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Smart Irrigation System for Precision Farming

Shital Ghodke, Shyam Tawde, Rutuja Ghumatkar, Sakshi Shete, Pratik Darawade, Vishal Patil

U.G. Student, Department of Information Technology, DY Patil University, Ambi, Pune, Maharashtra India

U.G. Student, Department of Information Technology, DY Patil University, Ambi, Pune, Maharashtra India

U.G. Student, Department of Information Technology, DY Patil University, Ambi, Pune, Maharashtra India

U.G. Student, Department of Information Technology, DY Patil University, Ambi, Pune, Maharashtra India

U.G. Student, Department of Information Technology, DY Patil University, Ambi, Pune, Maharashtra India

Associate Professor, Department of Information Technology, DY Patil University, Ambi, Pune, Maharashtra India

ABSTRACT: In the era of precision farming, the implementation of smart irrigation systems is transforming agricultural practices by optimizing water usage and enhancing crop yields. This paper presents a comprehensive overview of smart irrigation technologies, which utilize data driven approaches, including soil moisture sensors, weather forecasting, and IoT connectivity, to facilitate real-time decision-making. By integrating these technologies, farmers can tailor irrigation schedules to the specific needs of their crops, thereby minimizing water wastage and reducing operational costs. The study highlights case studies demonstrating the efficacy of smart irrigation in various climatic conditions and crop types.

KEYWORDS: Precision farming, Smart irrigation, Water conservation, Soil moisture sensors, IoT connectivity, Data-driven irrigation, Real-time decision-making, Weather forecasting, Sustainable agriculture, Crop yield optimization, Climate resilience, Sensor deployment..

I. INTRODUCTION

Image Many countries like India, majority of the population depends on farming, and its national income comes from farming. In spite of this and even the modern technology is found everywhere, the agriculture area is following the old conventional technology. Our farmers still resort to traditional methods like manual distribution of seeds and ploughing, two crops per year pattern, unscientific systems of cultivation. The monsoons are irregular, and unevenness of availability of water throughout the year poses a major problem.

All this leads to inadequate yield and low productivity. The implementation of scientific methods in the field of agriculture can bring about radical changes in the productivity of crops, due to improved efficiency in the farming techniques. Of the various advantages that IoT brings to the table, its ability to innovate the current scenario of farming methods is absolutely ground-breaking. Mostly, we come across ideas that suggest a wireless sensor network that collects data from the various sensors present in the field and sends the data to the main central server.

II. LITERATURE SURVEY

The deployment of IoT in agriculture has the potential to affect our society and the rest of the world. Nowadays, we see weather, soil, and water drying up as land that's critical to agriculture declines, making it harder and harder to produce food. Agriculturalists will benefit from using Internet of Things (IoT) technology, which will help them cut down on generated wastelands while also improving production. This figure could stem from the number of missions the farmhouse automobiles have performed, or from the amount of compost used in the composting process. A smart agriculture system may be defined as a food system that utilizes emerging nutrition that is uncontaminated and is accessible to a wide number of people. With the expansion of the entire Farming system with the addition of the Smooth Agricultural IoT platform, the Internet of Things (IoT) plays a larger role in agriculture. Although the Internet of Things (IoT) is utilized in Farming, it has saved not only the time of agriculturalists but also massive quantities of liquid and power, thanks to the interconnectedness of devices and services. It is able to preserve frequently encountered topographies including moisture, high temperature, soil, etc.

and offers real-time surveillance through the crystal-clear map. In agriculture, embracing Internet of Things (IoT) will yield various benefits. For example, the farmhouse automobiles have accomplished numerous missions.

III. METHODOLOGY

Power is supplied to ESP32 through power supply adaptor and voltage regulator.

Temperature sensor measures temperature of surrounding farm field analog output of the sensor send to application. The respective temperature is displayed on Blynk IOT application.

