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IoT BASED SMART AGRICULTURE PROTECTION AND MONITORING

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Abstract: Traditional methods may not be successful in meeting the evolving demands of modern agriculture, always striving for increased productivity and sustainability. The proposed architecture works as a system on top of comprehensive interfacing with the sensors and also in real time protecting crops through IoT cloud. Soil Moisture Sensor, PIR Motion Sensor, DHT11 are interfaced with microcontroller to send the moisture level and turn off the pump automatically and notify that on Telegram Bot. The DHT11 sensor data are transmitted on to the LCD. PIR Motion Sensor senses the passive infrared rays and notify the invasion activity on LCD and Telegram Bot. Hence with the above working the agriculture production leads to a better living and yield of the crops.

Keywords: AUTOMATION, ESP32, IOT, SENSOR, WFI, TELEGRAM BOT.

I. INTRODUCTION

Agriculture has always been a cornerstone of human civilization, providing the essential resources needed for sustenance and economic stability. However, modern agriculture faces increasing challenges due to factors such as climate change, resource scarcity, and the growing demand for food. Traditional farming methods, while historically effective, often fall short in addressing these contemporary challenges due to their reactive nature and lack of real-time data.

In recent years, advancements in technology have opened new avenues for transforming agricultural practices. The Internet of Things (IoT) has emerged as a pivotal technology, offering innovative solutions to monitor and manage agricultural processes with unprecedented precision.

II. LITERATURE SURVEY

Mr. Bhelave Jayramdas Rajkumar, Mr. Manjare Babaji Baban "IoT based Agriculture monitoring system". This paper introduces an IoT based smart agriculture monitoring system. Farmers can use a smartphone application to monitor and manage the irrigation system in this suggested system from any location. The mobile application retrieves these values from the cloud and displays them to the user, allowing them to monitor the system using this application [1]. The IoT system communicates the sensor values to the cloud. The sensors provide the moisture levels to the microcontroller on a constant basis. When the sensed values rise above the threshold value, the Microcontroller turns on the irrigation system. The irrigation system is shut off when they drop below the set threshold. The Gas sensor values are retrieved and the mobile application notifies the farmer if smoke or gas is detected. Through networked temperature, humidity and other sensors that can communicate with the farmers, this project provides improved irrigation and monitoring [1].

Patil et al. has proposed "Smart Door Locking System Using IoT" Smart agriculture is a farming system which uses IoT technology. This emerging system increases the quantity and quality of agricultural products. IoT devices provide information about nature of farming fields and then take action depending on the farmer input. In this paper, an IoT based advanced solution for monitoring the soil conditions and atmosphere for efficient crop growth is presented. The developed system is capable of monitoring temperature, humidity, soil moisture level using NodeMCU and several sensors connected to it. Also, a notification in the form of SMS will be sent to farmer's phone using Wi-Fi about environmental condition of the field. The servo library is introduced after the application is developed by creating a string variable that contains the unique device ID for the lock [2].

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M. Ayaz, M. Ammad-Uddin, Z. Sharif, A. Mansour and E. -H. M. Aggoune, "Internet-of-Things (IoT)-Based Smart Agriculture: Toward Making the Fields Talk".

This article highlights the potential of wireless sensors and IoT in agriculture, as well as the challenges expected to be faced when integrating this technology with the traditional farming practices. IoT devices and communication techniques associated with wireless sensors encountered in agriculture applications are analyzed in detail. Various sensors are were for specific agriculture application, like soil preparation, crop status, irrigation, insect and pest detection. Technology helping the growers throughout the crop stages, from sowing until harvesting, packing and transportation is explained and all the data is transmitted onto Zigbee.[3]

Kavitha B C, Shilpa D P. has proposed "Agricultural Crop Monitoring Sensors using IoT".Smart agriculture is a farming system which uses IoT technology. This emerging system increases the quantity and quality of agricultural products. In the above paper they have Raspberry pi has been used to interface pi camera, soil moisture, DHT sensor.[4]
P. Kanupuru and N. V. Uma Reddy, "Survey on IoT and its Applications in Agriculture," Wireless Sensor Network (WSN) and IoT. This paper has summarized the existing smart systems with WSN based sensor monitoring techniques by considering environmental parameters such as temperature, moisture, PH, humidity, light intensity which are very useful in efficient decision making for yielding high productivity. This survey also helps in understanding the recent technological developments in IoT for building an efficient smart agricultural system.[5].

