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Smart Agriculture Monitoring System Using IOT

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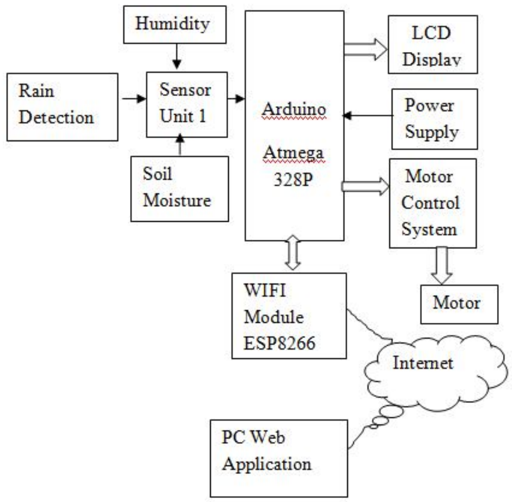
Abstract: Using wireless sensor networks, this Internet of Things (IOT)-based agricultural monitoring system gathers data from multiple sensors placed at different nodes and transmits it using IOT technology. The Arduino, which has a temperature sensor, moisture sensor, water level sensor, DHT11 sensor, water motor, buzzer, and node MCU, powers an Internet of Things-based smart farm system. The IOT-based agricultural monitoring system measures the moisture, humidity, and water levels when it first boots up. On the phone, it provides an SMS warning regarding the levels. Water level is sensed by sensors. The water pump is immediately started if it falls. The water motor activates if the temperature rises beyond the threshold. The buzzer we connected to the Arduino will activate the warning system if an animal enters the agricultural area. in order for the animal to go from the land. In India, agriculture is the primary source of income for people. It has a significant impact on the national economy. However, there are currently obstacles in agriculture as a result of rural-to-urban migration. Crop output can be increased by more than just keeping an eye on the environment. There aren't any elements that significantly reduce production. Therefore, in order to solve these issues, automation in agriculture must be used. an automated irrigation system, which helps farmers save time, money, and energy. Manual intervention is necessary when using traditional farm land irrigation techniques. Irrigation technology that is automated can reduce the need for human involvement. Continuous crop sensing and monitoring through the convergence of sensors and the Internet of Things (IOT) helps farmers stay informed about crop growth and harvest times, which in turn increases crop productivity and ensures that products are delivered to customers at the right time and location. Therefore, we use IOT-based smart agriculture techniques to solve this issue. Sensors including temperature, humidity, soil moisture, and rain detectors are used in this project to gather and process field data. To remotely manage and monitor sensor data, these sensors are Ease of Use.integrated with well-known web technologies in the form of a wireless sensor network.

I. INTRODUCTION

For the vast majority of Indians, agriculture is their primary source of income and a significant driver of the country's economy. There hasn't been much crop improvement in the agriculture sector over the last ten years. Because crop rates have decreased, food prices have been steadily rising. Water waste, inadequate soil fertility, fertilizer overuse, climate change, illnesses, and other factors are some of the causes of this. Effective agricultural intervention is crucial, and IOT in conjunction with wireless sensor networks offers the answer. The Internet of Things (IOT) is a way to connect everything to the internet. It does this by connecting previously unconnected objects or things (like a car, a house, electronic devices, etc.) with the primary goal of making sure that the right information is delivered to the right people at the right time. Given the unpredictability and uncertainty of monsoon rains, irrigation is a crucial component of agriculture. Automatic watering is required. Straight forward and simple to set up and install. Automatic irrigation would allow farmers to apply the appropriate amount of water at the appropriate time while saving energy and resources that may be used appropriately Reducing runoff from overwatering saturated soils and avoiding irrigation during the wrong times of day will enhance crop production. Valve systems are used in automated irrigation systems to turn motors on and off. With the help of controllers, motors may be simply automated, and turning them on and off doesn't require any labor. In highly specialized greenhouse vegetable production, it is an accurate irrigation technique and a useful instrument for precise soil moisture control. When altering the available soil moisture levels, it saves time and eliminates human error.

II. WORKING

A wireless sensor node's fundamental architecture for monitoring the environment is shown. The following characteristics form the basis of the system's design. Every node has a similar architecture and functionality, and the architecture may be easily upgraded. Each node can work cooperatively with the others or broadcast the data it has collected straight to the central system. Using Arduino and IOT, the sensor nodes created a network. The Arduino serves as the primary processor. A wireless sensor network is made up of various sensor kinds and an Arduino master.The entire system is supplied with a controlled power source. Figure 1 shows the proposed work's block diagram.



