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Smart Plant Monitoring System Using Blynk IoT

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ABSTRACT
*The **Smart Plant Monitoring System** is an IoT-based solution designed to enhance plant care through the integration of environmental sensors, automation, and wireless connectivity. Utilizing the ESP8266 NodeMCU microcontroller, the system collects real-time data from soil moisture, temperature, humidity, and motion sensors. This data is transmitted to the Blynk IoT cloud platform, allowing users to monitor and control the system remotely through a mobile or web interface. By automating the watering process based on live soil moisture readings, the system ensures efficient water usage, prevents overwatering or underwatering, and promotes healthier plant growth. Additionally, the inclusion of motion detection adds a security layer, alerting users to unauthorized movements around the monitored area. Designed to reduce manual effort, support sustainable water management, and improve plant health, this system is ideal for home gardens, smart agriculture, and greenhouse environments. It exemplifies how the convergence of IoT and automation can lead to intelligent, eco-friendly plant care solutions..*

1-INTRODUCTION

The **Smart Plant Monitoring System** is an innovative IoT-based solution developed to intelligently monitor and manage plant health and irrigation. By integrating embedded systems, sensor networks, and cloud services, the system automates routine plant care tasks such as watering, environmental monitoring, and security. At its core, the project utilizes the ESP8266 NodeMCU microcontroller to interface with various sensors and actuators, collecting real-time environmental data including soil moisture, temperature, humidity, and motion. The system processes this data and transmits it to the **Blynk IoT cloud**, enabling users to remotely visualize and control plant conditions through a smartphone or web application. This automation not only optimizes water usage and reduces manual effort but also introduces motion-based alerts to safeguard the plants from human or animal disturbances. The solution is ideal for smart homes, greenhouses, and small-scale agricultural applications aiming for sustainable, tech-enabled farming.

Exisiting System

Conventional plant care systems rely heavily on manual observation and intervention. Gardeners or farmers must inspect soil conditions, determine watering needs, and physically operate irrigation systems. This method is time-consuming, inconsistent, and lacks precision. Traditional systems do not support remote control, real-time data monitoring, or automated decision-making. Additionally, there is no security mechanism to detect disturbances around the plants, leaving them vulnerable to theft or damage..

Proposed System

The proposed **Smart Plant Monitoring System** incorporates smart sensing, cloud communication, and automation to address the drawbacks of traditional plant care.

2-REQUIREMENT ANALYSIS

Functional Requirements

The Smart Plant Monitoring System must fulfill the following key functionalities:

1. **Admin**

- Configures the Blynk IoT dashboard .
- Manages user access and system settings.
- Monitors overall system performance, sensor data, and alerts.

2. **User**

- Monitors real-time soil moisture, temperature, and humidity data via the Blynk .
- Controls the water pump manually or lets it operate automatically.
- Receives alerts for low soil moisture, motion detection, or environmental changes.

3. **Application**

- Collects real-time data from sensors and displays it on the Blynk dashboard.
- Sends alerts and notifications for motion detection, and security.
- Allows manual override of the water pump via a mobile app.

Non – Functional Requirements

Performance:

- Real-time data collection and updates to ensure timely decision making.
- Low latency in data transmission to minimize delays in response.

Scalability:

- Flexibility to add more sensors and monitoring points as needed.
- Ability to expand the system to monitor a larger plant population.

Usability:

- Intuitive user interface for easy monitoring and control of plant conditions.
- Clear visual representation of data through graphs and charts.
- Support for diverse plant sensors (soil moisture, temperature, humidity, light intensity).

Reliability:

- Correctly monitors the plant conditions and sends data to the application.

Power Efficiency:

- Low power consumption of sensor nodes to maximize battery life**.**

Hardware Requirements

1. ESP8266 Node MCU – Microcontroller for data processing & Wi Fi connectivity.
2. Soil Moisture Sensor – Measures soil moisture levels.
3. PIR Motion Sensor – Detects motion near the plants.
4. Relay Module – Controls the water pump.
5. Water Pump – Supplies water when needed.

