

Bangabandhu Sheikh Mujibur Rahman Digital University

Department of IOT & Robotics Engineering

Program in IOT and Robotics Engineering

Project Report

Report on: Smart Plant Watering System.

Course Code: ICT 4352

Course Title : Programming Embedded System Lab.

SUBMITTED TO	SUBMITTED BY
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Project Report: Smart Plant Watering System.

1. Introduction

The Smart Plant Watering System is an innovative IoT-based solution designed to automate plant watering. The system measures soil moisture and water tank levels, providing real-time updates via WhatsApp using the Twilio API. Historical data is visualized on ThingSpeak, enabling continuous monitoring.

2. Problem Statement

Maintaining optimal soil moisture for plants can be challenging, especially during busy schedules or for large-scale plantations. Manual watering may lead to over- or under-watering, affecting plant health. Monitoring water tank levels also requires manual inspection.

3. Objectives

- Automate Plant Watering: Use sensors to detect soil moisture and control the water pump automatically.
 - Monitor Water Tank Levels: Measure water levels in the tank using an ultrasonic sensor.
 - Real-time Notifications: Provide updates on soil moisture, water tank distance, and pump status via WhatsApp.
 - Data Visualization: Store and display sensor data using ThingSpeak for historical analysis.
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4. System Components

Hardware:

- Soil Moisture Sensor: Measures soil moisture level.
- Ultrasonic Sensor (HC-SR04): Measures water level in the tank.
- Relay Module: Controls the water pump.
- Water Pump: Delivers water to plants.
- ESP32 Microcontroller: Manages sensor data and internet connectivity.

Software:

- Programming Language: C++ (Arduino IDE)
 - Libraries: WiFi, ThingSpeak, ThingESP32
 - API Services: Twilio API for WhatsApp notifications, ThingSpeak for data visualization.
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5. System Design

1. Sensor Reading:

- Soil moisture is measured using the soil moisture sensor.
- The ultrasonic sensor determines the water level in the tank.

2. Data Processing:

- If soil moisture is below a threshold, the relay activates the water pump.
- If soil moisture is sufficient, the pump turns off.

3. Data Transmission:

- Sensor data is sent to ThingSpeak for visualization.
- Notifications are sent via WhatsApp using the Twilio API.

4. User Interaction:

- Users can query the system via WhatsApp for:
 - Soil moisture level
 - Water tank level
 - Pump status
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6. Implementation

The system was implemented using the following logic:

- Soil moisture values are read from the analog pin.
- The relay module controls the water pump based on moisture readings.

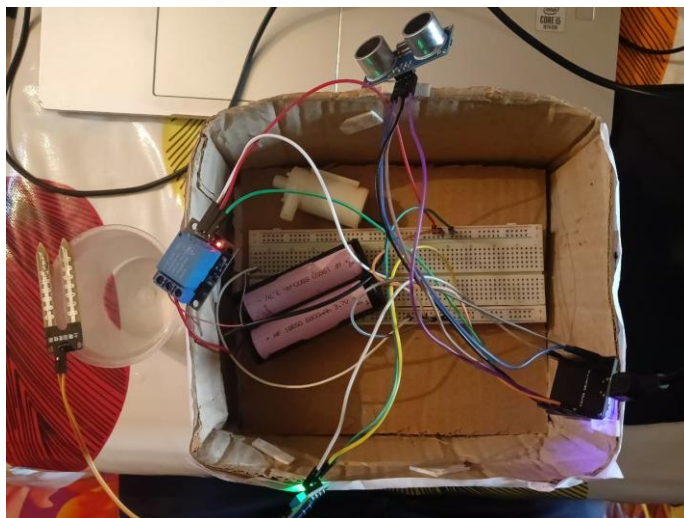
- The ultrasonic sensor measures water tank distance.
- Data is uploaded to ThingSpeak.
- WhatsApp responses are generated based on queries received.

Key Code Snippet:

```
if (moisturePercentage < 20) {  
    digitalWrite(relayPin, HIGH);  
    Serial.println("Soil is too dry. Water Pump Turned ON automatically.");  
} else {  
    digitalWrite(relayPin, LOW);  
    Serial.println("Soil moisture is sufficient. Water Pump Turned OFF automatically.");  
}
```

7. Results

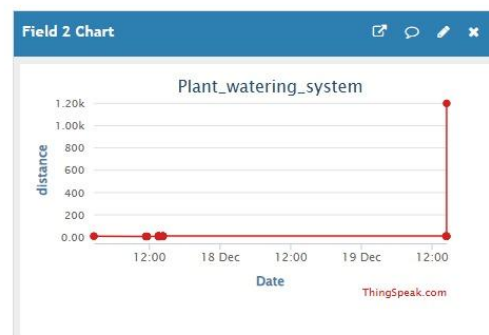
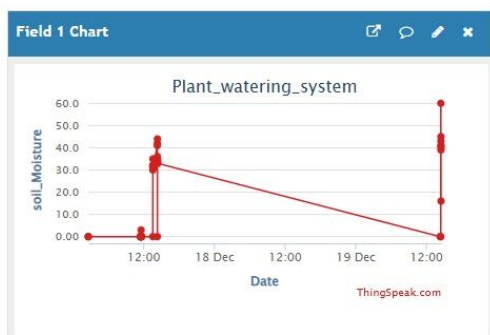
- Real-time soil moisture and water tank levels are displayed on WhatsApp.
- Historical data is visualized on ThingSpeak.
- Automated plant watering works efficiently based on sensor readings.





Channel Stats

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 Last entry: 5.minutes.ago
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8. Conclusion

The Smart Plant Watering System using WhatsApp successfully automates plant watering, monitors water tank levels, and sends real-time notifications. This system reduces manual effort and ensures optimal plant growth by maintaining appropriate soil moisture levels.

9. Future Enhancements

- Add weather-based irrigation control.
 - Integrate more sensors for pH and temperature monitoring.
 - Develop a mobile app for advanced control and monitoring.
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10. References

- [Docs: API Reference, Tutorials, and Integration | Twilio](#)
- [ThingESP | Arduino Documentation](#)
- [Installing - - — Arduino ESP32 latest documentation](#)

THE END