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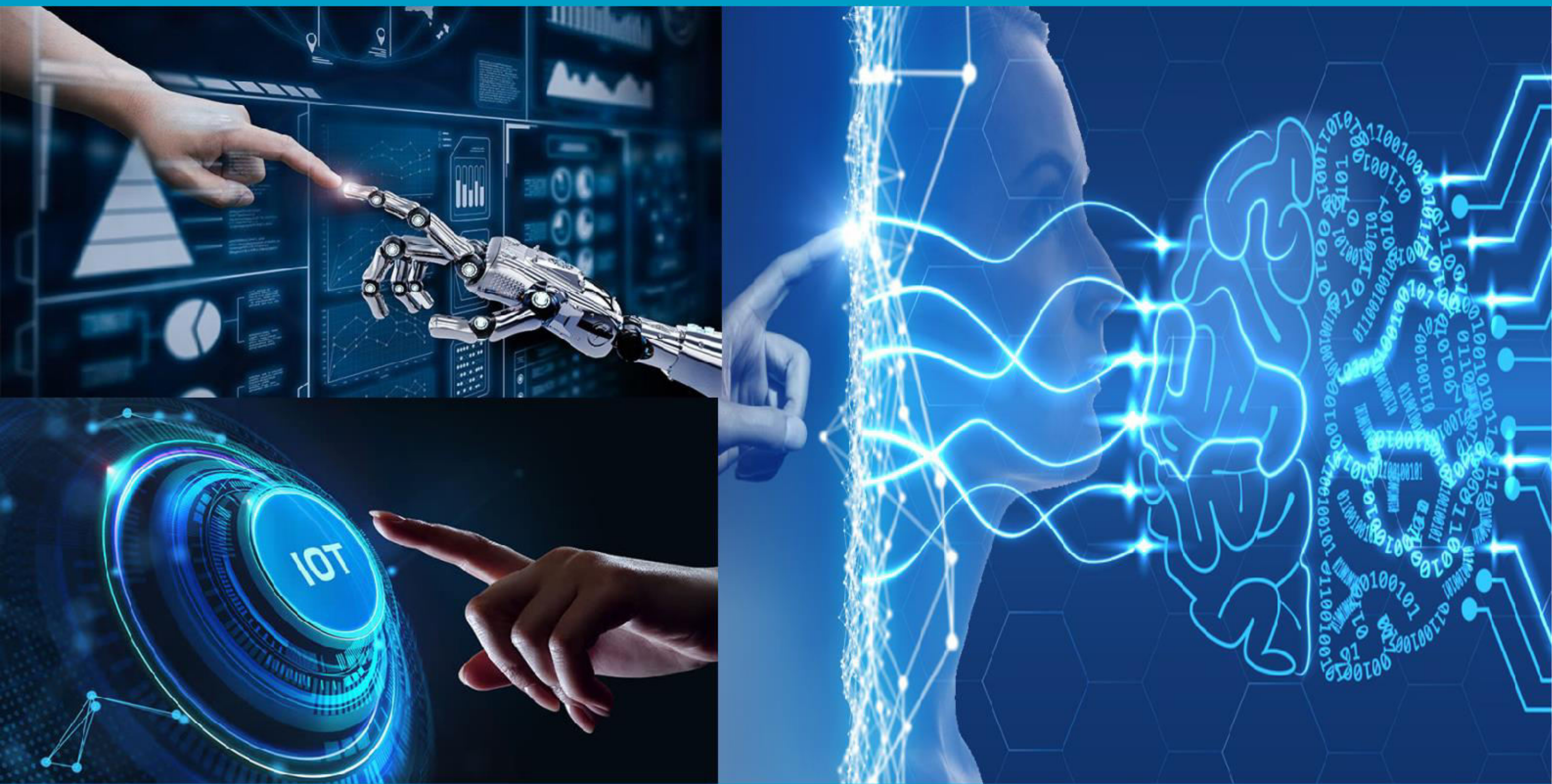

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IoT Based Smart Agriculture Monitoring and Prediction: A Survey

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ABSTRACT: Internet of Things (IoT) technology has brought revolution to each and every field of common man's life by making everything Smart and Intelligent. Smart agriculture is a farming system which uses IoT technology. This emerging system increases the quantity and quality of agricultural products provide information about nature of farming fields and then take action depending on the farmer input. The developed system is capable of monitoring temperature, humidity, soil moisture level using microcontroller unit named as NodeMCU and several sensors are connected to it. The data then goes to blynk app in smart phone where the user can see the humidity, temperature, soil moisture level and also fertilize the crops.