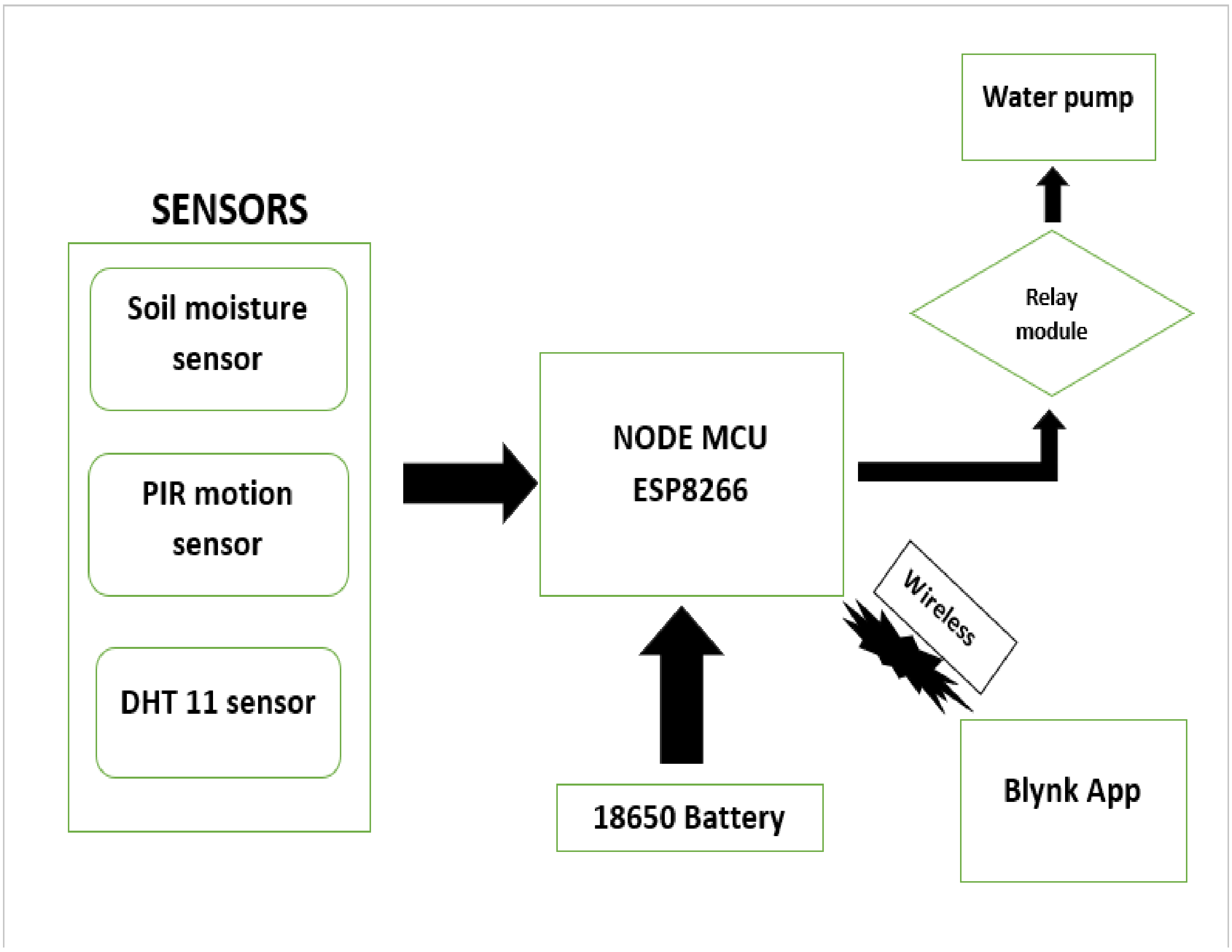
Software Requirements

1. Blynk IoT Platform – For real-time monitoring and remote control.
2. Arduino IDE – Used to program the ESP8266.
3. Blynk Library & ESP8266 WiFi Library – Enables communication with Blynk

3-DESIGN AND ARCHITECTURE

Project architecture represents number of components we are using as a part of our project and the flow of request processing i.e. what components in processing the request and in which order. An architecture description is a formal description and representation of a system organized in a way that supports reasoning about the structure of the system. Hardware Architecture

Block Diagram / Hardware Architecture



Fi g 3.1.1 Block diagram

Technical Architecture:

Data Flow Diagram:

A Data Flow Diagram is a graphical representation used to visualize the flow of data within a system. It shows how data moves from one part of a system to another, what processes are involved, and where the data is stored. The primary purpose of a DFD is to model the system's information processes, focusing on how input data is transformed into output data

