7-Segment Display with Arduino and Push Button

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Aim

To design and implement a simple digital system using an Arduino that displays a number on a 7-segment display, which changes when a push button is pressed.

Objective

- To learn how to interface a 7-segment display with an Arduino.
- To understand how to read input from a push button.
- To implement a basic digital counter that increments or cycles through numbers each time the push button is pressed.

Required Components

- Arduino Uno (or any other compatible Arduino board)
- 1 x 7-segment display (common cathode or common anode)
- 8 x 220-ohm resistors (for current limiting to the segments)
- 1 x Push button
- 1 x 10k-ohm resistor (for the pull-down resistor on the push button)
- Breadboard
- Jumper wires

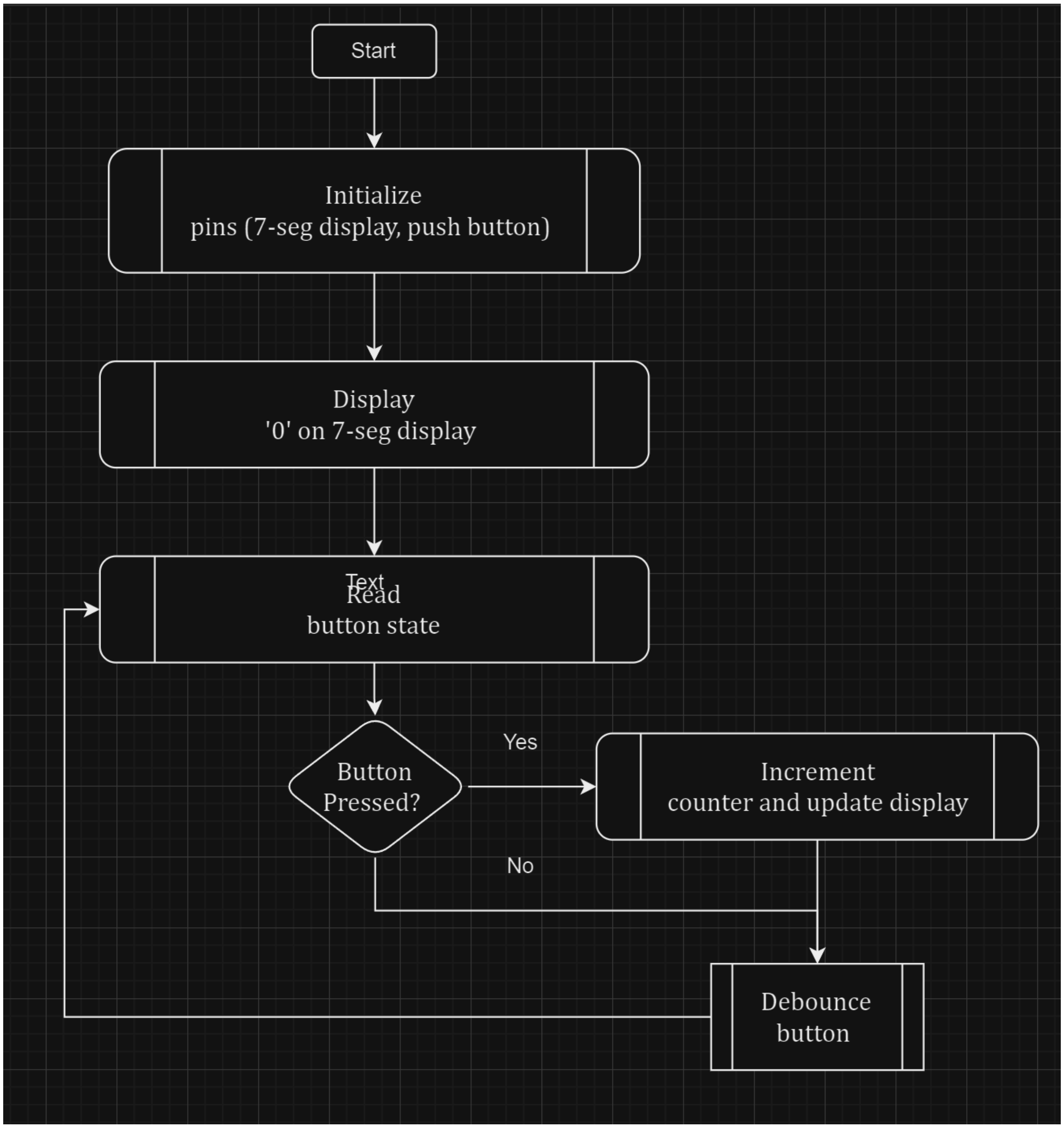
Process and Methodologies

1. Connecting the 7-Segment Display:
- Identify the pins of the 7-segment display.
- Connect the segment pins (A, B, C, D, E, F, G) to digital pins on the Arduino through current-limiting resistors.
- Connect the common cathode/anode pin to ground or Vcc respectively.

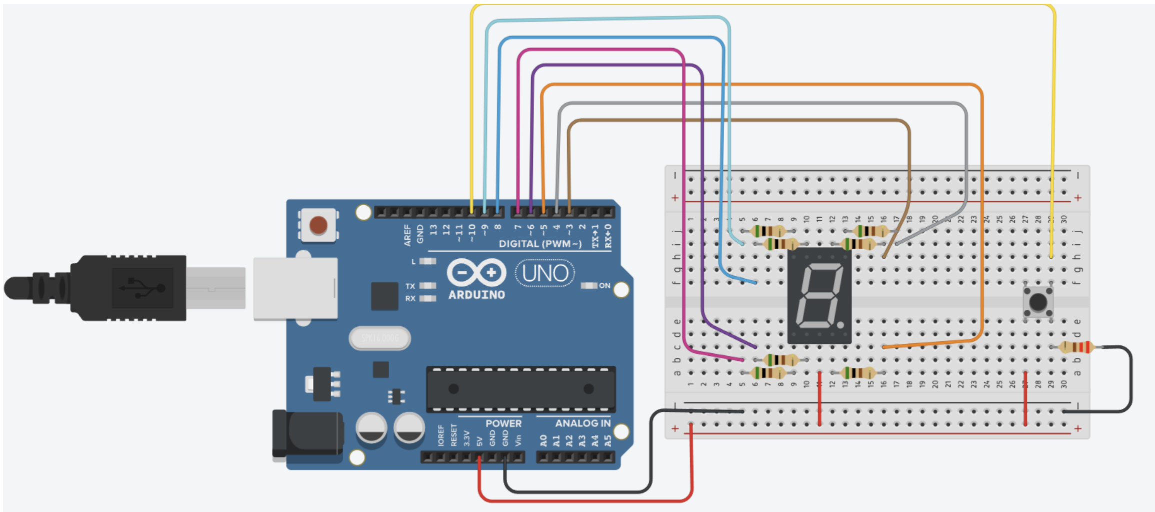
2. Connecting the Push Button:
- Connect one side of the push button to an input pin on the Arduino.
- Connect the other side of the push button to ground.
- Use a pull-down resistor to ensure the input reads LOW when the button is not pressed.

3. Programming the Arduino:
- Write code to initialize the 7-segment display pins as outputs.
- Write a function to display digits on the 7-segment display.
- Implement a loop that reads the state of the push button.
- Each time the button is pressed, the displayed number increments.
- Debounce the push button to avoid multiple counts from a single press.