III.METHODOLOGY

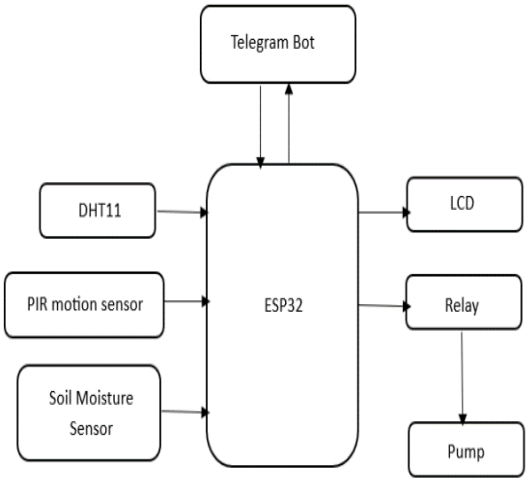

Figure 1:Block diagram of smart agriculture system

Figure1 represents the block diagram of smart agriculture protection and monitoring using ESP32 in which we have used the components like soil moisture sensor, ESP32, PIR motion sensor, LCD display, DHT11, buzzer ,pump ,relay.

I. WORKING

Initially Circuit is set up as shown in Fig 1**.** Code is initialized and connected to Wi-Fi and Telegram Bot using ssid, password and Bot token

Sensors are interfaced where the electrodes of Soil Moisture Sensor is put into the Soil.

The Threshold given in the code is compared with the moisture level in the soil. If the threshold is higher than the moisture of the soil then the pump turns on automatically via a Relay else the pump turns off automatically.

Another sensor is interfaced with Soil Moisture sensor is DHT11 which uses the capacitive humidity and Thermister to monitor the temperature and hence connected to the LCD via microcontroller. Hence displays the value.

PIR Motion Sensor senses the IR passive rays and notifies the invasion on Telegram Bot.

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II.FLOWCHART

Figure 2: Represents the flowchart of the system.

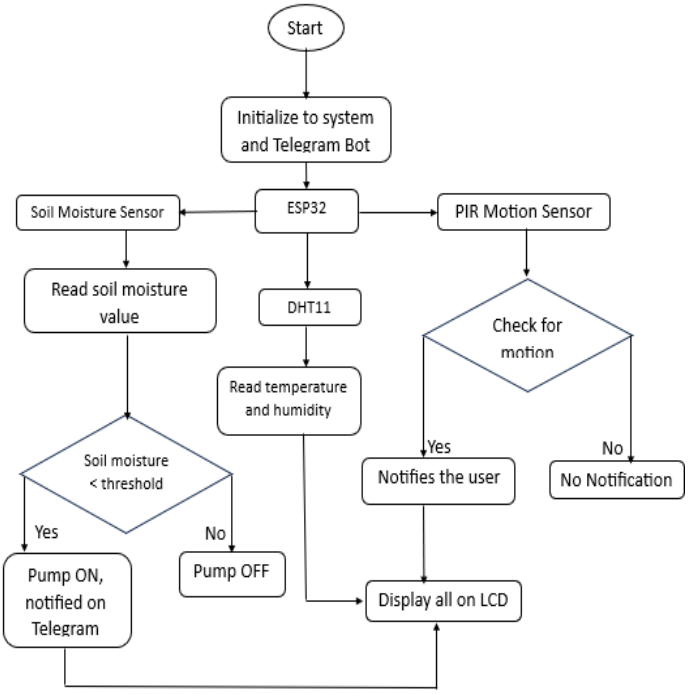

Figure 2: Flow chart

In Figure 2, the ESP32 takes the data from soil moisture sensor ,DHT11 and the PIR motion sensor and checks the condition and sends the value to the LCD display and the telegram bot.

III. RESULTS

The prototype of the proposed system is shown in Figure 3.

Figure 3: project demonstration is shown the above picture.

In Figure 3, all the sensors are interfaced and set up. Telegram Bot is internally connected using ssid, password and telegram token.

