

SMART AGRICULTURE MONITORING SYSTEM USING IOT

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Abstract: IOT (Internet of things), which is form of technology where it simplifies the daily life work and makes easy. India has agriculture as its primary and main occupation. The main problem faced by the farmers in agriculture is about monitoring the parameters such as soil moisture, temperature and humidity. To overcome those problems, we have proposed this system.

The system consists of microcontroller and sensors like soil moisture sensor, soil temperature sensor and humidity sensor. Here IOT based smart farming monitoring system is proposed. The intention for approaching smart agriculture is to increase its agricultural productivity and to make it easier for the farmer to control over the parameters.

In the proposed system we are going to monitor real time parameters of soil and environment through various soil and environmental monitoring sensors. The data from these sensors are periodically sent to cloud through ESP32. But the main limitation with this model is that we cannot use ESP32 module when we are offline, we need to have Internet for getting the results. Cloud stores the details of these sensors and analysis is done on the stored cloud data for proper management of the water levels and moisture levels. This model is useful to decrease the hard work to be done by farmer and increases efficiency and saves a lot of time by giving an analysis.

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I. INTRODUCTION

Agriculture also needs to keep up with the trend as the world is bursting with new technologies and implementation. There is a lot of research going on in the field of agriculture. Most projects refer to the use of a wireless sensor network, which collects data from different sensors installed on different nodes and sends it via a wireless protocol. The collected data provide information about various environmental factors. Monitoring environmental factors to increase crop yields is not a complete solution. There are many other factors that can greatly reduce productivity. Therefore an automatic process should be implemented in agriculture to overcome these problems. Therefore, in order to provide a solution to all such problems, it is necessary to develop an integrated system that takes care of all the factors that affect productivity at each stage. Due to the fact that full mechanization in agriculture has not been achieved but is not a problem. Although it is implemented at the research level, it is not given as a product to the farmers to benefit from the resources. Therefore this paper deals with developing smart farming using IoT and providing it to farmers.

According to the survey, global population growth is projected to reach around 10 billion by 2060. However, the demand for food grains will increase abruptly in these years due to population. Unfortunately, food grain is low compared to population growth. Worldwide food production should improve in the coming years for this reason.

IoT has recently given a strong impression on the agricultural sector with a wide range of sensors used for various smart farming objectives. IoT applications are on the rise in the coming year due to learning about the technology

Connecting multiple interconnected devices such as multiple sensors, drivers and smart objects to mobile devices via Internet usage. IoT services include sharing information with intellectual control and decision-making services due to the many cloud-based remote data collection. Such capabilities can provide efficient production to the smart farming industry. Improving modernized farming with the exploration of the IoT area of interest in the field of agriculture is the traditional approach of agriculture. IoT development has brought many benefits in all areas compared to last year. IoT is scalable software, hardware, cost-effective. A key element for the integration of different measuring components for smart architecture Schedule all activities including irrigation, plant growth, disease detection by its leaf and product management in smart agriculture sector

This IoT cost is very reasonable for all farm solutions with IoT based smart farming. Researchers have introduced a number of sensors that are technologically advanced to increase productivity in agriculture. Therefore, to achieve the goal Gradually, many new innovations can be combined with traditional agriculture. With multiple sensors and described in green nature, IoT can intelligently build agriculture.

Since framing is a major sector in our country we need to upgrade our self-reliance in smart farming activities and apply technology in our sectors so that framing can facilitate everyone and reduce migration. The food production country here needs a good passion for technology so that people can get interested in working in the field of providing them with all the values and readings online through wireless protocols. People Developing a crop seems like a daunting task, but as a food producing country we cannot take a step back in growing a crop field. They are not only a lot of factors for people to quit framing, so make sure it is easy for them but not bother them..

II. LITERATURE REVIEW

Patil K. A et al, introduced a ICT agriculture model, where ICT plays important role in agriculture. In agriculture weather, soil condition and pests etc. This information is required to examine the plant condition and able to improve the production. Predicting rapid change of climate in agriculture. ICT model helps to achieve the resources, and can be utilized. This technique can be achieved by wireless connection only and within in the shot distance.

Joaquín Gutiérrez et al. Proposed a agriculture model on 2014 which optimizes water usage in agriculture field. Water is essential resource, to maintain water moisture in agriculture field a algorithm is developed based on microcontroller. A threshold value which a limit for water moisture in the land which alerts the farmer to water the agriculture. The data which will uploaded to the cloud using cellular internet. Here is the main problem the electricity.

Shakthi Priya N et al., did a research on the sensors in 2014 which are used in the agriculture platform. The wireless technology which are used in agriculture. Collecting the value of the soil moisture using soil moisture sensor and based on the value water will be supplied to field. The model which is used in the agriculture field will send the SMS to the farmer it also sends soil PH values to the farmer through SMS. The SMS sent using gsm module which is used in the model.

