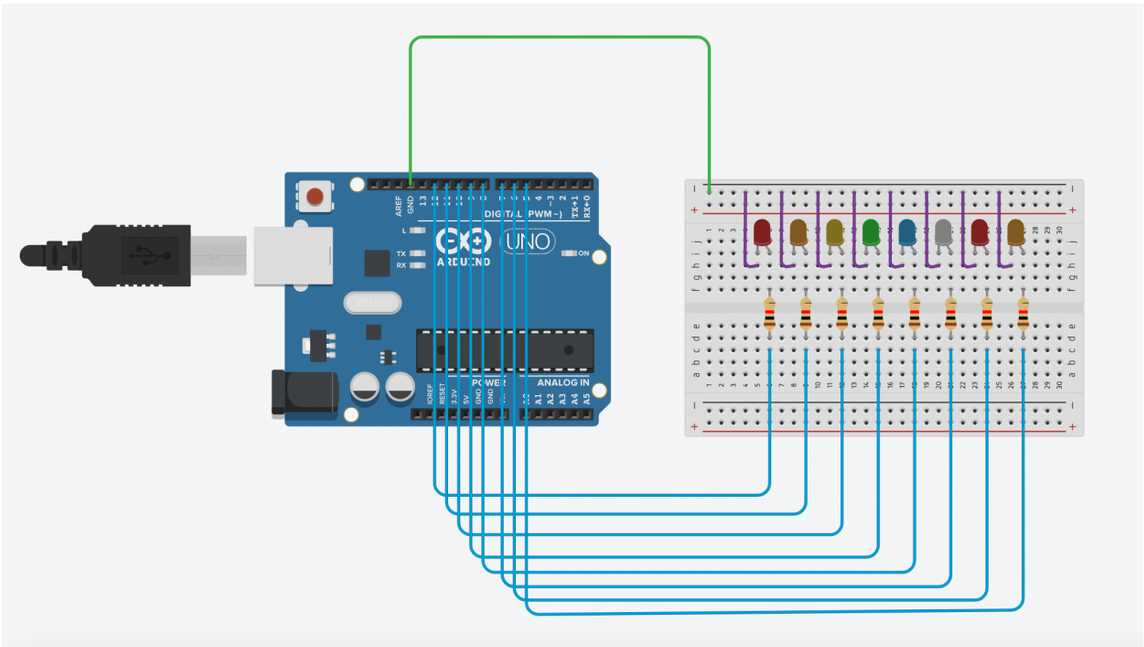


Figure No.1 Ring Counter Display Circuit Diagram

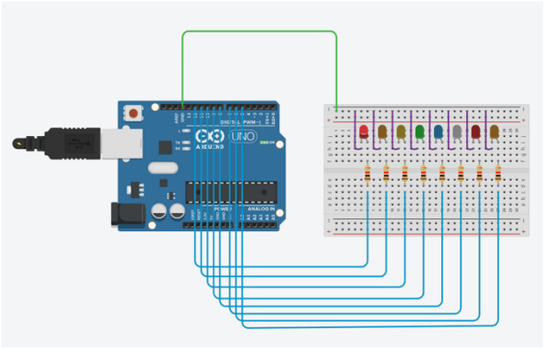
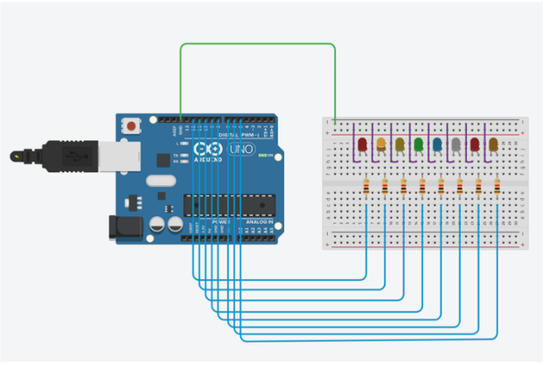
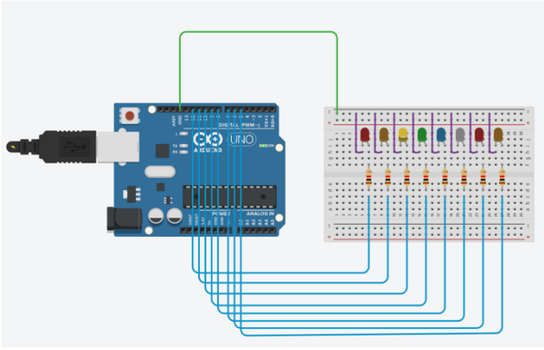
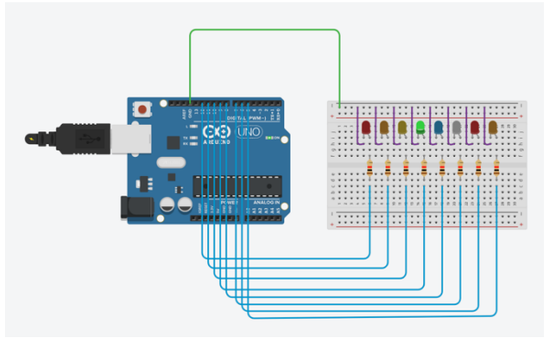
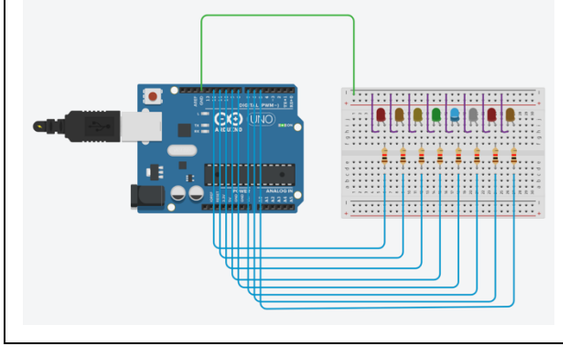
Components Used

