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

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Submitted to:

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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

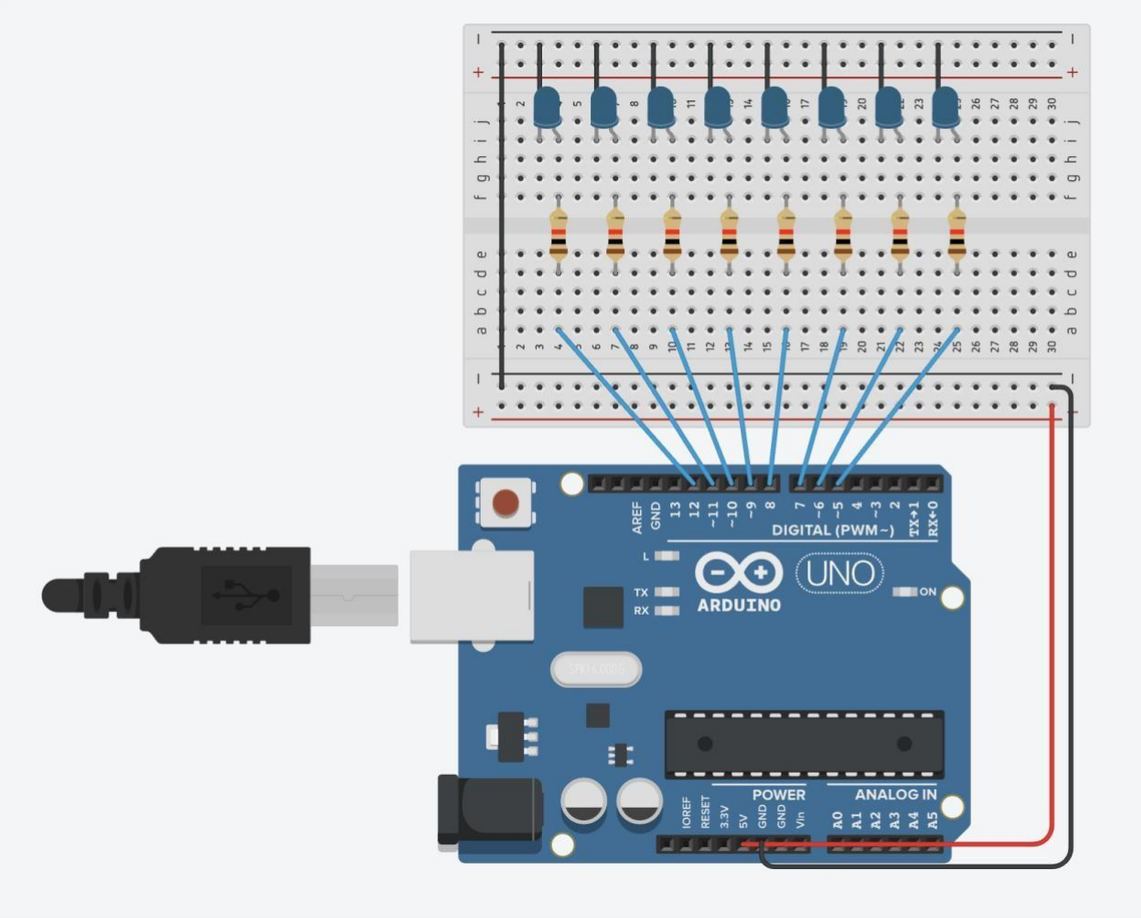


Figure 1. Binary Counter Display Circuit Diagram

Components Used

1. 8 LEDs
2. 1k resistor
3. Breadboard
4. Arduino UNO

CODE:

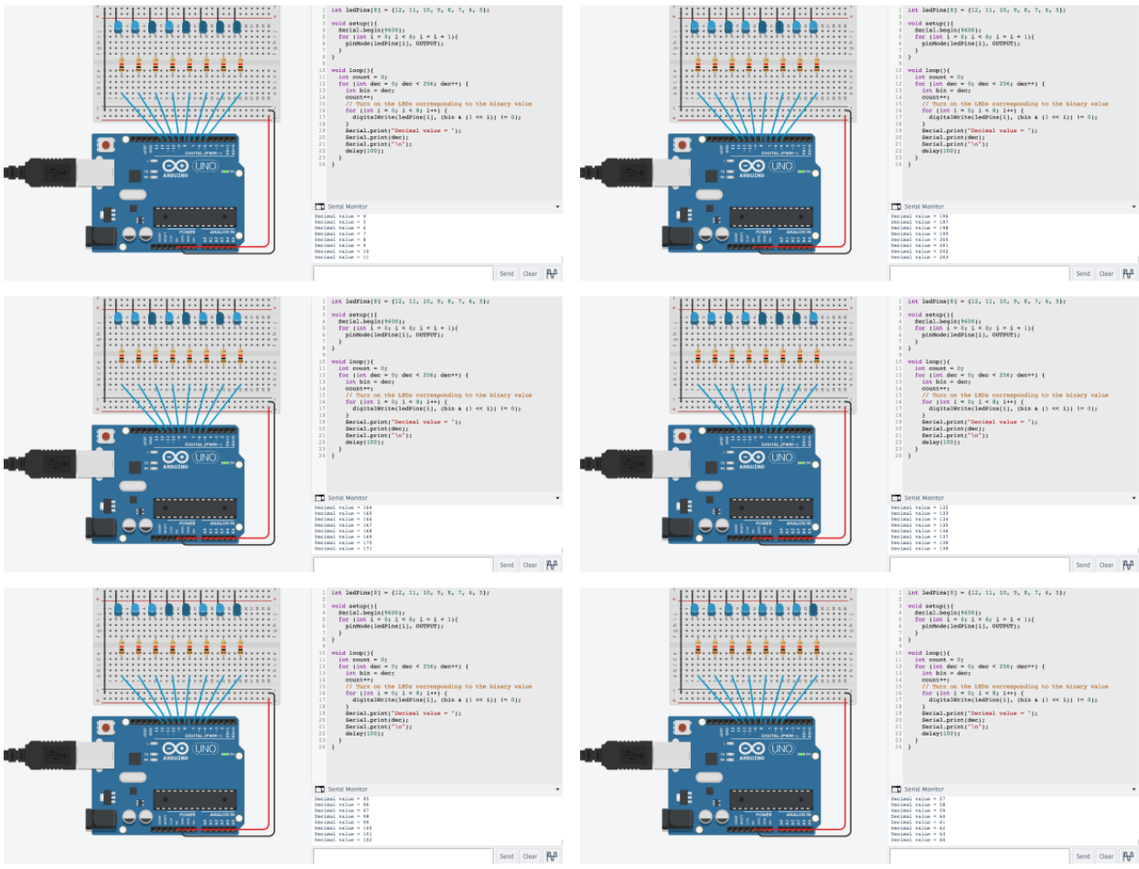
```
int ledPins[8] = {12, 11, 10, 9, 8, 7, 6, 5};

void setup(){
  Serial.begin(9600);
  for (int i = 0; i < 8; i = i + 1){
    pinMode(ledPins[i], OUTPUT);
  }
}

void loop(){
  int count = 0;
  for (int dec = 0; dec < 256; dec++) {
    int bin = dec;
    count++;
    // Turn on the LEDs corresponding to the binary value
    for (int i = 0; i < 8; i++) {
      digitalWrite(ledPins[i], (bin & (1 << i)) != 0);
    }
    Serial.print("Decimal value = ");
    Serial.print(dec);
    Serial.print("\n");
    delay(100);
  }
}
```

Serial Monitor

Result:



IV. Conclusion

In summary, this experiment effectively showcases the operational features of an 8-LED Binary Counter circuit arranged on a breadboard, symbolizing decimal values ranging from 0 to 255. Deriving the binary values involves a straightforward calculation based on powers of two, expressed as (2^n - 1), where n corresponds to the number of LEDs employed. With 8 LEDs, the circuit covers 2^7, equivalent to 128, with the highest-value LED illuminated. Activating all LEDs results in a cumulative value reaching the maximum of 255.

The importance of the left shift operator (<<) in this context cannot be overstated, as it vividly illustrates the binary addition process. The left shift operator shifts bits to the left by a specified number indicated on the right operand, mimicking the binary addition of ones, such as 1 + 1 = 10.

Moreover, the inclusion of the "Serial.begin(9600)" statement in the setup is pivotal for monitoring and displaying the current decimal value. This ensures that the Binary Counter's functionality can be easily observed and comprehended.

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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