

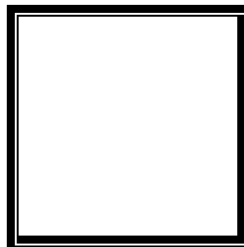


**PAMANTASAN NG LUNGSOD NG MAYNILA**  
(University of the City of Manila)  
Intramuros, Manila

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**Microprocessors (Laboratory)**

Laboratory Activity No. 5  
**7 Segment Display LED**



Score

*Submitted by:*

**Leader: Palacio, Leticia Mae**  
**Baldanzo, Raizza Marrie C.**  
**Baltes, Billy Renz C.**  
**Belmonte, Jhade Loui M.**  
**Garcia, Joven M.**  
**Magnabihon, Michael Lorenz M.**  
**Tiu, Joshua Miguel Yaj A.**

**S 10:00am-1:00pm / CPE 0412.1-1**

*Submitted to:*

**Engr. Maria Rizette H. Sayo**

*Date Submitted:*

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I. Objectives

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

- Familiarizing with the Arduino IDE.
- Demonstrate Analog and Digital Input techniques.
- Demonstrate data display using the serial monitor

II. Methods

- Visualize and label the Arduino IDE interface.
- Perform the tasks and problems presented in the presentation.
- Present a unique implementation representative of the objectives.

III. Results

In order to create the 7-segment display LED circuit the materials used were an Arduino Uno R3, a cathode 7 segment display, 3 1k resistors, and 1 push button.

Name	Quantity	Component
U1	1	Arduino Uno R3
Digit1	1	Cathode 7 Segment Display
R2 R3 R1	3	1 k $\Omega$ Resistor
S1	1	Pushbutton