KEYWORDS— Internet of Things (IoT), Node MCU, soil moisture sensor, temperature and humidity sensor, raindrop sensor.

I.INTRODUCTION

Agriculture is the primary occupation in India and it is the backbone of Indian economic system. Agriculture provides employment opportunities to rural people on a large scale in underdeveloped and developing countries in addition to providing food. Climate changes will have significant impact on agriculture by increasing water demand and limiting crop productivity in areas where irrigation is most needed. As in today's, the world population is growing every day and it is believed to be around 9.8 billion by 2060 for producing the foods of those billion of peoples require to pick up the productivity of crops. The world population is growing day by day and the agricultural land is decreasing due to a lot of reasons like industrializations, housing buildings and commercial markets are being buildup on agricultural parkland. In this system, an IoT based advanced solution for monitoring the soil condition and atmosphere for efficient crop growth is presented. The developed system is capable of monitoring temperature, humidity, soil moisture level using Node MCU and also fertilize the crops.

II.LITERATURE REVIEW

Smart farming model based on the Internet of Things using the clustering to deal with the adverse condition. In this model use the different type of sensors like soil moisture, air pressure , rain detection and humidity sensor for a different purpose. The data will collect on the cloud and calculated automatically. The smart agriculture can be adopted from the crop control, collection of useful data and analysis automatically [1]. The purpose of this paper is how the implement the Internet of Things(IoT) in the monitoring of humidity, soil condition, temperature and supply water to the field, level water, climate condition. [2] Low-cost IoT network for smart agriculture. For monitoring the soil moisture content, used an in-house developed sensor. In the proposed network, the IITH mote is used as a sink and sensor node which provides low-power communication. For evaluated our network with state of the art networks, proposed for agriculture monitoring. Power and cost are the two metrics use for evaluation of these networks. Results show that the proposed network consumes less power and has on average 83% prolonged lifetime at a lower cost compared to previously proposed network in the agriculture field. [3] This system design to work an IoT based smart farming to control high voltage electrical devices like pump, flap of playhouses etc. without human intervention depending on environmental parameters like soil moisture and temperature. These parameters are stored in cloud for future data analysis. Farming is done within playhouses for better controlled environment. This system is consisting of different layer. It is divided into four modules: Sensor layer, Middleware, Communication layer and cloud & application layer. [4] In the field area, different sensors are sent in the field like temperature sensor, dampness sensor and stickiness sensor. The information gathered from these sensors are sent to the microcontroller. In control segment, the got information is checked with the edge esteems. On the off chance that the information surpasses the edge esteem the ringer is exchanged ON. This caution is sent as a message to the rancher and the qualities are created in the page and the rancher gets the point by point depiction of the qualities. In manual mode, the client needs to switch ON/OFF the microcontroller by squeezing the catch in the Android Application created. This is finished with the assistance of WI-FI Module. In programmed mode, the microcontroller gets turned ON and OFF consequently if the esteem surpasses the edge point. This is accomplished by making an impression on the website page through the WI-FI module and now parameters like the temperature, moistness and the dampness sensors demonstrates the edge esteem. The water level sensor is utilized just to show the dimension of water inside a tank or the water asset.

Table 1 Literature Survey

S. No.	Paper Title	Author Name	Key Points
1	Agriculture monitoring and prediction using Internet of Things(IoT).	M. K. Saini and R. K. Saini, 2020.	The purpose of this paper is how the implement the Internet of Things(IoT) in the monitoring of humidity, soil condition, temperature and supply water to the field level of water, climate condition.[1]
2	A Low Power IoT Network for Smart Agriculture	S. Heble, A. Kumar, K. V. V. D. Prasad, S. Samirana, P. Rajalakshmi, and U. B. Desai, 2018.	Author proposed a low-power, low-cost IoT network for smart agriculture. For monitoring the soil moisture content, It is used in-house developed sensor.[2]
3	IoT Based Intelligent Agriculture Field Monitoring System	M. AshifuddinMondal and Z. Rehena, 2018	The purpose of this research work is to propose a smart farming method based on IoT to deal with the adverse situations. The smart farming can be adopted which offer high precision crop control, collection of useful data and automated farming technique.[3]
4	A Model for Smart Agriculture Using IoT	K. A. Patil and N. R. Kale, *2016*	Author proposed a smart farming system in a limited, enclosed area wherein different sensors are strategically positioned to measure parameters such as moisture content, temperature, pressure, light intensity and pH of the soil.[4]