Flowchart of Process



Circuit Diagram



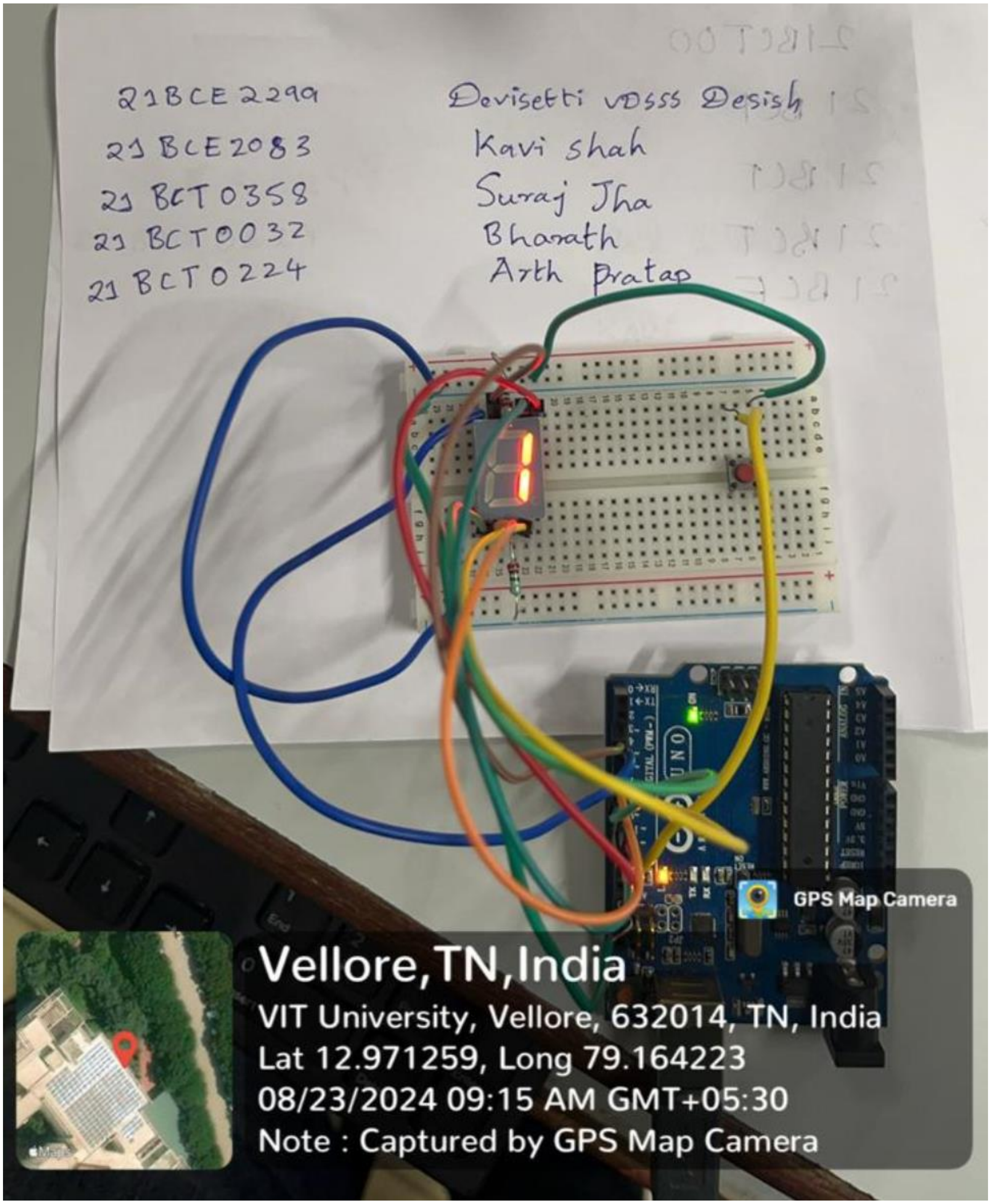
1. 7-Segment Display:
   - Pin A to Digital Pin 2 of Arduino
   - Pin B to Digital Pin 3 of Arduino
   - Pin C to Digital Pin 4 of Arduino
   - Pin D to Digital Pin 5 of Arduino
   - Pin E to Digital Pin 6 of Arduino
   - Pin F to Digital Pin 7 of Arduino
   - Pin G to Digital Pin 8 of Arduino
   - Common Cathode to GND (through a 220-ohm resistor)

2. Push Button:
   - One terminal to Digital Pin 9 of Arduino
   - Other terminal to GND
   - Pull-down resistor (10k-ohm) between the input pin and GND.

Methodologies

- Debouncing: Software debouncing is used to ensure that the push button press is registered once. This can be done by introducing a small delay (e.g., 50ms) after a button press is detected before reading the state again.
- Modular Code: Separate the display logic and the button handling into functions for clarity and reusability.

Practical Implementation Photos and Video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GPS Map Camera
Vellore,TN,India
VIT University, Vellore, 632014, TN, India
Lat 12.971259, Long 79.164223
08/23/2024 09:15 AM GMT+05:30
Note : Captured by GPS Map Camera

Google Drive Link:

https://drive.google.com/file/d/1hvIjv0FhhlLTd47H3qQVghmH42Ewbwqu/view?usp=sharing

Arduino Code

```
int segments[] = {2, 3, 4, 5, 6, 7, 8}; // pins connected to the 7-segment display
int buttonPin = 9; // pin connected to the push button
int count = 0;
int digits[10][7] = {

  {1, 1, 1, 1, 1, 1, 0}, // 0

  {0, 1, 1, 0, 0, 0, 0}, // 1

  {1, 1, 0, 1, 1, 0, 1}, // 2

  {1, 1, 1, 1, 0, 0, 1}, // 3

  {0, 1, 1, 0, 0, 1, 1}, // 4

  {1, 0, 1, 1, 0, 1, 1}, // 5

  {1, 0, 1, 1, 1, 1, 1}, // 6

  {1, 1, 1, 0, 0, 0, 0}, // 7

  {1, 1, 1, 1, 1, 1, 1}, // 8

  {1, 1, 1, 1, 0, 1, 1}  // 9

};
void setup() {
  for (int i = 0; i < 7; i++) {
    pinMode(segments[i], OUTPUT);
  }
  pinMode(buttonPin, INPUT);
}
void loop() {
  displayDigit(count);
  if (digitalRead(buttonPin) == HIGH) {
    delay(50); // debounce delay
    count++;
    if (count > 9) count = 0; // reset to 0 after 9
    while(digitalRead(buttonPin) == HIGH); // wait until button is released
  }
}

void displayDigit(int num) {
  for (int i = 0; i < 7; i++) {
    digitalWrite(segments[i], digits[num][i]);
  }
}
```

Inference

Thus implemented a push-button activated 7-segment display LED program to display digits from 0 to 9 sequentially via interfacing with Arduino uno microcontroller board.