Table 1. List of Components for the 7 Segment Display LED Circuit

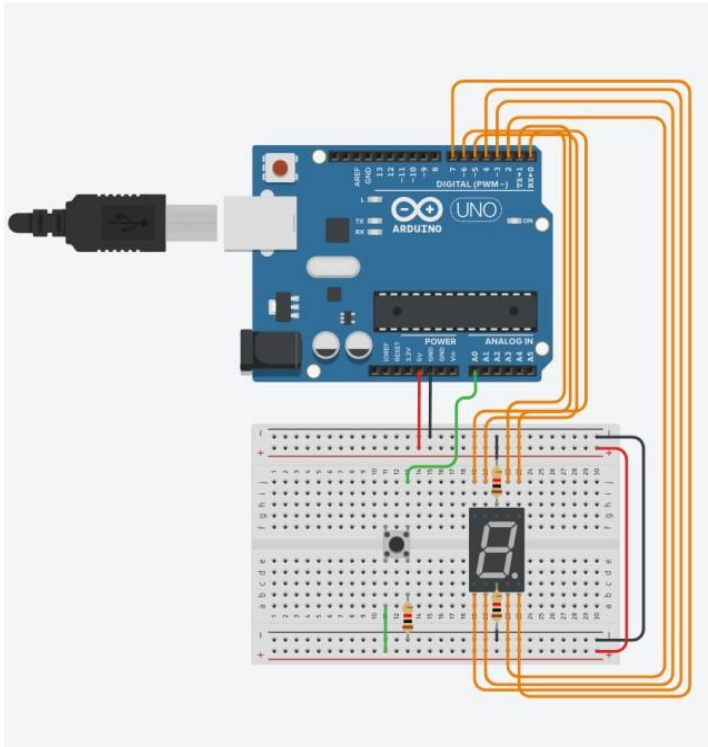


Figure 1. Circuit Diagram of the 7 Segment Display LED Circuit

The circuit diagram is made by connecting the 7-segment display to the Arduino development board by connecting each of its corresponding pins to the input/output pins of the board that will allow it to control the output of the 7-segment display. A push button will also be connected as an input to the development board which will operate if the 7-segment display will turn on or not.

```

1 // C++ code
2 //
3
4 int a=0, b=1,c=2,d=3,e=4,f=5,g=6,dp=7;
5 int button=14;
6 int counter=-1;
7 void setup()
8 {
9     pinMode(a, OUTPUT);
10    pinMode(b, OUTPUT);
11    pinMode(c, OUTPUT);
12    pinMode(d, OUTPUT);
13    pinMode(e, OUTPUT);
14    pinMode(f, OUTPUT);
15    pinMode(g, OUTPUT);
16    pinMode(dp, OUTPUT);
17    pinMode (button, INPUT);
18 }
19
20 void number(int counter)
21 {
22     if (counter==0)
23     {
24         digitalWrite(a, HIGH);
25         digitalWrite(b, HIGH);
26         digitalWrite(c, HIGH);
27         digitalWrite(d, HIGH);
28         digitalWrite(e, HIGH);
29         digitalWrite(f, HIGH);
30     }
31     else if (counter==1)
32     {
33         digitalWrite(b, HIGH);
34         digitalWrite(c, HIGH);
35     }
36     else if (counter==2)
37     {
38         digitalWrite(a, HIGH);
39         digitalWrite(b, HIGH);
40         digitalWrite(d, HIGH);
41         digitalWrite(e, HIGH);
42         digitalWrite(g, HIGH);
43     }
44     else if (counter==3)
45     {
46         digitalWrite(a, HIGH);
47         digitalWrite(b, HIGH);
48         digitalWrite(c, HIGH);
49         digitalWrite(d, HIGH);
50         digitalWrite(g, HIGH);
51     }
52     else if (counter==4)
53     {
54         digitalWrite(b, HIGH);
55         digitalWrite(c, HIGH);
56         digitalWrite(f, HIGH);
57         digitalWrite(g, HIGH);
58     }
59     else if (counter==5)
60     {
61         digitalWrite(a, HIGH);
62         digitalWrite(c, HIGH);
63         digitalWrite(d, HIGH);
64         digitalWrite(f, HIGH);
65         digitalWrite(g, HIGH);
66     }

```

*Figure 2. First Part of the Program Code of the 7 Segment Display LED Circuit*

The first part of the program code initializes all the components as well as the pins used in the Arduino Uno R3 including its outputs which are connected to each pin of the 7-segment LED display and input which is connected to the push button. A void function is also created which will command the 7-segment LED to turn on specific LED's to output the numbers 0-9.

