B.TECH 3rd Year, Semester V

Sardar Vallabhbhai National Institute of Technology

Surat-395007, Gujarat, INDIA

Year 2024-25

IOT based Smart Garden

Watering to soil using ESP-32 to watering garden with smart devices

Introduction

Teammates

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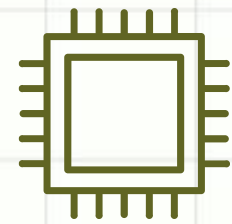U22EC040

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Project Overview

The IoT-based Smart Garden project leverages an ESP32 microcontroller to create an intelligent gardening system.

It monitors soil moisture and humidity levels using respective sensors to ensure optimal conditions for plant growth

Components Required

1 x ESP32
1 x Bread Board
1 x Humidity Sensor
1 x Moisture Sensor
1 x USB cable
1 x Soil container
Wires as required

Project Description

IOT based Smart Garden

This system ensures optimal growing conditions by monitoring soil moisture and environmental humidity and providing real-time feedback for plant management

Components

ESP32 Microcontroller

Central unit for processing sensor data and enabling remote monitoring via Wi-Fi.

Humidity Sensor

Monitors air humidity to assess environmental conditions

Moisture Sensor

Measures soil moisture to ensure proper watering
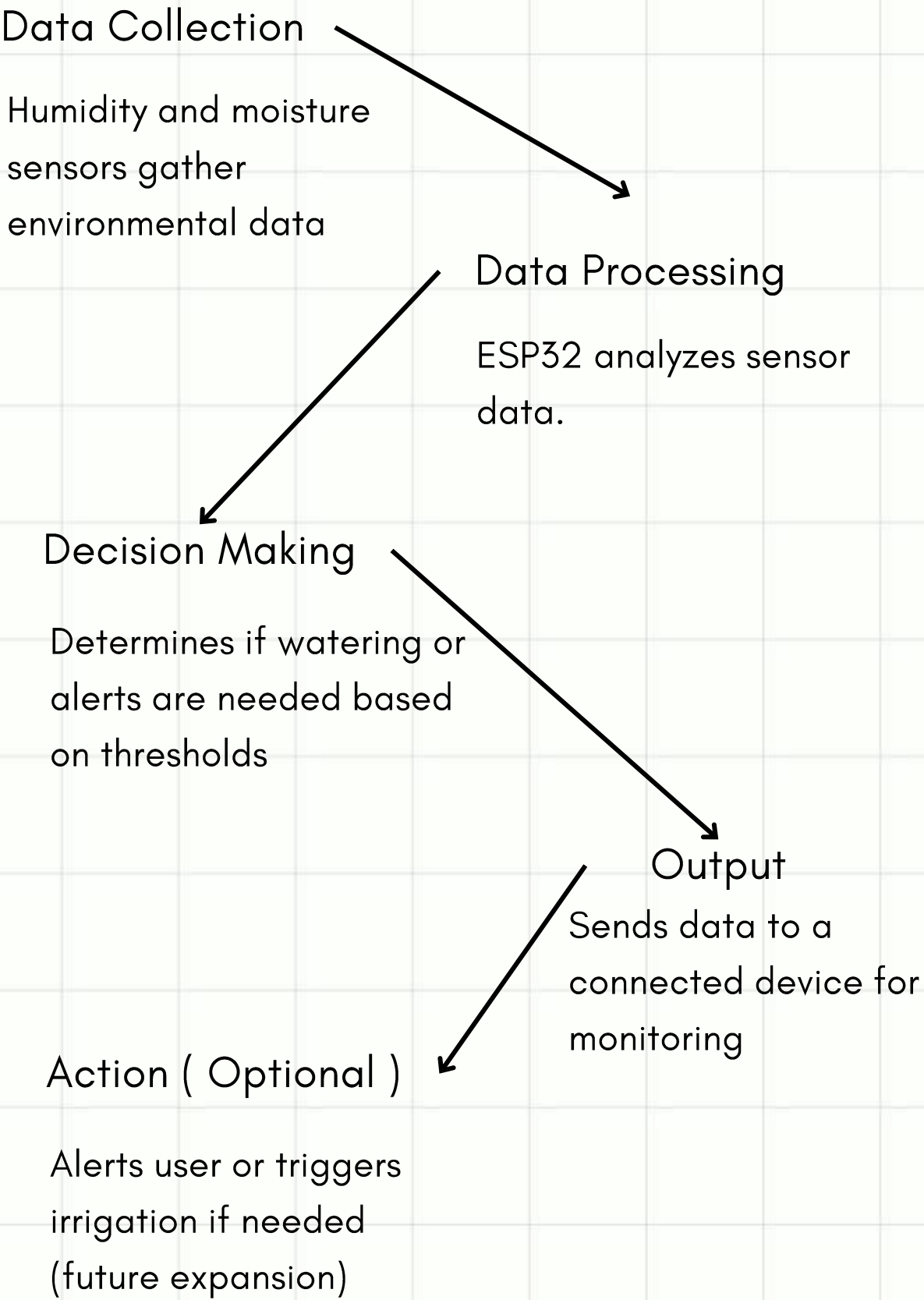
USB Cable

Powers the ESP32 and enables programming

Soil Container

Holds soil for testing sensor functionality

Wires

Connect components for data and power transfer

Working Flow

Data Collection

Humidity and moisture sensors gather environmental data

Data Processing

ESP32 analyzes sensor data.

Decision Making

Determines if watering or alerts are needed based on thresholds

Output

Sends data to a connected device for monitoring

Action (Optional)

Alerts user or triggers irrigation if needed (future expansion)

Objective & Implementation

The objective of this project is to develop an IoT-based Smart Garden system that automates plant care by monitoring environmental humidity and soil moisture levels. The system ensures efficient water usage, promotes healthy plant growth, and enables real-time monitoring and control using IoT technology.
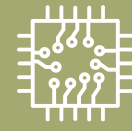
Hardware Setup

Assemble the components on a breadboard, connecting the humidity sensor and moisture sensor to the ESP32 microcontroller.

Place the moisture sensor in the soil container for accurate readings. Power the system using a USB cable.

Programming the ESP32

Write and upload code to the ESP32 using the Arduino IDE or similar platform.

Data Transmission

Utilize the ESP32's Wi-Fi capabilities to send sensor data to a connected device or cloud platform for real-time monitoring
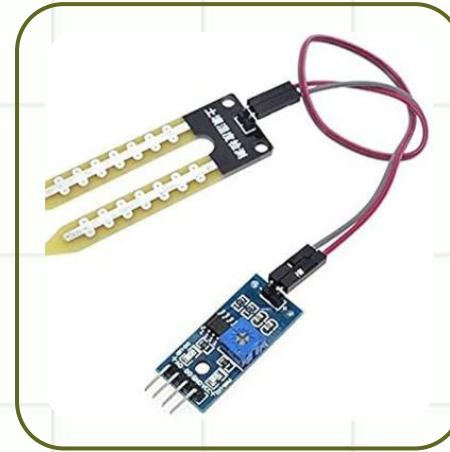
Monitoring and Alerts

Display sensor data on a dashboard or IoT app.

Implement conditions to alert the user or trigger actions, such as activating irrigation, if thresholds are crossed.

Testing and Optimization

Test the system in different conditions to ensure accurate sensor readings and efficient operation.

Optimize sensor placement and thresholds for best performance

IoT-Based Smart Garden

The project develops an efficient, automated, and IoT-driven smart garden system to optimize plant care and resource usage.

Humidity and Moisture Sensors

The system uses sensors to monitor air humidity and soil moisture for precise environmental assessment.

ESP32 Microcontroller

The ESP32 processes sensor data and enables remote monitoring and control through its Wi-Fi capability.