From the amount of fertilizer used to the number of trips the farm vehicles have made, smart farming based on IoT technologies helps farmers and growers decrease waste and increase output while facilitating the efficient use of resources like water, power, etc. An IoT smart farming solution is a system designed to automate the irrigation system and monitor the crop field using sensors (light, humidity, temperature, soil moisture, crop health, etc.). From any location, farmers can keep an eye on the state of the fields. Based on this data, they can also decide whether to take the required measures manually or automatically.

III. LITERATURE REVIEW

A sensor-based system is developed for crop-field monitoring, and a server makes decisions based on sensed data to automate the irrigation system. A sensor-based system is developed for crop-field monitoring, and a server makes decisions based on sensed data to automate the irrigation system. The sensed data was transferred to the web server database via wireless transmission. The temperature and moisture fields are below their potential range if irrigation is mechanized. The system can be remotely monitored and controlled by the user through an application that provides a web interface.[1]

Many studies are being conducted to track the effective food crop cycle since farmers face major obstacles in attaining greater food crop yields from the start of harvest to the finish. IOT can be used to enhance the production of food crops. In order to enable continuous crop sensing and monitoring through the convergence of sensors with IOT and to periodically notify farmers about crop growth and harvest time, a great deal of research on current agricultural practices is still required. This is despite the fact that the Indian government has taken some steps to provide farmers with online and mobile messaging services for agricultural inquiries and information about vendors. By educating farmers on crop growth and harvest times on a regular basis, which will increase agricultural output and guarantee that goods are delivered to final customers at the appropriate time and location.[2]

Cloud computing is the primary component of agriculture IOT sensor monitoring network technology. IOT-enabled technologies can improve the accuracy and efficiency of precision agriculture. IOT can be used in a variety of agricultural fields. The first is water and energy, which are the two most crucial inputs in agriculture and whose prices have the power to make or ruin a company. Lighting, boosters, and other tasks are also completed. The second is agricultural monitoring, where the main issues areinsect management, fertilizer and pesticide application depending on crop and soil health. An suitable decision can be made using IOT by placing sensors and image-capturing devices in the agricultural field that is connected to the internet. IOT can be used to make efficient use of pesticides and fertilizers. Finally, come to the conclusion that the best Agri-IOT architecture must be developed, one that is affordable, has low device power consumption, improves decision-making, offers QoS service, performs optimally, and is simple enough for a novice farmer to understand. [3]

IV. RESULT& ANALYSIS

A. Web Page inPut Window

We have developed the website of smart agriculture monitoring system. This web browser displays a web page on a monitor or mobile device. On a network, a web browser can retrieve a web page from a remote web server.

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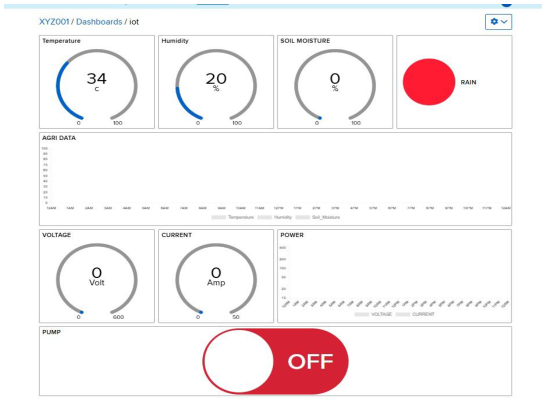

Figure (4.1) Web page input window

This web server is used access a private network such as a corporate internet. The web browser uses the Hypertext Transfer Protocol (HTTP) to make such requests to the web server.

B. Web Page Result

Figure (4.2) Web page output window

This gives us the webpage result. We can observe the current climatic conditions in the agriculture sector on the webpage. One can watch it from anywhere because of internet of things. Smart agriculture monitoring system provides advanced system for farmers. Every time the sensors sense the climatic conditions it is displayed on this webpage. The refresh time is about 10 seconds. The changes in temperature, humidity, moisture and rain detection are displayed on this page. The changes in temperature and humidity are displayed in terms of digits. Soil moisture measures the water shortage and gives output either low or high. Rain detector detects rainfall, if there is no rain it outputs as no rain otherwise it indicates as raining.