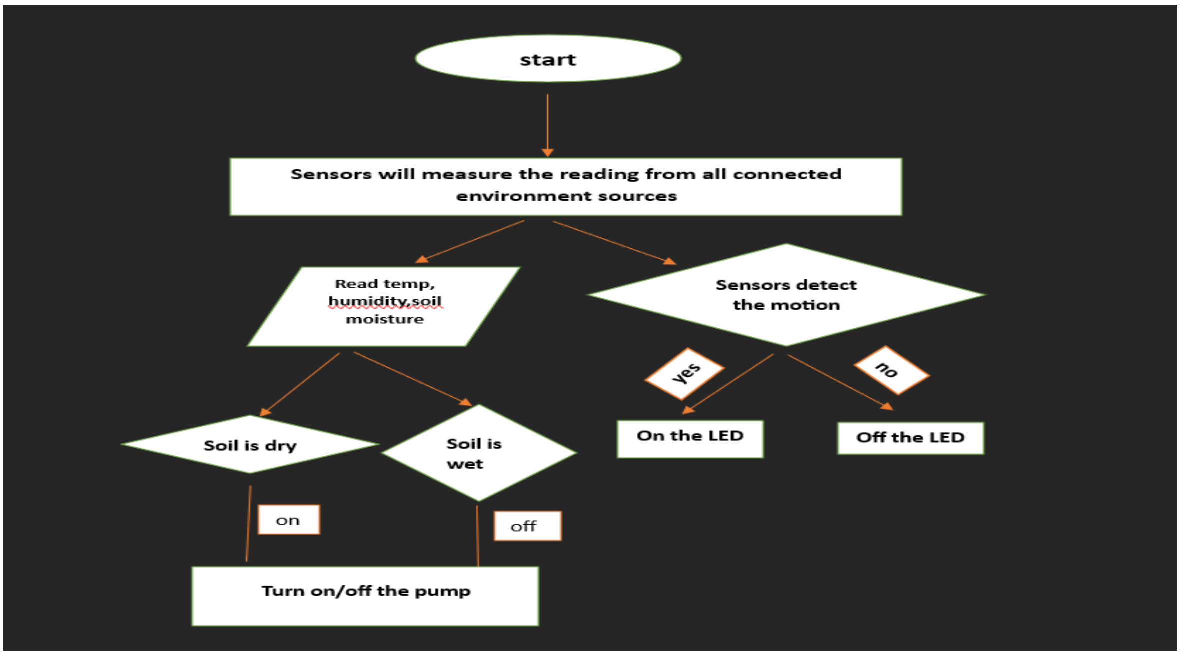


Fig 3.2.1 Data Flow diagram for Smart Plant monitoring system Using IoT

4-IMPLEMENTATION

Technologies

This Smart Plant Monitoring System is implemented using **C programming** on the **Arduino IDE**, tailored for the **ESP8266 NodeMCU** microcontroller. The system utilizes IoT and embedded programming principles to create an automated plant care system with real-time monitoring and control capabilities.

C Programming

C is a powerful procedural programming language commonly used for low-level system development and embedded programming. In this project, C is used to program the NodeMCU board to interact with sensors, actuators, and the Blynk IoT platform.

- **DHT11 Sensor**: Measures temperature and humidity; the values are displayed on an LCD and sent to Blynk.
- **Soil Moisture Sensor**: Detects soil water levels and determines the need for irrigation.
- **PIR Motion Sensor**: Detects motion around the plant area for added security.
- **Relay Module**: Controls a water pump for irrigation based on soil moisture.
- **Push Button**: Manual override for relay control.
- **LCD (I2C 16x2)**: Displays real-time temperature, humidity, soil moisture, motion, and water pump status.

IoT Platform

- **Blynk Cloud**: Used for remote data monitoring, relay control, and event logging through a mobile application.

Working of the System

- The ESP8266 initializes all sensor pins and connects to the Blynk cloud using Wi-Fi credentials.
- **DHT11** and **Soil Moisture Sensors** send data every few milliseconds using BlynkTimer.
- If soil moisture falls below a set threshold, the relay is triggered to power on the water pump.
- The **PIR sensor** continuously checks for motion; if detected, a warning is logged via Blynk.
- The user can also **manually control the water pump** via a **mobile app or physical push button**.
- Real-time values are displayed on an **LCD screen**, showing temperature (T), humidity (H), soil moisture (S), motion detection (M:ON/OFF), and water pump status (W:ON/OFF)

