



SMART PLANT MONITORING AND IRRIGATION SYSTEM.

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◆ Abstract

The Smart Plant Monitoring System is an automated irrigation solution designed to monitor soil moisture levels and control watering efficiently. The system uses a soil moisture sensor, Arduino microcontroller, relay module, and LCD display to provide real-time monitoring and automatic irrigation.

The main objective of this project is to reduce manual effort and optimize water usage in plant care. The system continuously measures soil conditions and activates a water pump when the soil becomes dry. The real-time status is displayed on an LCD, making it user-friendly and efficient.

This system is cost-effective, easy to implement, and suitable for small-scale agricultural and home gardening applications. It also has the potential to be enhanced with IoT technology for remote monitoring and control.

◆ Keywords

Smart Irrigation, Arduino, Soil Moisture Sensor, Automation, Agriculture, Embedded Systems

◆ 1. Introduction

Agriculture and plant maintenance require regular monitoring of soil conditions, especially moisture levels. Traditional irrigation methods often lead to overwatering or underwatering, which affects plant growth and wastes water.

To overcome these issues, the Smart Plant Monitoring System is developed as an automated solution. This system uses embedded technology to monitor soil moisture and control irrigation without human intervention.

The project focuses on creating a simple, efficient, and low-cost system that can be used by farmers and home gardeners.

◆ 2. Problem Statement

Manual watering of plants has several limitations:

- Lack of proper monitoring of soil moisture
- Overuse or wastage of water
- Time-consuming process
- Inconsistent watering

This project aims to solve these problems by developing an automated irrigation system that ensures optimal water usage.

◆ 3. Proposed System

The proposed system consists of:

- Soil Moisture Sensor
- Arduino Microcontroller
- Relay Module
- Water Pump
- LCD Display Working Principle:

1. Soil moisture sensor detects water content in soil
2. Arduino processes sensor data
3. If soil is dry → Pump turns ON
4. If soil is wet → Pump turns OFF
5. LCD displays system status

◆ 4. Methodology

The methodology used in this project includes:

Step 1: Hardware Setup

- Connecting sensor, relay, and LCD to Arduino
- Step 2: Programming
- Writing Arduino code to read sensor data and control pump
- Step 3: Testing
- Testing system under different soil conditions
- Step 4: Implementation
- Final deployment of system

◆ 5. Results and Discussion

The system was tested under various soil conditions:

- In dry soil, the pump was activated automatically
- In wet soil, the pump remained OFF
- LCD displayed correct status in real-time

- Observations:
- Accurate moisture detection
 - Fast system response
 - Stable performance

The system successfully reduced water wastage and improved irrigation efficiency.

◆ 6. Advantages

- Automatic irrigation system
- Saves water and time
- Low-cost implementation
- Easy to operate
- Improves plant health

◆ 7. Limitations

- Limited to small-scale use
- No remote monitoring (without IoT)
- Sensor accuracy depends on soil type

◆ 8. Future Scope

The system can be enhanced by:

- Integrating IoT for remote monitoring
- Adding mobile app control
- Using solar power supply
- Implementing AI-based irrigation

◆ 9. Conclusion

The Smart Plant Monitoring and irrigation System is an effective solution for automated irrigation. It ensures efficient water usage and reduces manual effort. The system demonstrates the practical application of embedded systems in agriculture.

This project can be further developed into a smart farming solution with advanced technologies.