PIR Sensor detects the intruder/Animal in the farm field the output of the sensor is digital signal will be sent and also it sends Notification (i.e., Motion Detected in your Farm) to registered mobile number. If the sensor does not detect any motion in the farm field, then no Notification will be sent to registered mobile,

Soil Moisture sensor senses the moisture content in the soil. If the measured moisture content of the soil is higher than the predetermined value then no signal will be sent to relay 2 through ESP32 Drip Irrigation pump will be in OFF State. If the measured moisture content of the soil is lower than the predetermined value then output signal will be sent to relay2 through ESP32. Relay2 gets activated the electromagnet makes the switch in ON condition which in turn Drip Irrigation pump operates (ON State), shows (Le., WATER PUMP ON) in the application.

IV. EXPERIMENTAL RESULTS

Figs. 1 Prototype of Smart Irrigation System for Precision Farming – Demonstrating Automated Watering and Shading Mechanisms for Efficient Crop Growth.



Fig.1

Fig.2 Blynk IoT interface displaying the real-time status of the ESP-based Smart Irrigation System, indicating device connectivity and data monitoring.

Fig.3 Real-time Monitoring Dashboard of the Smart Irrigation System

This interface displays live sensor data, including temperature, humidity, soil moisture, and rain detection, enabling precision farming through automated irrigation control.

The dashboard provides live monitoring of environmental parameters essential for precision irrigation. The temperature and humidity sensors measure atmospheric conditions, while the soil moisture and rain sensors detect soil and weather status. The system uses these real-time inputs to optimize water usage, reducing waste and enhancing crop yield through automated irrigation control.

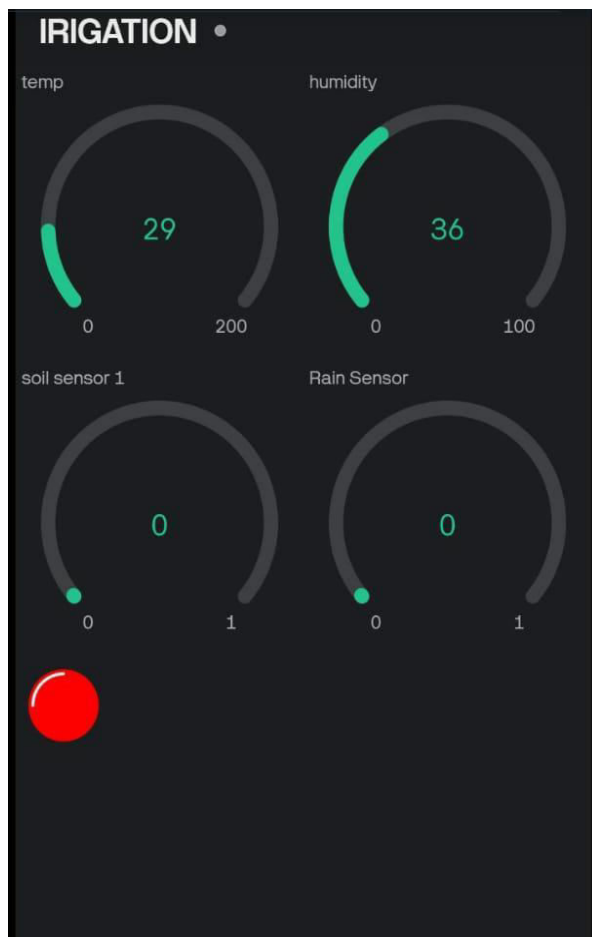


Fig.2



Fig.3

V. CONCLUSION

Agriculture monitoring system is needed to reduce the need for human intervention in farming. This process is aimed to educate the farmer on the use of an integrated technology system to monitor the farm land to increase the quantity of the production of the crops. This project helps in efficient usage of water. This project can also be used in various farm lands, it can be used gardening, greenhouse farming, horticulture etc.

In this project intruder can be detected by pir sensor. Farmer now no need to be afraid of theft of his crops and destruction of his crops by animals. The System has high efficiency and accuracy in fetching the live data of temperature and soil moisture.

The IOT based smart farming System being proposed via this report will assist farmers in increasing the agriculture yield and take efficient care of food production as the System will always provide helping hand to farmers for getting accurate live feed of environmental temperature and soil moisture with more than 99% accurate results.

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