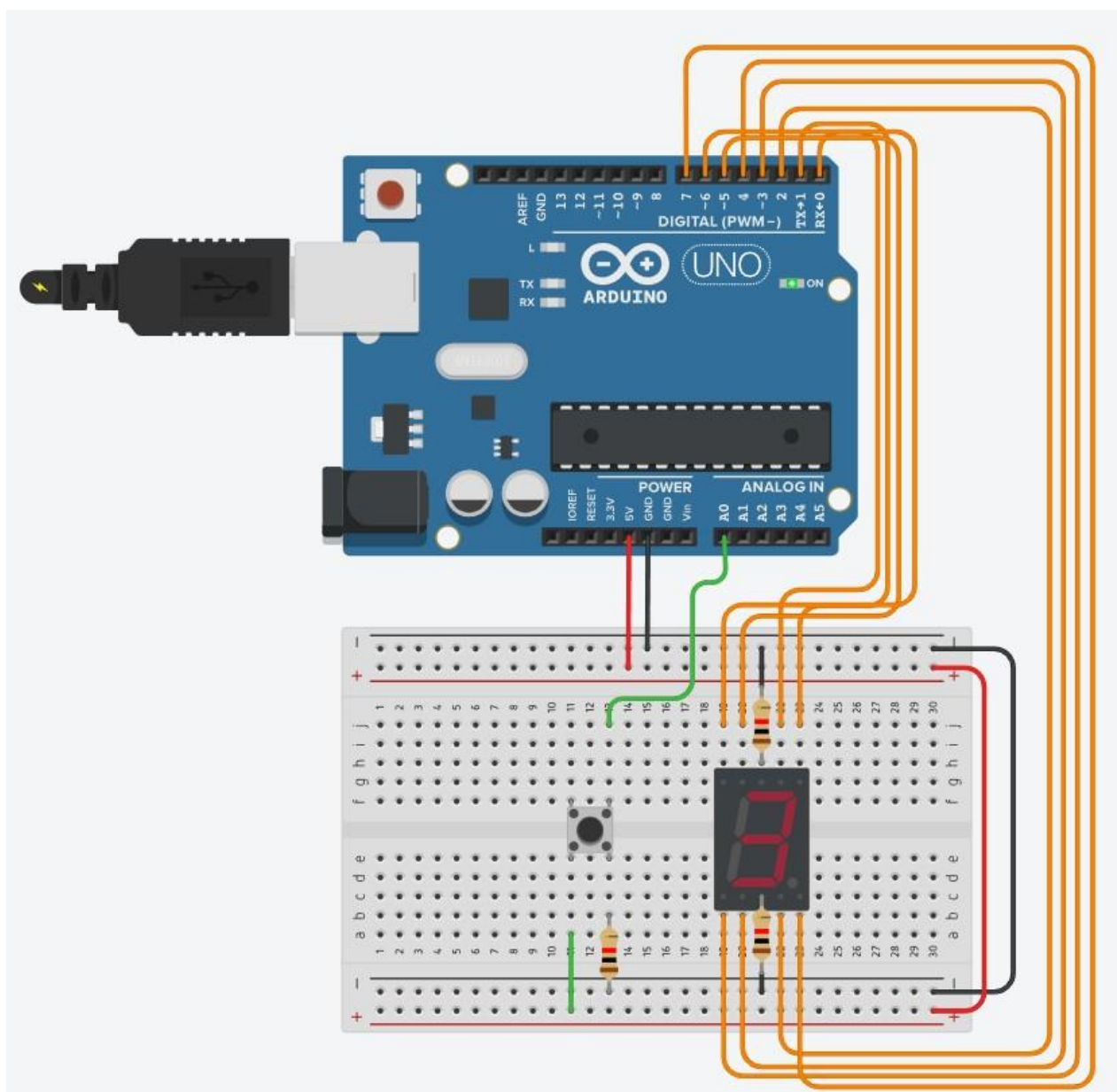
```

67     else if (counter==6)
68     {
69         digitalWrite(a, HIGH);
70         digitalWrite(c, HIGH);
71         digitalWrite(d, HIGH);
72         digitalWrite(e, HIGH);
73         digitalWrite(f, HIGH);
74         digitalWrite(g, HIGH);
75     }
76     else if (counter==7)
77     {
78         digitalWrite(a, HIGH);
79         digitalWrite(b, HIGH);
80         digitalWrite(c, HIGH);
81     }
82     else if (counter==8)
83     {
84         digitalWrite(a, HIGH);
85         digitalWrite(b, HIGH);
86         digitalWrite(c, HIGH);
87         digitalWrite(d, HIGH);
88         digitalWrite(e, HIGH);
89         digitalWrite(f, HIGH);
90         digitalWrite(g, HIGH);
91     }
92     else if (counter==9)
93     {
94         digitalWrite(a, HIGH);
95         digitalWrite(b, HIGH);
96         digitalWrite(c, HIGH);
97         digitalWrite(d, HIGH);
98         digitalWrite(f, HIGH);
99         digitalWrite(g, HIGH);
100    }
101 }
102
103 void clear()
104 {
105     digitalWrite(a, LOW);
106     digitalWrite(b, LOW);
107     digitalWrite(c, LOW);
108     digitalWrite(d, LOW);
109     digitalWrite(e, LOW);
110     digitalWrite(f, LOW);
111     digitalWrite(g, LOW);
112 }
113
114 void loop()
115 {
116
117     if (digitalRead(button)==HIGH)
118     {
119         if (counter<9)
120         {
121             counter++;
122             number(counter);
123             delay(500);
124             clear();
125         }
126         else
127         {
128             counter=-1;
129         }
130     }
131     else
132     {
133         clear();
134         counter=-1;
135     }
136 }
137 }

