

UNIVERSITY OF GUADALAJARA

University Center of Exact Sciences and Engineering

Practice report

Counter from 00:00 to 99:99 using ESP32



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Embedded Systems Programming Troubleshooting Seminar

Made in Samsung notes

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1. Introduction

This practice was carried out during class hours with the aim of applying previously studied concepts about PWM (Pulse Width Modulation) using an ESP32 microcontroller. In this practice, the brightness of an LED will be controlled by the PWM signal generated by the ESP32, which is regulated by a potentiometer.

1.1 Objective

Implement a system that allows controlling the intensity of an LED using a potentiometer, utilizing the PWM signal generated by the ESP32 microcontroller.

2. Development

2.1 Theoretical Framework

PWM (Pulse Width Modulation) is a technique used to control the power delivered to electrical devices by modulating the duty cycle of a digital signal. In the case of an LED, brightness can be controlled by varying the proportion between the time the signal is high and the time it is low.

The ESP32 allows generating PWM signals on multiple pins through its configurable PWM channels. The `analogWrite()` function is used to write a PWM value ranging from 0 (off) to 255 (maximum brightness).

2.2 Methodology / Procedure

- **Circuit Assembly:**
- Connect the potentiometer to an ADC pin of the ESP32 to read its analog value.
- Connect the LED to a pin configured for PWM output.
- **Code Configuration:**
- Configure the potentiometer pin as input and the LED pin as PWM output.
- Read the potentiometer value and map it to the appropriate range for PWM.
- Apply the mapped value to the LED using `analogWrite()`.
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3. Results

Below are images of the assembled circuit and the system's operation:

4. Conclusion

The practice demonstrated the use of PWM to control the intensity of an LED using a potentiometer. The ESP32 facilitated PWM signal generation and potentiometer reading through its built-in ADC.

References

- [1] Arduino. PWM Reference Guide. Available at: <https://www.arduino.cc/reference/en/language/functions/analog-io/analogwrite/>
- [2] ESP32 PWM Documentation. Available at: <https://docs.espressif.com/projects/esp-idf/en/latest/esp32/api-reference/peripherals/ledc.html>