III. EXISTING SYSTEM

The Existing system was demonstrated with the help of Thingspeak cloud. ThingSpeak is an IOT analytics place to accommodate to sanctions to aggregate, depict and analyze real-time data streams in the cloud. ThingSpeak gives instant envision of data posted by the contrivances with the competency to execute MATLAB code. Additionally , it is often utilized for prototyping and proof of concept IoT systems that require analytics. The data is first collected from the different sensors here Sensors like Moisture level of soil, Temperature of the area, air moisture and Water Level are used. They are attached to a breadboard which is intern connected to the Arduino Board. The data from the board is sent to the Arduino IDE. The live data received from the sensors are stored in the cloud. The stored data is classified and analyzed using classification algorithm at Thing-speak cloud. The data such classified which fall beyond threshold value are analyzed and an email is sent to the user to perform necessary actions. The disadvantages of this method is to fertilizer method for crops is not included. Therefore the chances of disease in the crops are high.

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IV.METHODOLOGY OF PROPOSED SURVEY

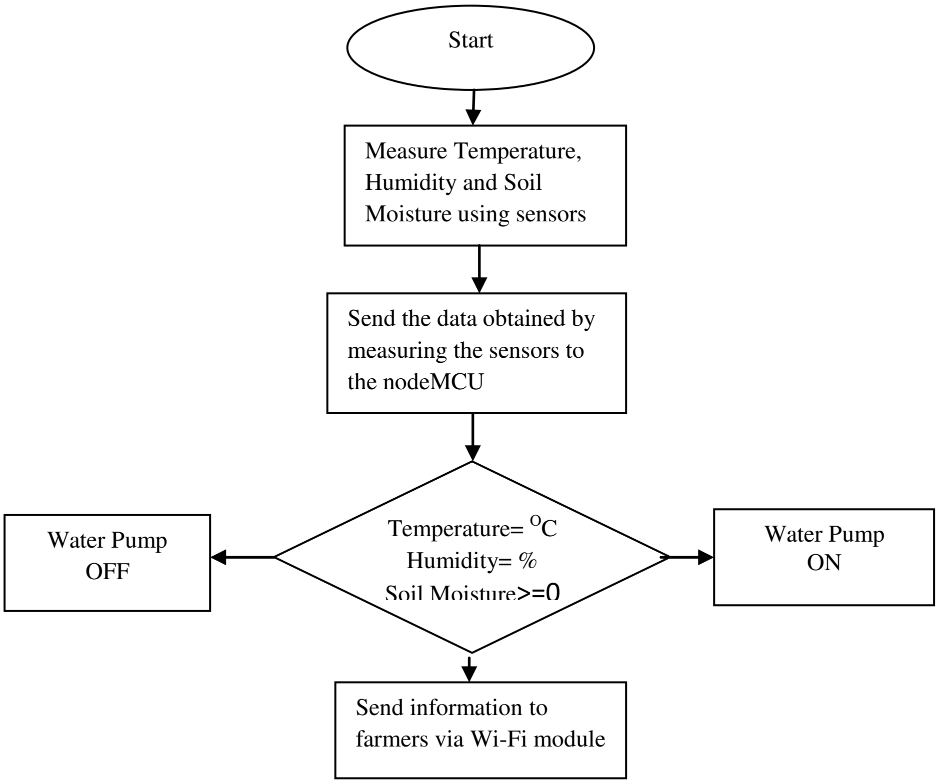

Figure 1 Flowchart for smart agriculture using IoT

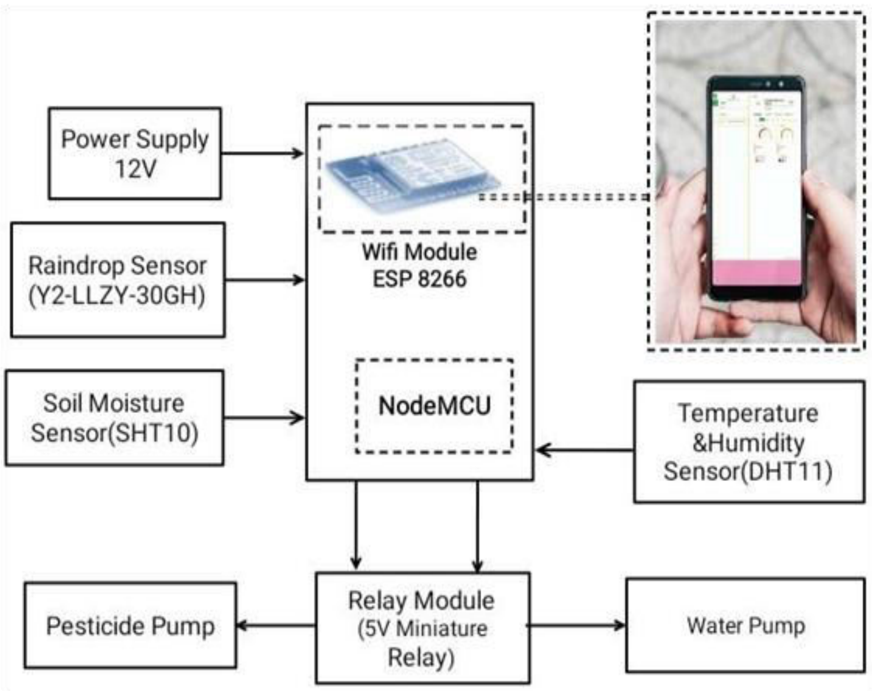

Figure 2 Block diagram for smart agriculture using IoT

The system proposed uses a microcontroller (NodeMCU) which has a Wi-Fi module (ESP8266) over it. Smartphone with blynk is used as user interface. Soil moisture sensor, humidity and temperature sensor (DHT11) and rain detection sensors along with DC motor are used. This DC motor is connected to a water pump which pumps water to the crops when the DC motor is ON. The soil moisture sensor senses the moisture level in the soil. Depending on the level of moisture, NodeMCU decides whether to water the crop or not. By using appropriate functions and conditional statements in the code written for the NodeMCU functioning, the watering of the crop starts by NodeMCU making DC motor ON when the moisture content is below a