C. Three Phase Output

Fig.(4.3) Three phase out put window

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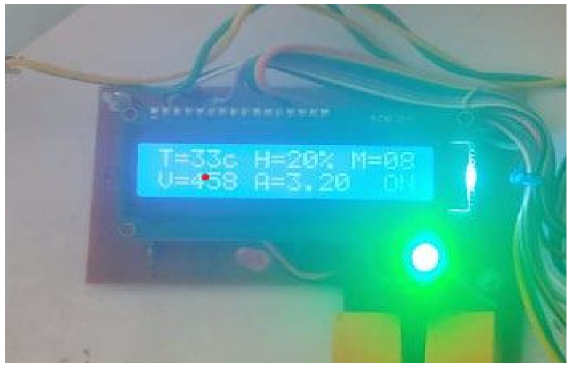

Fig.4.4 Three phase LCD display out put

D. Single Phase Output
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Fig.4.5 Single phase out put window

Fig.4.6 Single phase LCD display out put

E. Motor off

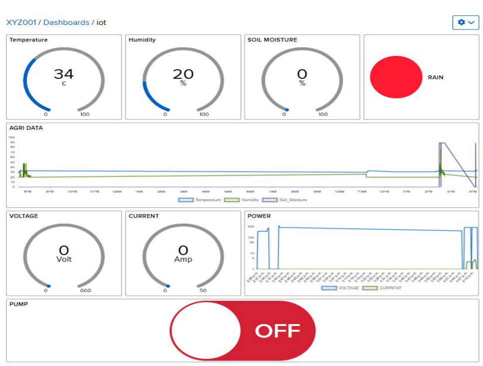

Fig.4.7 Motor OFF out put Window

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V. RESULT WITH GRAPH

2025/02/25 02:37PM	rain	10
2025/02/25 02:37PM	soil-moisture	89
2025/02/25 02:37PM	humidity	32
2025/02/25 02:37PM	temperature	33
2025/02/25 02:37PM	current	0
2025/02/25 02:37PM	voltage	0
2025/02/25 02:36PM	rain	10
2025/02/25 02:36PM	soil-moisture	89
2025/02/25 02:36PM	humidity	30
2025/02/25 02:36PM	temperature	33
2025/02/25 02:36PM	current	0
2025/02/25 02:36PM	voltage	0

Live Data (newest data at top)

2025/02/25 02:37PM	current	0
2025/02/25 02:37PM	voltage	0
2025/02/25 02:37PM	rain	10
2025/02/25 02:37PM	soil-moisture	89
2025/02/25 02:37PM	humidity	30
2025/02/25 02:37PM	temperature	33
2025/02/25 02:37PM	current	0
2025/02/25 02:37PM	voltage	0
2025/02/25 02:37PM	rain	10
2025/02/25 02:37PM	soil-moisture	89

Live Data (newest data at top)

2025/02/25 02:38PM	soil-moisture	89
2025/02/25 02:38PM	humidity	30
2025/02/25 02:37PM	temperature	33
2025/02/25 02:37PM	current	0
2025/02/25 02:37PM	voltage	687
2025/02/25 02:37PM	rain	10
2025/02/25 02:37PM	soil-moisture	89
2025/02/25 02:37PM	humidity	29
2025/02/25 02:37PM	temperature	33
2025/02/25 02:37PM	current	0

Live Data (newest data at top)

2025/02/25 02:39PM	rain	10
2025/02/25 02:39PM	soil-moisture	89
2025/02/25 02:39PM	humidity	27
2025/02/25 02:39PM	temperature	33
2025/02/25 02:39PM	current	0
2025/02/25 02:39PM	voltage	448
2025/02/25 02:39PM	rain	10
2025/02/25 02:38PM	soil-moisture	89
2025/02/25 02:38PM	humidity	26