```

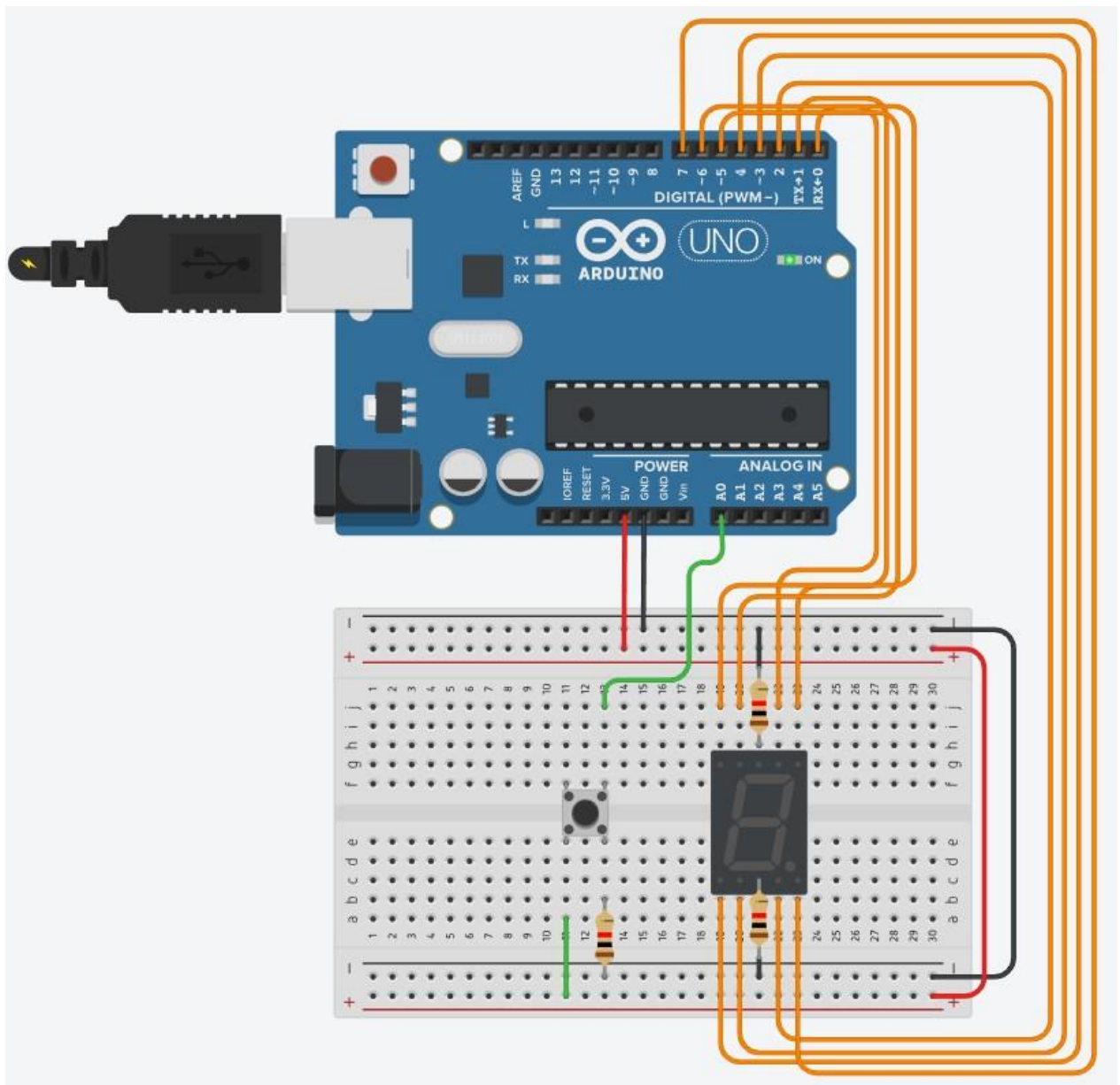
*Figure 3. Second Part of the Program Code of the 7 Segment Display LED Circuit*

The second part of the program code includes the continuation of the void function from the first part as well as another void function called clear which will turn off all the LEDs in the 7-segment display. The main loop is also included which operates the count function whenever the button is pressed and loops it as long as it's pressed while if the button is not pressed it will perform the clear function which will turn off all the LEDs in the display.



