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IoT based Monitoring system in Smart Farming

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ABSTRACT
It is necessary to increase agricultural production with the growing population in India. Hence agriculture is one of the important sectors to be considered. Smart farming is adapting latest technologies in agriculture to monitor the field without manual intervention of the farmer and there by automating the entire system. The purpose of this work is to introduce a smart farming method with the implementation of the Internet of Things to gather physical parameter from the field by making use of different sensors like Rain sensor, Humidity sensor, Temperature sensor and Soil moisture sensor and storing them on Thinkspeak cloud[1], based on the values stored actions are taken accordingly and data is even used for future analysis.
***Keywords*—**Internet of Things, Agriculture, Sensors, Smart Farming, ThinkSpeak Cloud.

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I. INTRODUCTION

Agriculture plays a prominent role in the economy of India. In rural India, Agriculture is the largest provider of the livelihood. India holds second place in the agricultural output. About half of the population Relays on the agriculture as a source of income. It is the backbone of Indian economy. The major challenge in quality farming is unpredictable weather and environmental conditions such as rain fall, temperature, soil moisture etc.55-75% of water is used for agriculture is used and 60% of the water is wasted. Humidity is the environmental parameter which affects the turgon presure of the plant which indicates the amount of water in the cells of the plant. With the increase in the humidity, transpiration rate of the plant increases ant the plant wilts due to the excess loss of water. With the increase in the temperature and the moisture in the air the transpiration rate is decreased and which in turn restrict the evaporative cooling. In order to monitor these environmental conditions and action have been taken accordingly, continuous manual effort was required which is quite impractical and not possible all the times[2][3].

Advancement in farming by making use of modern technologies and tools for improving the quality and production of the yield in farm is referred as Smart Farming. Many techniques are implemented in smart farming for the automation of monitoring the crops.IOT is one among the technologies, which is the network of many smart sensors and many other devices working for many other purposes .This technology monitors the farming over the internet by collecting the different physical parameters such as humidity, moisture, temperature etc through the different sensors connected in the smart system and based on the data's obtained predictions are made and based on the predictions required actions are taken for the improvement of the production and the quality of the yield. Farmer can monitor his field by making use of smart device in case of IOT based smart farming. Cloud computing is one more booming technology which can be used by smart farming effectively for storing the different data's related to smart farming[4][5].

II. LITERATURE SURVEY

Cloud for the Modernization will give ICT based data assistance to farmers in making decisions. In [6], AnupriyaTuli, et. al. propose a cloud deployment replica "Agri- assistant", which gives agriculture associated information support to Indian farmers living in rural areas, facing financial and connectivity constraints. Many initiatives are in use by Government of India to promote and launch ICT in agricultural field. On comparing to its developing countries like Japan, China etc. Where agriculture is advanced by making use of technologies like IoT, but for India there is lot more to adapt. The model leverages the active Government services and mobile service to give a solution to existing scenario with minimum burden on farmer's pocket.

Research work in [7], Md. Ashifuddin Monda, et. al. is to plan a elegant farming system based on Internet of Things(IoT) to deal with the adverse situation. The smart farming can be adopted which offer high accuracy crop control, gathering of useful data and automated farming method. Here temperature and moisture of the soil are measured

and these sensed values are stored in ThingSpeak cloud for future data analysis. The Internet of things (IOT) is remodelling the agriculture enabling the farmers with the wide range of methods. IOT technology helps in gathering data about conditions like weather, moisture, temperature and fertility of soil, Crop online monitoring allows detection of weed, level of water, pest detection, and intrusion of animals inside the field, growth related to crops, and agriculture. To view remotely the conditions in the form of image and video, wireless cameras have been used. IOT technology can reduce the cost and enhance the productivity of traditional farming.

In [8], Muhammad Shoaib Farooq, et. al. explains control networks and information networks combination of lOT technology are studied based on the actual situation of agricultural production. Remote monitoring system with internet and wireless communications combined is used. Also taking into account the system, information management system is designed. The collected info by the system provided for agricultural research facilities. . The literature on IoT in agriculture and food is very much liberated by Asian scientists, especially from China. In other continents, the concept of IoT was up to lately mainly adopted by non-agricultural scientists. The application area of food supply chains is addressed most regularly, followed by arable farming. Many documents report the results of explorative studies or they present IoT systems that are designed or implemented in prototypes and pilots.

III. PROPOSED SYSTEM

The goal of this work is to propose an IoT based smart farming system to monitor the agricultural field parameter and there controlling the electrical devices without the manual intervention of farmer. The data collected by different sensors like Soil moisture sensor, Humidity sensor, Temperature sensor and the Rain sensor are stored over the cloud for future analysis.

The four major layer of the proposed system are shown in fig 1.

1. Sensor Layer

This is the first layer of smart farming system. Sensor layer captures and monitors the different physical parameters from the agriculture field. Four types of sensors are used in this system- Temperature sensor, Soil moisture sensor, Humidity sensor and Rain Sensor. The sensors are attached with microcontroller. This Microcontroller converts the physical parameter electrical signal. Hence any changes in the physical parameter is sensed and monitored through the Sensor layer[9].

2. Middleware Layer

This layer is the second layer of the system. This layer is necessary for the automation of the smart farming process by monitoring the Actuator. The Actuator is a transducer which takes up the electrical signal and converts it into physical action. The sensed value from the Sensor layer is fed into the Microcontroller and based on the different threshold value of the physical parameter which affect the crops, that is moisture and temperature.

If the moisture level of the soil is lesser than the threshold value, then the microcontroller will trigger pump machine for watering the plants as the inadequate moisture level inversely affect the production of the crops. The threshold value of the soil moisture content differs for different crops[9].

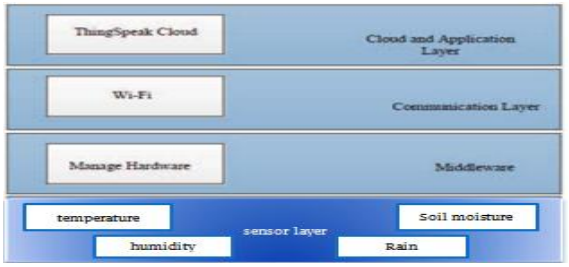

Fig 1: Different layers of smart farming system.

3. Communication layer

In this layer Microcontroller sends the signal on to the cloud through the gateway by making use of wireless WIFI module. WIFI module is advantageous over the Bluetooth since it covers larger range of communication. The communication is not encouraged using Ethernet to avoid cabling. The physical parameter sensed by the sensors is sent by the Microcontroller to cloud through gateway. IP based protocol runs on the gateway.

4. Cloud and Application layer

Cloud technology is an emerging technology which can be used effectively in smart farming. Different agricultural data's are recorded in the cloud computing platform. Microcontroller sends the physical parameter on to the cloud using gateway periodically by making use of technologies like Zigbee, LoRa, Modbus [10][11]. These data's are plotted against time as a graph agriculture Field status is monitored through the graph.

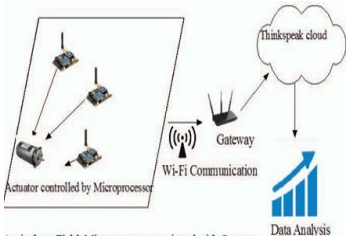

Fig 2: System deployment model

IV. EXPERIMENT AND RESULTS

In experimenting the working of the system different types of equipment are used. Microcontroller used here is Arduino UNO board and different sensors like Soil moisture sensor, Temperature sensor, Humidity sensor and the Rain sensor are attached to the Arduino analog pins since the analog readings are fetched from the field.

The values from the field parameters are sent to the Middleware of the Arduino and based on these values the Middleware controls the actuator to perform automation. There by converting physical parameter into electrical signals. Along with controlling the Actuator, Arduino board will send the measured value from field on to the Think speak cloud service. To communicate with the cloud ESP8266 WIFI module is used.

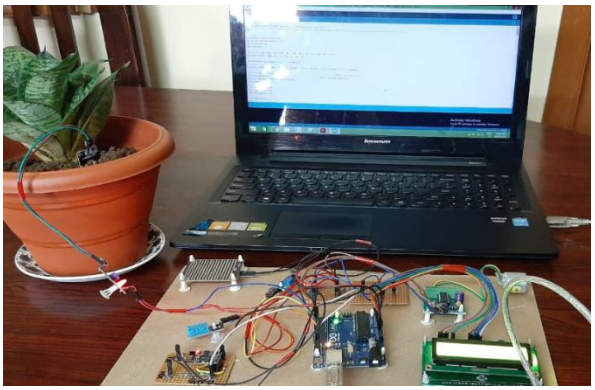

Fig 3: Experimental setup

The proposed system collects these field values by continues monitoring and the values are represented in cloud in the form of plotted graph as shown in the figure Fig 4. Timely updating of values are done every 15sec. simultaneously the values are displayed on the LCD display as shown in the figure Fig 6 .

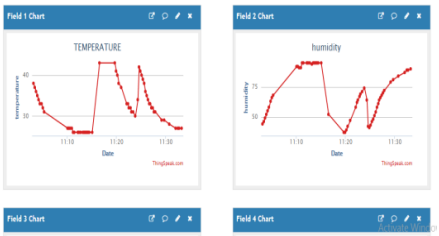

Fig 4: Snapshot of graphs of Temperature and Humidity field

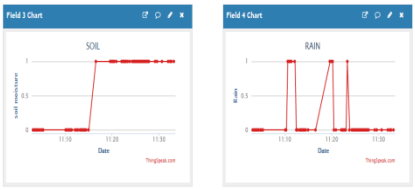

Fig 5: Snapshot of graphs of Soil and Rain field

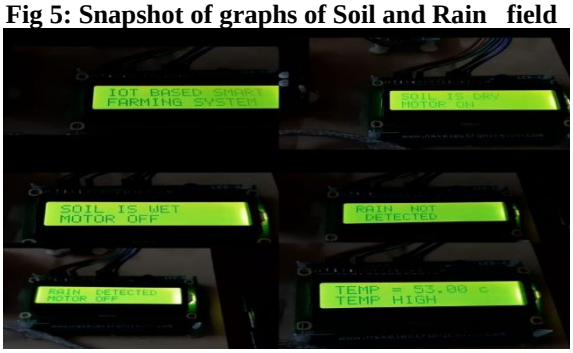

Fig 6: Values displayed on LCD

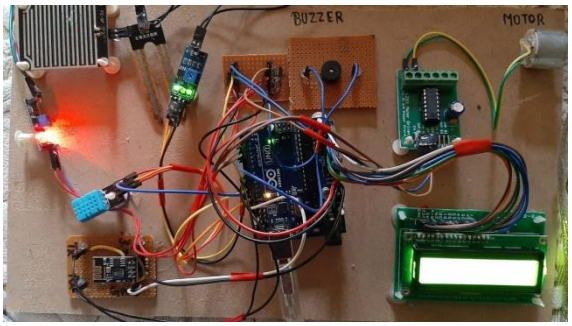

Fig7: Buzzer and Motor turns on when soil is dry

V. CONCLUSION

The system has been proposed using Ardunio for monitoring the field parameters which includes soil moisture, temperature, humidity and rain. Acquisition of data from the field is done by sensors and the collected data will upload on to cloud. The system proposed here is efficient and the farmer can make use of this proposed IoT based monitoring system for production of better yield with the accuracy in result. The system can be enhanced by increasing the number of sensors and there by fetching the large number of data and storing it on the other cloud storage which provides

better features. Also by making use of Machine learning algorithms and model the system can be made smarter enough to take the decision about the performance and the data.

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REFERENCES

[1]. IoT Based Intelligent Agriculture Field Monitoring System Md AshifuddinMondal ; Zeenat Rehena 2018 8th International Conference on Cloud Computing, Data Science & Engineering (Confluence) Year: 2018 | Conference Paper | Publisher: IEEE

[2]. Internet of Things application for implementation of smart agriculture system K. Lokesh Krishna ; Omayo Silver ; Wasswa Fahad Malende ; K. Anuradha 2017 International Conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud) (I-SMAC) Year: 2017 | Conference Paper | Publisher: IEEE

[3]. A Survey on the Role of IoT in Agriculture for the Implementation of Smart Farming Muhammad Shoaib Farooq ; Shamyla Riaz ; Adnan Abid ; Kamran Abid ; Muhammad Azhar Naeem IEEE Access Year: 2019 | Volume: 7 | Journal Article | Publisher: IEEE

[4]. An Adaptive Cloud-Based IoT Back-end Architecture and Its Applications Attila Csaba Marosi ; Attila Farkas ; Robert Lovas 2018 26th Euromicro International Conference on Parallel, Distributed and Network-based Processing (PDP) Year: 2018 | Conference Paper | Publisher: IEE

[5]. Framework to leverage cloud for the modernization of the Indian agriculture system Anupriya Tuli ; Nitasha Hasteer ; Megha Sharma ; Abhay Bansal IEEE International Conference on Electro/Information Technology Year: 2014 | Conference Paper | Publisher: IEEE

[6]. AnupriyaTuli ; NitashaHasteer ; Megha Sharma ; Abhay Bansal"Framework to leverage cloud for the modernization of the Indian agriculture system"IEEE International Conference on Electro/Information Technology

[7]. Md.Ashifuddin Mondal ; ZeenatRehena "IoT Based Intelligent Agriculture Field Monitoring System" 2018 8th International Conference on Cloud Computing, Data Science & Engineering (Confluence) Year: 2018 | Conference Paper | Publisher: IEEE

[8]. Muhammad Shoaib Farooq ; Shamyla Riaz ; Adnan Abid ; Kamran Abid ; Muhammad AzharNaeem "A Survey on the Role of IoT in Agriculture for the Implementation of Smart Farming" IEEE Access Year: 2019 | Volume: 7 | Journal Article | Publisher: IEEE

[9]. Sensor data collection and irrigation control on vegetable crop using smart phone and wireless sensor networks for smart farm Nattapol Kaewmard ; Saiyan Saiyod 2014 IEEE Conference on Wireless Sensors (ICWiSE) Year: 2014 | Conference Paper | Publisher: IEEE

[10]. Designing An IoT Cloud Solution for Aquaculture Uğur Acar ; Frank Kane ; Panagiotis Vlacheas ; Vassilis Foteinos ; Panagiotis Demestichas ; Güven Yücetürk ; Ioanna Drigkopoulou ; Aycan Vargün 2019 Global IoT Summit (GIoTS) Year: 2019 | Conference Paper | Publisher: IEEE

[11]. Enabling IoT automation using local clouds Jerker Delsing ; Jens Eliasson ; Jan van Deventer ; Hasan Derhamy ; Pal Varga 2016 IEEE 3rd World Forum on Internet of Things (WF-IoT) Year: 2016 | Conference Paper | Publisher: IEEE