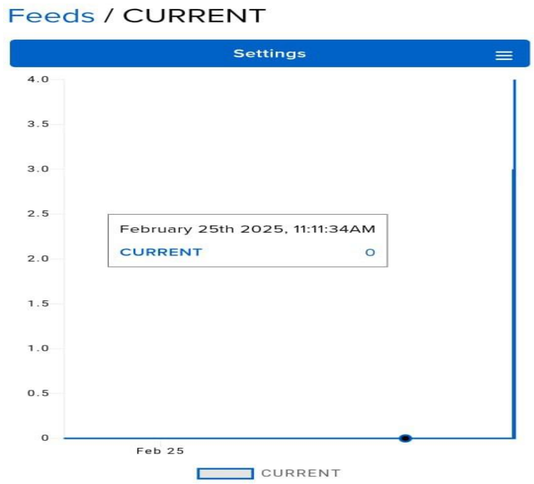

Fig.5.8 Current graph

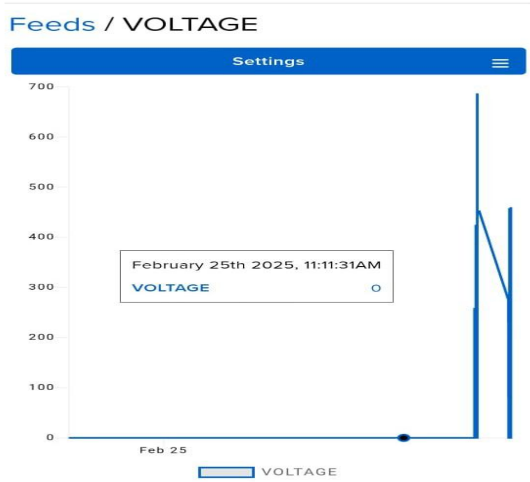

Fig.5.9 Voltage graph

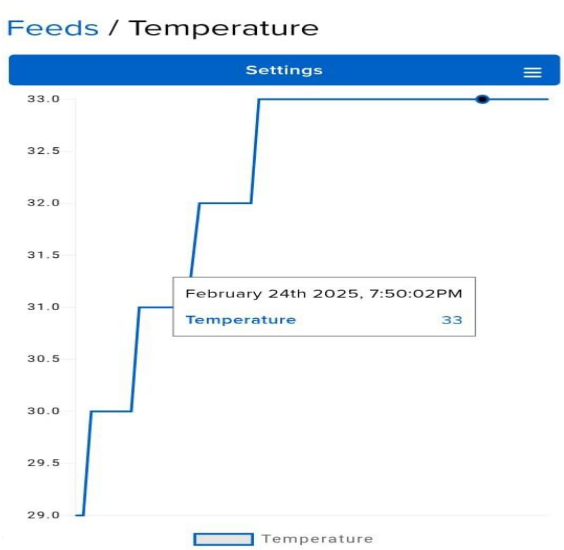

Fig.5.10 Temperature graph

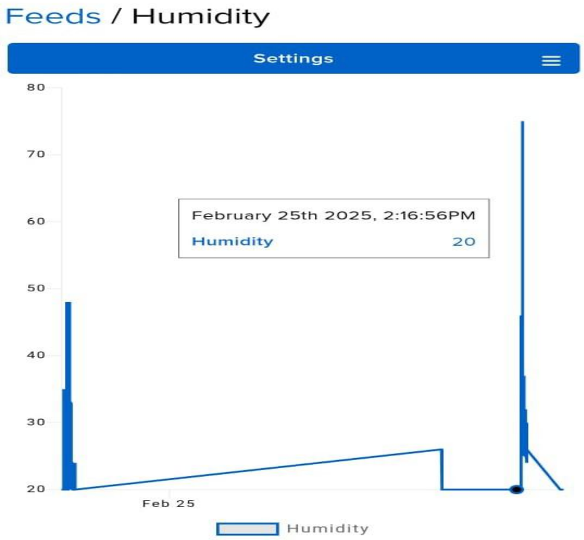

Fig.5.11 Humidity graph

Fig.5.12 Rain graph

VI. CONCLUSIONS

This study describes an IOT-based automated watering system. Together, cloud computing and the internet of things create a system that efficiently manages the agriculture industry. All environmental characteristics will be sensed by this system, which will then transmit the data to the user via the cloud. Using an actuator, the user will take controlling action in accordance with that. This resource enables the farmer to enhance cultivation in a manner that suits the needs of the plants. Higher crop yields, longer production times, improved quality, and a reduction in the need for protective chemicals are the results. Smart farming will benefit from IoT. The irrigation system can be tracked and managed by using the Internet of Things to forecast the soil's humidity and moisture content. IoT improves soil management, crop monitoring, water management, time efficiency, and pesticide and insecticide control, among other aspects of farming. Additionally, this approach reduces human labor, streamlines farming methods, and promotes intelligent farming.

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