Exploration Project Documentation

Overview

This project uses a Capacitive Soil Moisture Sensor (V1.2) to monitor soil moisture levels. It provides visual feedback through two LEDs:

- A Red LED signals dry soil, requiring watering.

- A Blue LED signals adequate moisture, indicating no watering is needed.

The Raspberry Pi acts as the central controller, analyzing the sensor's analog output in real time.

Devices and Libraries Used

Devices:

1. Capacitive Soil Moisture Sensor V1.2: Measures soil moisture levels via analog output.

2. Raspberry Pi: Processes sensor data and controls LEDs.

3. Red LED: Indicates low soil moisture levels.

4. Blue LED: Indicates sufficient soil moisture levels.

Libraries:

1. smbus: Facilitates I2C communication for sensor data acquisition.

2. RPi.GPIO: Manages GPIO pins and LED states.

3. time: Used for delays and loop intervals.

Challenges and Solutions

Challenge: Calibrating the soil moisture thresholds.

- Solution: Conducted experiments under various soil conditions to identify:

  Low: Below 1V

  High: Above 2.45V

Adequate: Between 1V and 2.45V

Challenge: Avoiding rapid LED toggling due to fluctuating sensor readings.

- Solution: Added a delay of 1 second in the loop to stabilize the readings and ensure consistent LED behavior.

Challenge: Clear LED indications for user-friendly feedback.

- Solution: Implemented exclusive conditions to ensure only one LED lights up at a time based on the moisture levels.

References

1. SunFounder Soil Moisture Sensor Guide

- URL: https://docs.sunfounder.com/projects/umsk/en/latest/05_raspberry_pi/pi_lesson02_soil_moisture.html

- Explains how to interface a soil moisture sensor with Raspberry Pi.

2. ESP32 Soil Moisture Sensor Tutorial

- URL: https://esp32io.com/tutorials/esp32-soil-moisture-sensor

- Provides information on integrating a soil moisture sensor with ESP32 boards.

3. Capacitive Soil Moisture Sensor with Raspberry Pi Pico

- URL: https://how2electronics.com/capacitive-soil-moisture-sensor-with-raspberry-pi-pico/

- Details the working of capacitive soil moisture sensors with Raspberry Pi Pico and offers additional insights into sensor calibration.