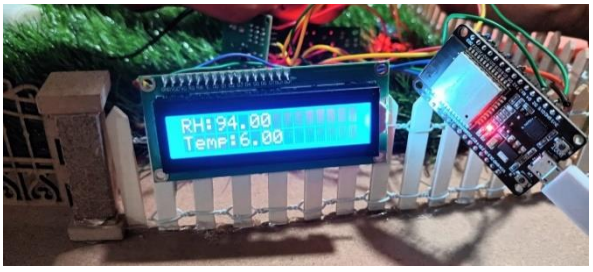

Figure 4: Displaying of Temperature and humidity on LCD

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In Figure 4, the Thermistor and Humidity Capacitance inside DHT11 sensor senses the atmospheric humidity and temperature and sends it to the microcontroller hence prints it via LCD

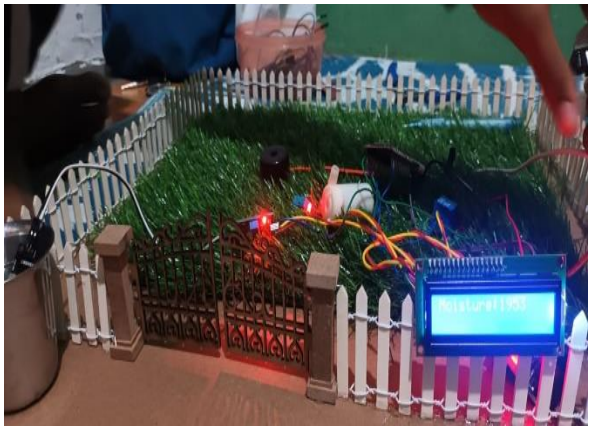

Figure 5: Displaying of Moisture level on LCD

In Figure 5, the resistance of the soil is compared with threshold mentioned hence the pump turns OFF or ON via an actuator i.e., relay.

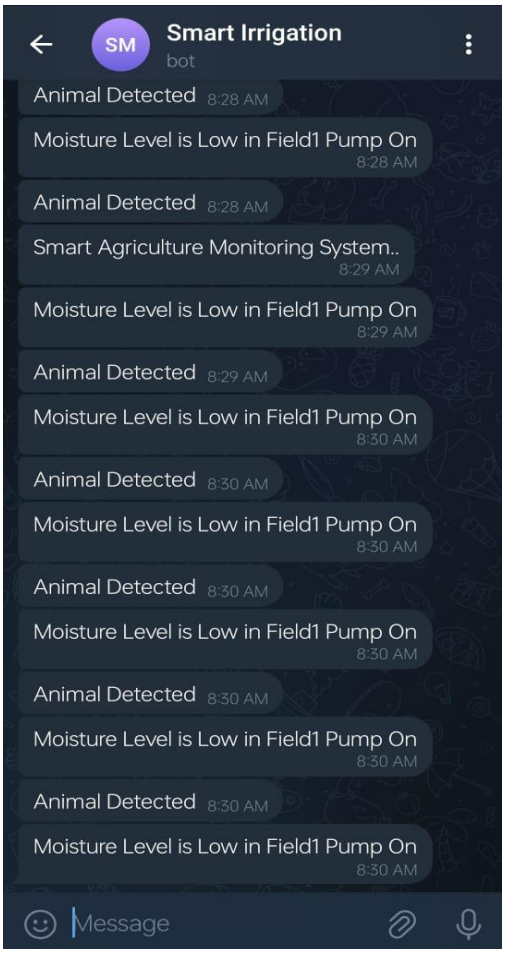

Figure 6: Updated the User with Telegram Notification

In Figure 6, the notification of all the data is sent via Telegram Bot by connecting it through telegram token and Wi-Fi ssid, password.

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IV. APPLICATIONS

- Small Farm
- Gardening
- Egg Incubator Factories
- Small Scale Factories
- Farming Land

Industries and Cold Storage of Farms

CONCLUSION

The implementation of IoT-based smart agriculture monitoring and protection systems holds significant promise for transforming the agricultural sector. By addressing key challenges such as resource optimization, climate variability, and pest management, these systems can improve crop yield, enhance operational efficiency, and promote sustainability. The applications of this technology are vast, ranging from precision farming and smart irrigation to livestock monitoring and supply chain optimization. Ultimately, the integration of IoT in agriculture empowers farmers with data-driven insights and automation, leading to better decision-making, cost reduction, and increased resilience against environmental challenges.

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