*Figure 4. Simulation of the 7 Segment Display LED Circuit (Push Button Pressed)*

The figure shows the simulation of the circuit when the button is pressed. Whenever the button is pressed the 7-segment will display the numbers 0-9 and will loop as long as the button is pressed.

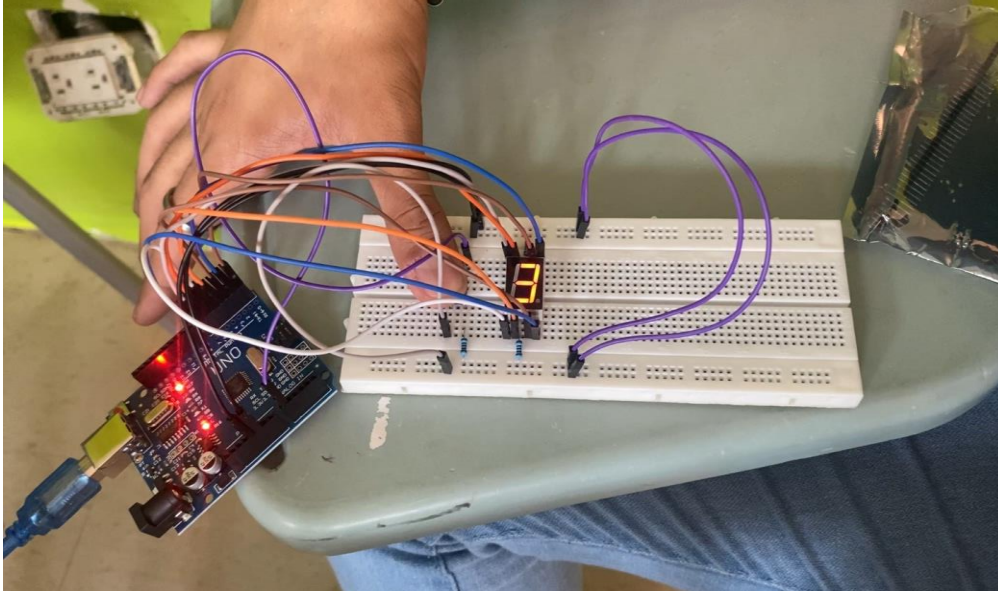


*Figure 5. Simulation of the 7 Segment Display LED Circuit (Push Button Unpressed)*

The figure shows the simulation of the circuit when the button is unpressed. Whenever the button is unpressed, all the 7-segment display LEDs will turn off which puts the 7-segment display to output nothing.



Actual Implementation:



*Figure 6. Actual 7 Segment Display LED*

#### IV. Conclusion

In summary, the circuit effectively exhibits responsive behavior in response to button push, displaying the digits 0 through 9 on the 7-segment display in order. The looped sequence demonstrates the developed circuit's usefulness and dependability, guaranteeing continuous operation as long as the button is pressed. When the button is pressed, the circuit may cycle through the display of digits on the 7-segment, demonstrating its usefulness for repetitive activities. This behavior and the looping mechanism point to possible uses in situations requiring sequential counting or continuous monitoring. The circuit's responsiveness adds an interactive component and makes it flexible for user-triggered displays in various settings. The seamless integration of button input and sequential output improves the circuit's adaptability and usefulness.

## References

[1] IC Projects, “Digital Lab - 7-segment LED display: Digital IC Projects: Electronics Textbook,” All About Circuits, <https://www.allaboutcircuits.com/textbook/experiments/chpt-7/7-segment-display/> (accessed Nov. 11, 2023).