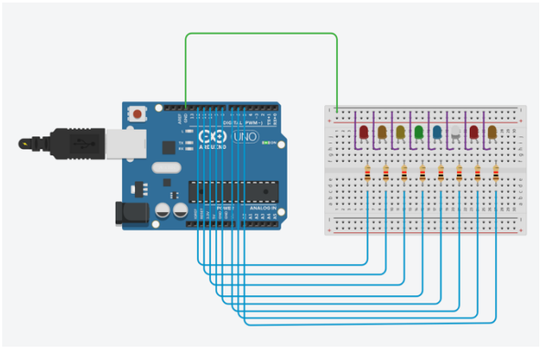
1. 8 LEDs
2. Resistor
3. Breadboard

CODE:

```
// C++ code
//
/*
  Ring counter display for eight (8) LEDs starting from left.
*/

void setup()
{
  Serial.begin(9600);
  pinMode(5, OUTPUT);
  pinMode(6, OUTPUT);
  pinMode(7, OUTPUT);
  pinMode(8, OUTPUT);
  pinMode(9, OUTPUT);
  pinMode(10, OUTPUT);
  pinMode(11, OUTPUT);
  pinMode(12, OUTPUT);
}

void loop()
{
  digitalWrite(12, HIGH);
  delay(500);
  Serial.println("The LED1 is HIGH");
  digitalWrite(12, LOW);
  delay(500);
  Serial.println("The LED1 is LOW");

  digitalWrite(11, HIGH);
  delay(500);
  Serial.println("The LED2 is HIGH");
  digitalWrite(11, LOW);
  delay(500);
  Serial.println("The LED2 is LOW");

  digitalWrite(10, HIGH);
  delay(500);
  Serial.println("The LED3 is HIGH");
  digitalWrite(10, LOW);
  delay(500);
  Serial.println("The LED3 is LOW");

  digitalWrite(9, HIGH);
  delay(500);
  Serial.println("The LED4 is HIGH");
  digitalWrite(9, LOW);
  delay(500);
  Serial.println("The LED4 is LOW");

  digitalWrite(8, HIGH);
  delay(500);
  Serial.println("The LED5 is HIGH");
  digitalWrite(8, LOW);
  delay(500);
  Serial.println("The LED5 is LOW");

  digitalWrite(7, HIGH);
  delay(500);
  Serial.println("The LED6 is HIGH");
  digitalWrite(7, LOW);
  delay(500);
  Serial.println("The LED6 is LOW");

  digitalWrite(6, HIGH);
  delay(500);
  Serial.println("The LED7 is HIGH");
  digitalWrite(6, LOW);
  delay(500);
  Serial.println("The LED7 is LOW");

  digitalWrite(5, HIGH);
  delay(500);
  Serial.println("The LED8 is HIGH");
  digitalWrite(5, LOW);
  delay(500);
  Serial.println("The LED8 is LOW");

}
```

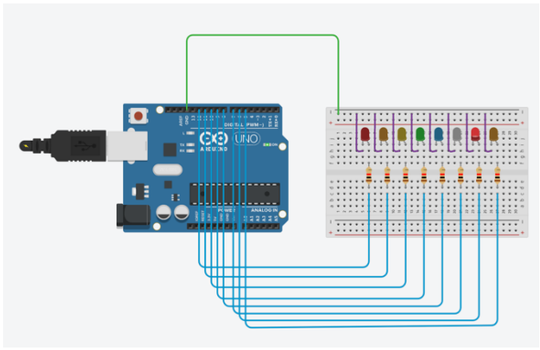
RESULTS

	Serial Monitor The LED1 is HIGH
	Serial Monitor The LED1 is LOW The LED2 is HIGH
	Serial Monitor The LED2 is LOW The LED3 is HIGH
	Serial Monitor The LED3 is LOW The LED4 is HIGH
	Serial Monitor The LED4 is LOW The LED5 is HIGH



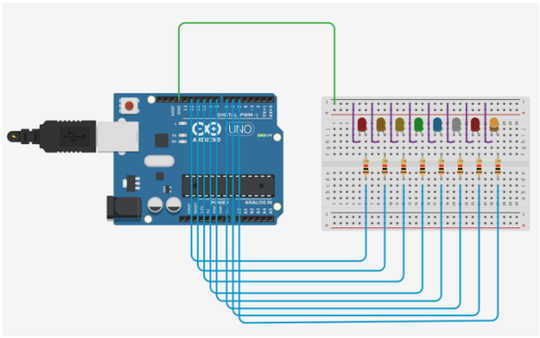
Serial Monitor

```
The LED5 is LOW
The LED6 is HIGH
```



Serial Monitor

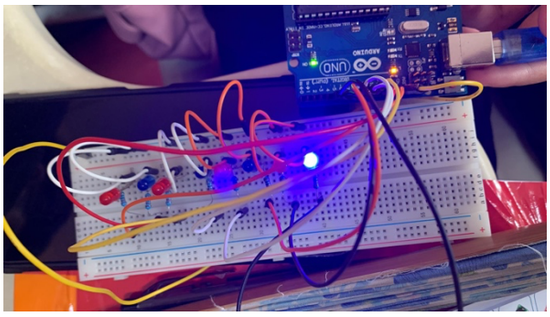
```
The LED6 is LOW
The LED7 is HIGH
```

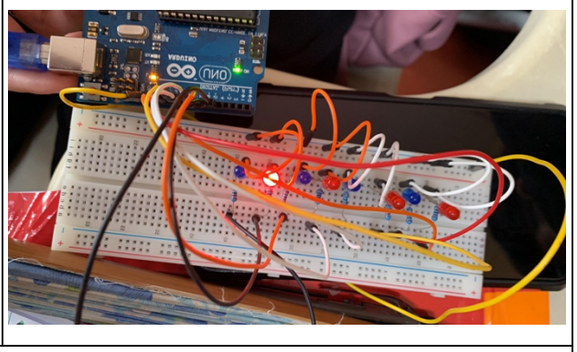


Serial Monitor

```
The LED7 is LOW
The LED8 is HIGH
The LED8 is LOW
```

ACTUAL IMPLEMENTATION





Both figures show the sample outputs of the actual implementation of a Ring Counter Display of 8 LEDs. As observed, when the LED1 is HIGH, the first LED in the circuit is ON. On the other hand, the LED2 to LED7 is LOW, which means that the rest of the LEDs in the circuit are OFF. This process will continue for the rest of the LEDs until the given program code function is satisfied.

IV. Conclusion

In conclusion, a ring counter is an example of a digital sequential logic circuit that is made to iterate continuously over a set of binary states. It works like a shift register with feedback, with each stage's output feeding into the one after it to form a closed loop or ring. Hence, why ring counters are typically used for applications that require a sequence of states, such as control signal generation and frequency division.

For this experiment, a circuit diagram with eight (8) LEDs are used to create a Ring Counter Circuit Display. As observed, the LEDs take turns in displaying the light. As one LED is lit, it will then turn off with a delay of 1000ms as it shifts to the next LED. The operation of the ring counter is synchronized with a clock signal. When the clock signal transitions, the counter advances to the next state in the sequence. Additionally, it can be seen that in the Serial Monitor, there is a message being display such as “The LED1 is HIGH” or “The LED1 is LOW” depending on the condition of the LEDs.

Finally, ring counters are helpful in many different situations, such as frequency dividers, time delay generators, digital displays, and the creation of control signals in digital systems. They serve as a basic building element in the construction of digital circuits and provide an easy approach to produce recurring sequences of binary states.

References

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

[2] “Ring Counter in digital logic,” GeeksforGeeks, https://www.geeksforgeeks.org/ring-counter-in-digital-logic/ (accessed Oct. 14, 2023).

[3] “8-bit ring counter • amplelab,” AmpleLab, http://amplelab.com/product/8-bit-ring-counter/ (accessed Oct. 14, 2023).

[4] “Ring Counter in Digital Electronics - Javatpoint,” www.javatpoint.com, https://www.javatpoint.com/ring-counter-in-digital-electronics (accessed Oct. 14, 2023).