Applications of C Programming in Embedded and IoT Systems

1. **Embedded Systems Programming**: C is ideal for microcontroller programming due to its close-to-hardware nature, making it suitable for interacting with GPIOs, timers, and sensors.
2. **IoT Device Development**: C is widely used in IoT firmware for devices like the ESP8266, handling real-time data acquisition, decision-making, and cloud communication.
3. **Automation Projects**: With its speed and efficiency, C enables automation systems such as smart plant watering, environmental monitoring, and actuator control.
4. **Consumer Electronics**: Many devices (e.g., smart home appliances, wearables) are powered by firmware written in C.
5. **Sensor Interfacing**: C simplifies the integration of various sensors (temperature, humidity, motion) and modules (LCDs, relays) in microcontroller-based setups.
6. **Real-time Systems**: Its deterministic performance makes C suitable for systems needing instant feedback and real-time control, such as motion alerts or irrigation.

5-SCREENSHOTS

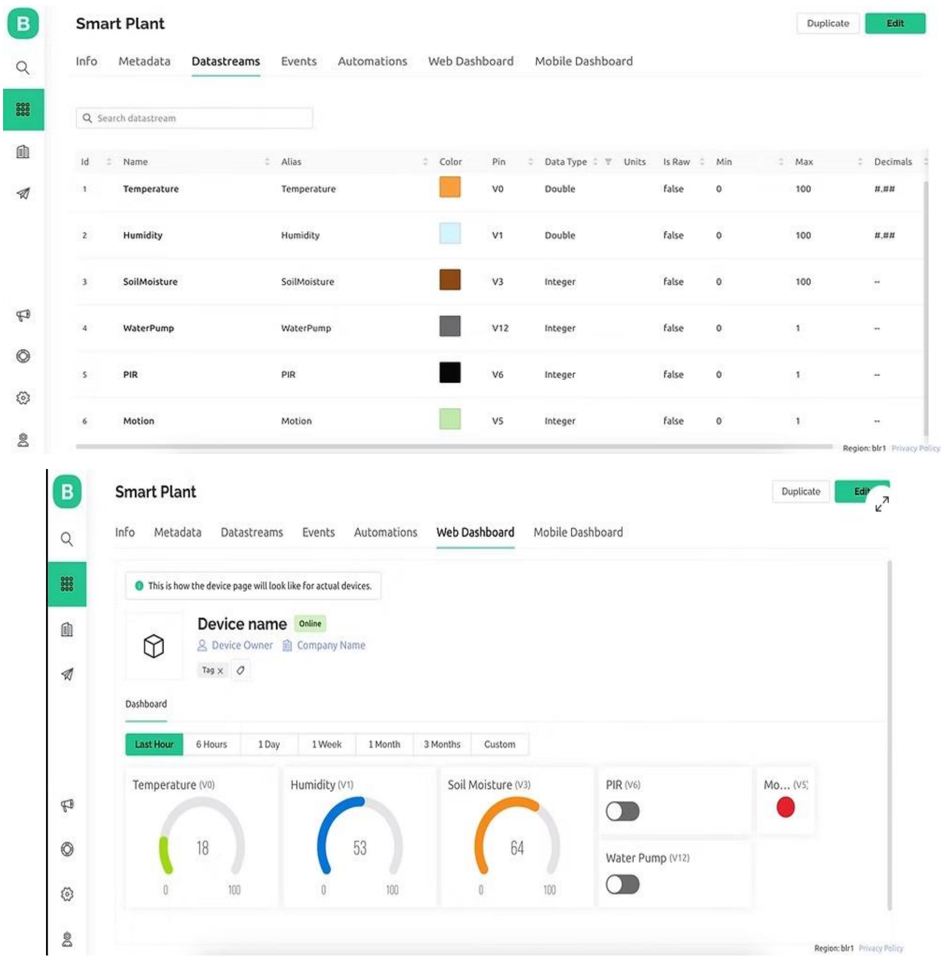


Fig 1 Blynk IoT dashboard

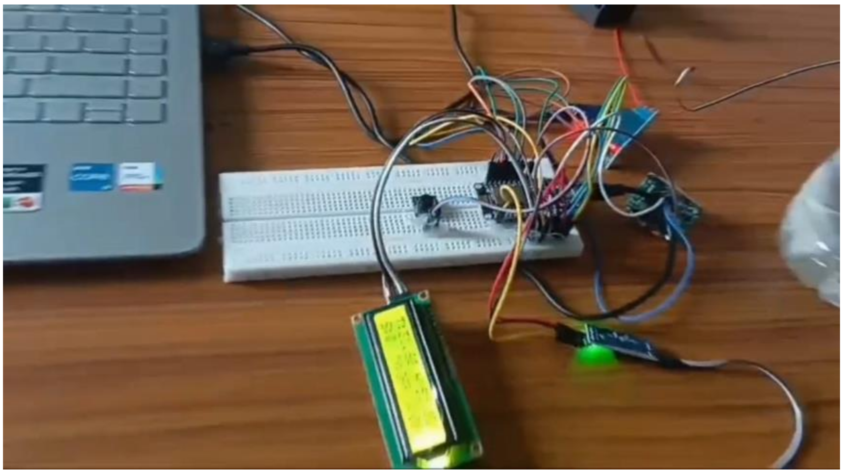


Fig 2 Practical set up

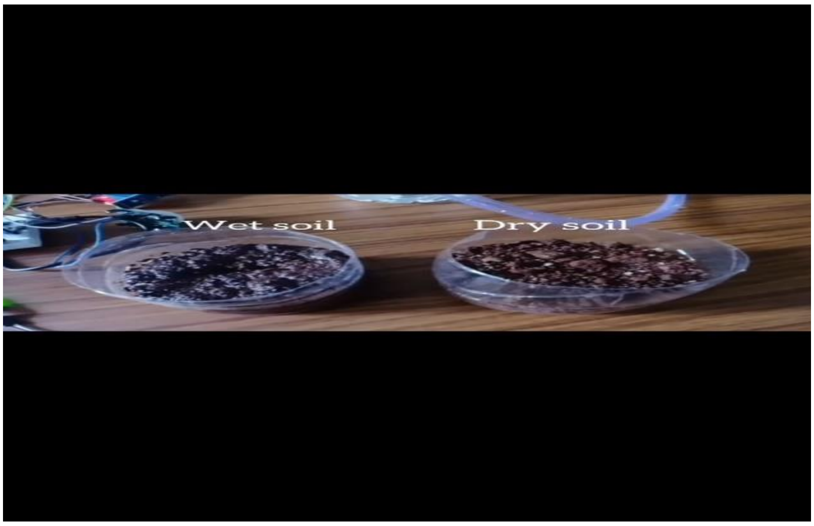


Fig 3 wet and dry soil

Fig 4 Soil moisture readings when soil sensor is kept in wet soil

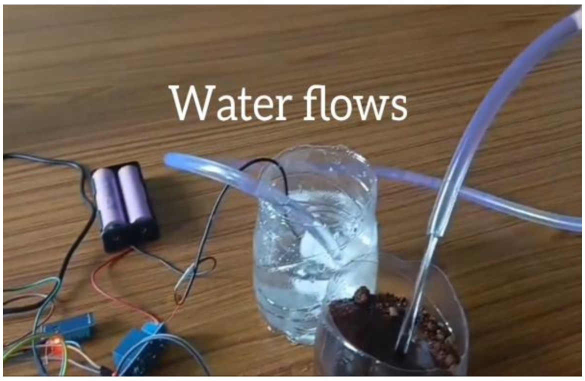


Fig 5 water flow using water pump

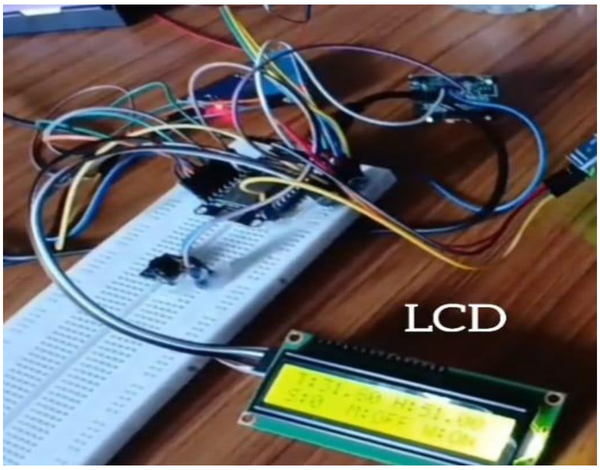
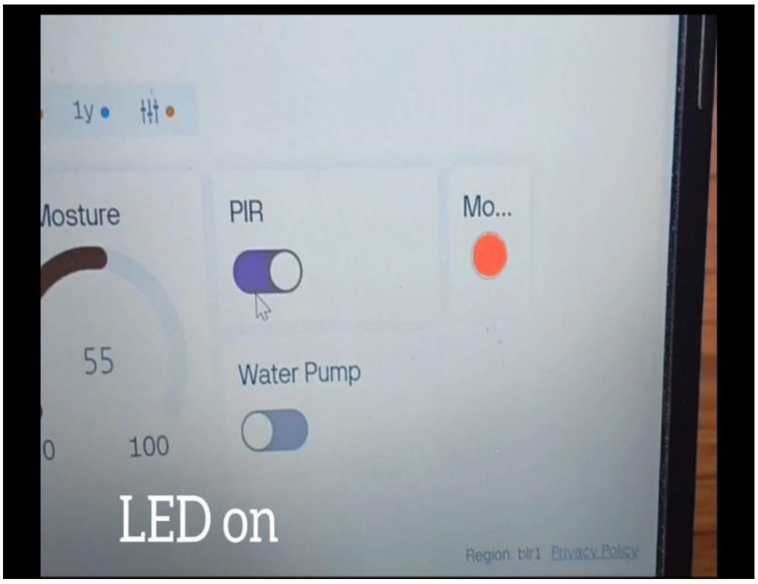
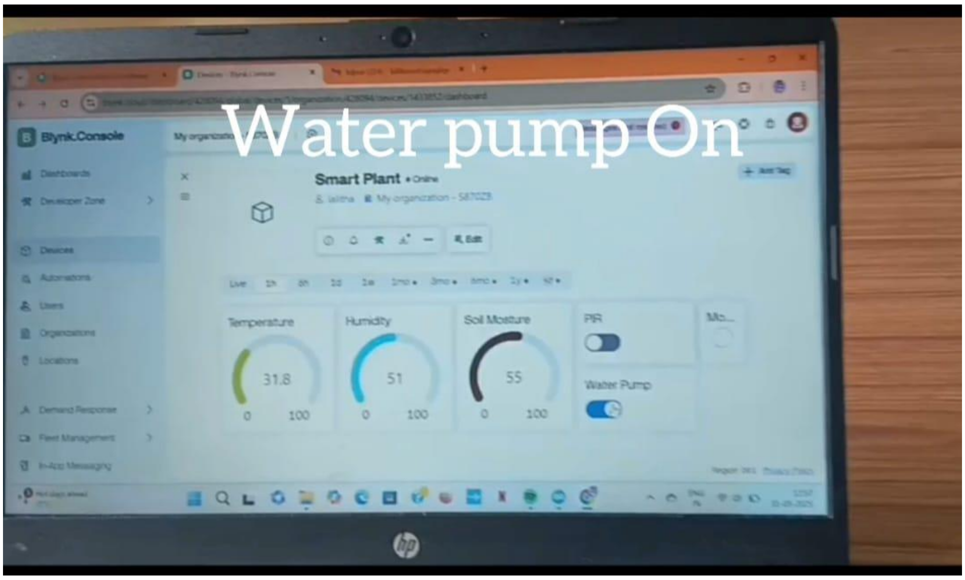


Fig 6 LCD Display





6-CONCLUSION

The Smart Plant Monitoring System demonstrates how affordable and accessible sensor technologies can be used to effectively monitor essential environmental parameters such as soil moisture, temperature, humidity, and motion. By automating irrigation and enabling real-time monitoring through a user-friendly mobile application, the system reduces manual labor, improves water efficiency, and enhances plant security. Its adaptability to various environments like home gardens, greenhouses, and small-scale farms makes it a practical solution for modern agriculture..

REFERENCES

[1] Divani, Drashti; Patil, Pallavi; Punjabi, Sunil. (2016). Automated Plant Watering System.

[2] N. Ananthi et al., “IoT Based Smart Soil Monitoring System for Agricultural Production”, IEEE International Conference on Technological Innovations in ICT, ITAR 2017.

[3] E. Sowmiya, S. Sivaranjani, “Smart System Monitoring on Soil Using Internet of Things”, International Research Journal of Engineering and Technology (IRJET), Volume 4, Issue 2, February 2017.

[4] N. Sakthipriya, “An Effective Method for Crop Monitoring Using Wireless Sensor Network”, Middle East Journal of Scientific Research, Volume 5, Issue 2, March 2018.

[5] K. Shalini, K. Soundarya, “Smart Plant Monitoring System using IoT and Blynk”, International Journal of Engineering Research & Technology (IJERT)