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Practice report #2

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INTRODUCTION

This report focuses on the implementation of a counter with a seven-segment display. The objective of this project is to understand how to control a display through programming, utilizing an ESP32 microcontroller, a push button, and basic electronic components.

THEORETICAL FRAMEWORK

To understand this practice here are a couple of topics that you need to know first.

Display: a device in certain electronic devices that allows information to be displayed to the user in a visual manner. (The display that this practice uses is a display with seven segments)

Capacitor: a circuit component that temporarily stores electrical energy through distributing charged particles on (generally two) plates to create a potential difference.

Resistor: an electronic component that limits the flow of electric current in a circuit.

Push button: is a mechanical device used to control an electrical circuit in which the operator manually presses a button to actuate an internal switching mechanism.

IMPLEMENTATION

With an understanding of these concepts, the implementation process is as follows:

1. Hardware Setup:

- Connect the ESP32 microcontroller to a protoboard and a computer.
- Connect the pins of the seven-segment display to the ESP32, referring to the display's datasheet for proper pin configuration.
- Connect the push button to a designated pin of the ESP32.
- Use a resistor to connect the push button to the display, limiting the electric current flow.

2. Software Implementation:

- Open the Arduino IDE and define the output pins corresponding to the display connections.
- In the loop function, implement a counter that increments by one each time the push button is pressed.
- Utilize a switch function to control the display output. Since the counter ranges from 0 to 9, define ten cases where each case corresponds to a specific number displayed:

```
//FABCDE
digitalWrite(F7,0);
digitalWrite(A7,0);
digitalWrite(B7,0);
digitalWrite(C7,0);
digitalWrite(D7,0);
digitalWrite(E7,0);

/*
G centro centro
F izquierda sup
A centro sup
B derecha sup

E izq infer
D centro inf
C derecha inf
```

3. Addressing Button Debounce Issue:

- When pressing the button too quickly, the counter may occasionally skip numbers due to slow discharge of the push button.
- To resolve this, connect a capacitor between the push button and the display to stabilize the signal and prevent erratic behavior.

CONCLUSION

This project provides a practical understanding of controlling a seven-segment display using an ESP32 microcontroller. Through this implementation, fundamental concepts of circuit components, programming logic, and hardware-software interaction were reinforced. Additionally, the challenge of button debounce was identified and effectively resolved using a capacitor, improving the system's reliability. This exercise demonstrates the importance of integrating electronic components and programming techniques to develop functional embedded systems.

This is our practice:

