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CONFERENCE PAPER

AGROSENSE: SMART IOT-BASED PLANT MONITORING AND AUTOMATED IRRIGATION SYSTEM

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Abstract

This project presents AgroSense, a smart IoT-based plant monitoring and automated irrigation system. The system uses sensors to monitor soil moisture, temperature, and humidity in real time. Data is transmitted using an ESP32 microcontroller to a Python-based server, where it is processed and visualized through an interactive dashboard. Based on predefined thresholds, the system automatically controls irrigation using a relay module and water pump. This approach ensures efficient water usage, reduces manual effort, and supports sustainable agriculture practices.

Introduction:-

Agriculture and plant care require consistent monitoring of environmental conditions. Traditional watering methods often lead to overwatering or underwatering, affecting plant health. With advancements in IoT and automation, smart systems can optimize plant care. AgroSense integrates sensors,wireless communication, and Python-based analytics to provide a real-time monitoring and control solution.

Literature Review:

Previous studies have explored IoT-based irrigation systems using Arduino and basic sensors. Many systems focus only on monitoring without automation. Recent developments include cloud-based monitoring and AI-based prediction. However, most systems lack simplicity and cost-effectiveness. AgroSense addresses these gaps by combining real-time monitoring, automation, and a user-friendly interface.

Motivation and Challenges:

The motivation behind this project is to reduce water wastage and improve plant health using automation. Challenges include sensor accuracy, reliable WiFi communication, and integrating hardware with software systems. Ensuring real-time response and system stability is also critical.

Proposed Framework (Data Flow Diagram):

Sensors collect environmental data and send it to the ESP32 microcontroller. The ESP32 transmits data via WiFi to a Python server. The server processes and displays data on a dashboard.

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Based on moisture levels, control signals are sent back to activate or deactivate the irrigation system.

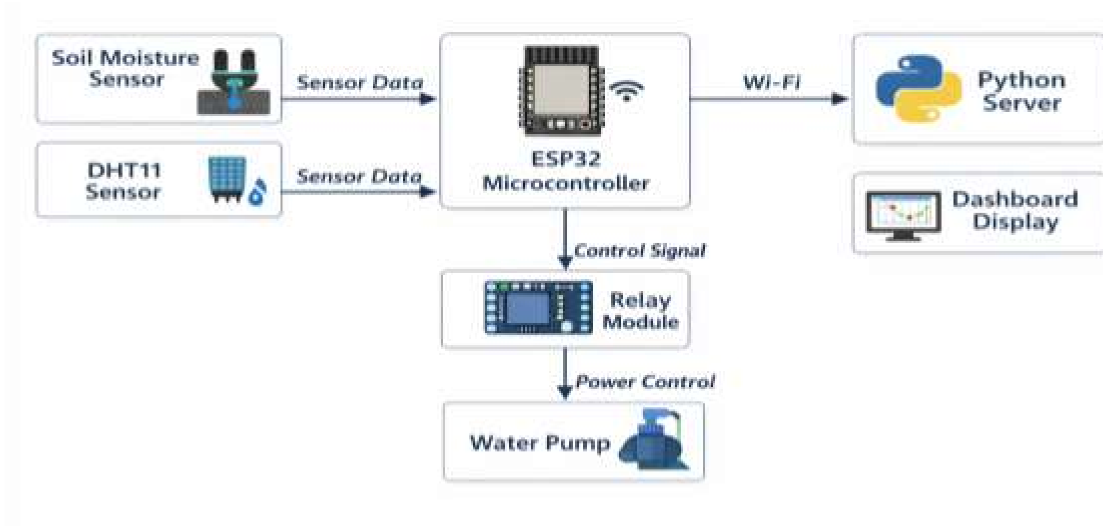

Fig 1: Block Diagram of Agro Sense

User → Dashboard → Python Server → ESP32 → Sensors

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Relay → Pump

Result Analysis:-

The system efficiently monitors real-time environmental data and intelligently automates the irrigation process, ensuring optimal water usage. By continuously analyzing soil moisture levels through sensors, it dynamically compares the readings against predefined threshold values to determine when irrigation is required. This threshold-based control mechanism allows the water pump to operate only when necessary, significantly reducing water wastage and preventing over-irrigation, which can harm crops and degrade soil quality. Additionally, the system enhances operational efficiency by minimizing manual intervention and enabling consistent irrigation practices.

Comparison Study

Compared to traditional irrigation, AgroSense provides automated control and real-time monitoring. Compared to basic IoT systems, it offers both automation and visualization. It is more efficient, scalable, and user-friendly.

Feature/Aspect	Traditional Irrigation	Basic IoT system	AgroSenseSystem
Operation Method	Manual	Semi-automatic	Fully automated
Data Monitoring	Not available	Real-time monitoring	Real-time monitoring
Decision Making	Human-based	User-dependent	Automated
Water Efficiency	Low	moderate	High
Pump Control	Manual	Manual/Remote	Automatic
Visualization Dashboard	Not available	Limited	Advanced
Human Intervention	High	Moderate	Minimal
Scalability	Limited	Moderate	High
Ease of Use	Moderate	Moderate	High
Sustainability	Low	Moderate	High

Conclusion and Future Work:

AgroSense demonstrates an effective solution for smart plant monitoring and irrigation. It improves efficiency and reduces manual effort. Future enhancements may include AI-based prediction, weather integration, and mobile app development.

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