Automated Monitoring

The system ensures plants thrive by minimizing manual effort and providing real-time data alerts for optimal care.
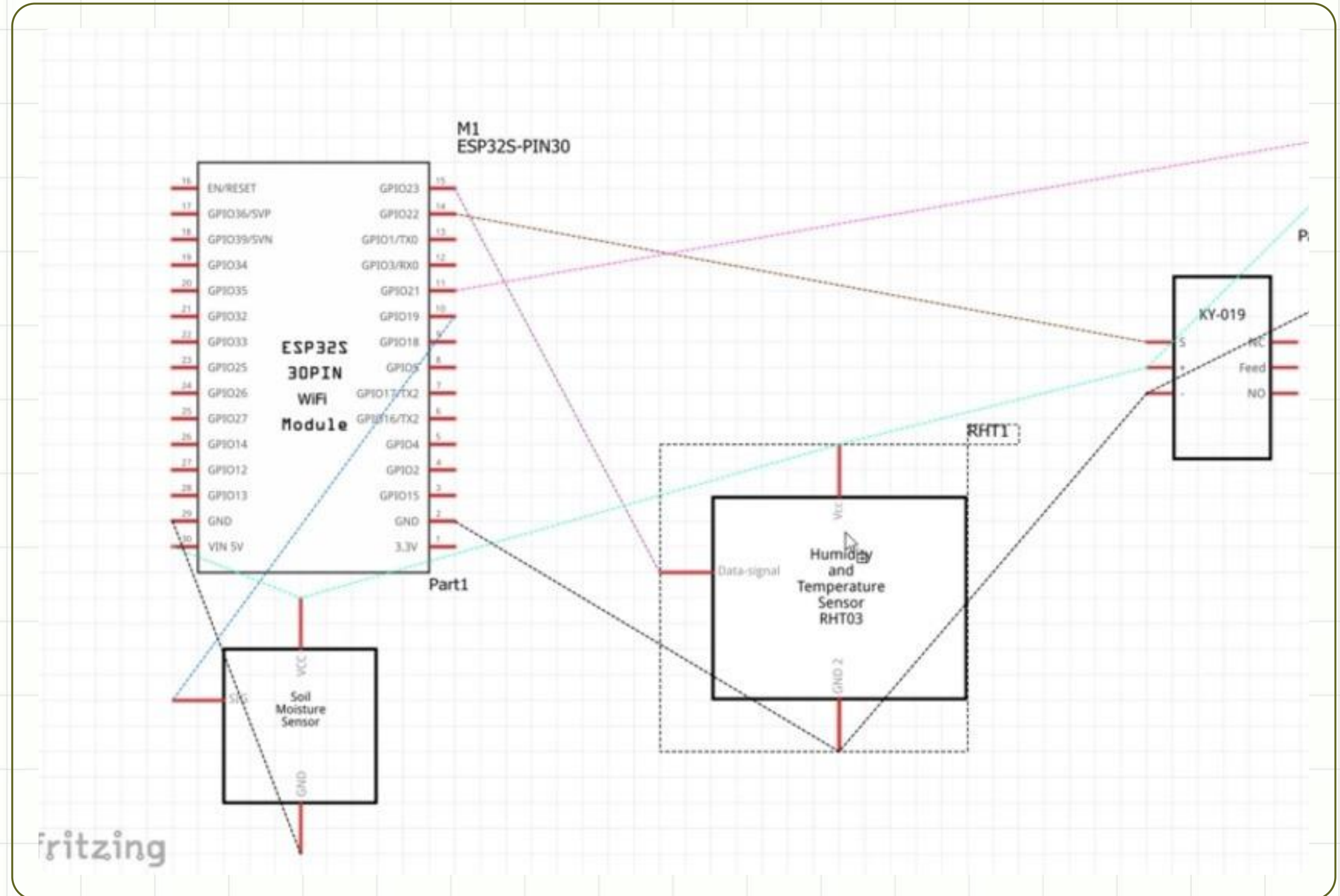

Cost-Effective Gardening

This solution focuses on affordability and simplicity, making it ideal for smart gardening enthusiasts and small-scale applications.

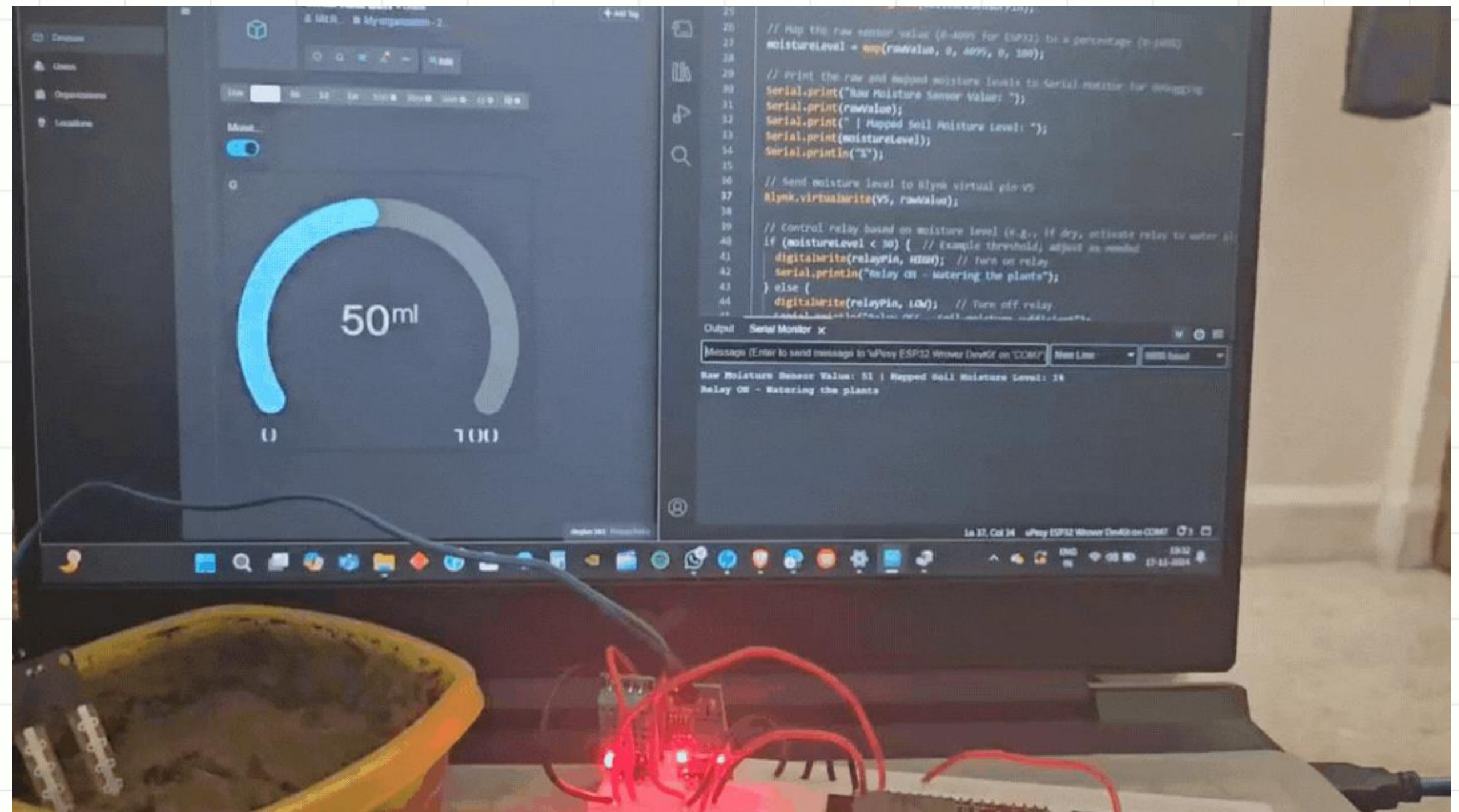# Electronic Schematic

IOT based Smart Garden

ESP-32 based

Testing Video

IOT based Smart Garden

ESP-32 based

Future Advancement

Automated Irrigation System

Integrate a water pump to automatically irrigate plants based on soil moisture levels.

Weather Data Integration

Use APIs to fetch weather forecasts and adjust irrigation schedules accordingly.

Mobile App Control

Develop a smartphone app for real-time monitoring, alerts, and manual control of the system.

Solar Power Integration

Add solar panels to make the system energy-efficient and eco-friendly
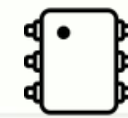
Multi-Sensor Expansion

Include additional sensors like temperature, light intensity, and pH for comprehensive plant care.

Summary

Smart and Sustainable Gardening Solution

To create a smart gardening system that automates plant care using IoT and sensor technologies.

ESP32 Microcontroller Integration

The ESP32 serves as the brain of the system, enabling real-time data processing and remote monitoring via Wi-Fi.

Environmental Monitoring

Incorporates a Humidity Sensor for tracking air conditions and a Moisture Sensor to ensure optimal soil water levels.

User-Friendly and Expandable Design

Utilizes a breadboard and USB cable for easy prototyping and upgrades, supporting future expansions like automated irrigation systems.

Promotes Water Conservation

Prevents overwatering through precise moisture level detection, ensuring sustainable gardening practices.

Thank You