threshold value and is made OFF when there is enough moisture content in the soil. The humidity and temperature sensor gives the humidity and temperature values of the atmosphere which determine whether the crop is suitable for growth. Some crops grow only in particular weather conditions and some give better yield only for a particular temperature range. The raindrop sensor measures the intensity of rain. If there is enough rainfall to provide soil with required water, the crops are not watered. Even after raining, if the crops are not having sufficient water then water is pumped again by making DC motor ON. Data reaches the blynk cloud from NodeMCU through Wi-Fi from Wi-Fi module present on NodeMCU. The data then goes to blynk cloud in smartphone where the user can see the humidity, temperature, soil moisture levels and also fertilize thecrops.

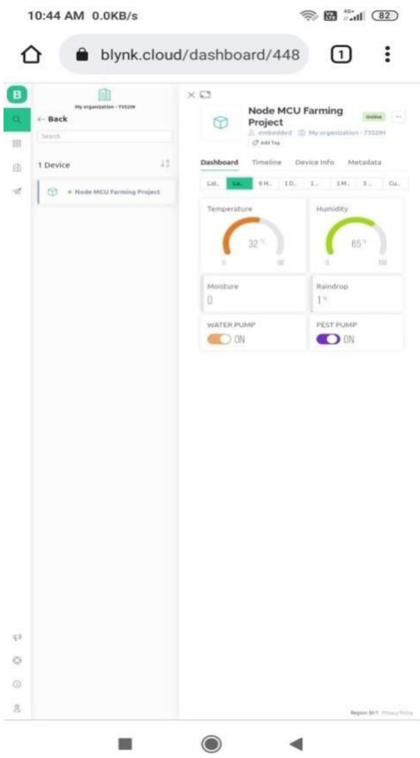

Figure 3 Output of Smart Agriculture

ADVANTAGES

- Avoid wastage of water.
- To acquire knowledge of soil moisture and temperature
- conditions. Increases the efficiency of production.
- Save time.
- Reduce Manpower.
- It is cost effective method.
- It delivers high quality crop production.

V. CONCLUSION AND FUTURE WORK

IoT technology is used to sense and analyze the temperature, humidity level, soil moisture level and the rain condition and DC motor is controlled using NodeMCU. All these values are sent to the smart phone using Wi-Fi. Due to the usage of this system, adequate water is pumped and rain is also utilized efficiently. This system is very much helpful to farmers as they need to regularly pump water and check the status of each crop. From anywhere in the world, farmers can know the values of humidity, temperature and soil moisture and if the DC motor is ON through the blynk app present in their smartphones.

Future scope:

Future work would be focused more on increasing sensors on this system to fetch more data especially with regard to pest control and by also integrating GPS module in this system to enhance this Agriculture IoT Technology to full-fledged Agriculture precision ready product.

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