BezaNegashGetu et al. (2015), It researched on the design and the working of an electronic system for automatic controlling of water pumps that are used for fields in agriculture or for the plant watering based on the level of soil moisture sensor. The speed of the motor is changed according to the level of the soil moisture content; the motor will be turned off during the maximum wet and is running with HIGH speed during dry soil conditions respectively. The duration of water pumping is controlled by a timer circuit. The system is tested with a simulation software called as NI MULTISM. In this both DIAC and TRIAC techniques are used. The problem is that it does not support no.of water levels and uses pervious techniques.

G. Meena Kumari et al. (2014), This approach is proposed by wireless technology sensor networks where it is used for controlling and monitoring remotely anywhere from the world. It is used monitor and control the greenhouse parameters in agriculture field. In this approach the bus concept and data transfer which mainly controlled by the hybrid technology which is also a automated system, which be operated both wired and wireless which improves the performance and throughout. The wireless technology which used in this system is Zigbee and it is based on the protocols of IEEE 802.15.4. Here this system is used to monitor the atmospheric conditions. This system can be controlled over online from anywhere. In this system Ethernet is used, which is used for online controlling system, the ethernet protocols are under IEEE 802.3. A process is implemented which is used to save the water, the process name Partial Root Zone Drying process. It can be controlled over Controlled Area Network (CAN) and Hybrid networks. The system uses traditional communication system. In future studies this system can be used with optical communication system with wave length routing network. There can be done many implementations in future.

Nikhil Agrawal et al. (2015), here as we can see the researcher and developer came with an idea using home automation system readymade, high performance, low cost components like raspberry pi, Arduino microcontrollers, Xbee modules and relay boards. These components makes the work with less effort and more efficient and a robust system to sustain in the wild environment where we can have the perfect or approximate results/values. In the drip irrigation process the water and the pesticides makes the much use of these things according to the necessity. The flavor of Freedomia of arduino board is used for this specific design. To start of process which is Drip irrigation the application software which is created and developed will send the confirmation email to the particular persons account so that he/she can access through that account. Here comes the major disadvantage of the system is that it cannot be used in the major landforms/fields & we need to examine the every part which is connected to the board because it

doesn't intimate the failure of the product whether its in use or not working. We physically has to go and check the products working sometimes.

HemlataChanne1 et al. (2015), she is also the researcher and analyser she states that disadvantage for this project is that system gives the approximate values but it does not show the exact results/value & the major point is the soil nutrition sensor product is missing from the project. As it is connected to the IoT(Internet Of Things) we can add use every product which is available and necessary for the project on the basis of environment and soil purpose. Every sensor works on it on and sends the data the data to cloud and cloud data analyses and will be show in the mobile application and according to the necessity we give commands to the board on demand this is how the progress goes on she stated according to the analyses.

Keerthana B 1, Nivetha P 2, Mathivathani M 3 states that IOT based agriculture system is very important to the farmers which avoids the interaction of human in the crop field so that we can get good quality and quantity of crop at low cost and efficient way of working.

M.Vinoth, G.Vithiya Farm Field Monitoring And Irrigation Automation Using IoT International Journal of Engineering &Technology, vol.7. explains us that there is every need of sensor in this project where we can monitor each and every element of the irrigation and agriculture part. This makes the use every sensor useful in many ways and can be monitored wirelessly and anywhere of the world.

Human Jamal, AbhilshaLal, ShashankSingh,R. SaiSwaplin,ShamimBano, ShailendraSingh, these researchers tells us about the auto irrigation system using IOT which the wastage of water is avoided and the crop gets the water according to the need where the information of soil moisture Is gather and analysed and the instructions takes place. This every work is doen in smartphone with the need of soil moisture sensor.

G. Sushanth a researcher states that's the novel smart system monitoring of farming is more important with all the necessary sensors and there part of work. And also he says that the connectivity is much more important which we as users need to monitor it at any time and from anywhere. And also we can detect the animals moving around and detect in time before destroying the crops through the help of sensors.

Divya J., Divya M.,Janani V states that the agriculture is the profession which makes the India great and famous country in the world of modern technology. They stated that the main pur-pose of this project is embedded-based soil monitoring and irrigation system where there is no need of visiting or staying in the field for much more hours were the work in done at sitting in the home and monitoring about the commands given to the sensors and make the rules either manual or automatic.

H.G.C.R. Laksiri, H.A.C. Dharmagunawardhana, J.V. Wijayakulasooriya Development of an effective IoT-based smart irrigation system is also a crucial demand for farmers in the field of agriculture. This research develops a low-cost, weather-based smart watering system. To begin, an effective drip irrigation system must be devised that can automatically The researchers H.G.C.R. Laksiri, H.A.C. Dharmagunawardhana, J.V. Wijayakulasooriya states that the Development of an effective IoT-based smart irrigation system is much more important in the field of smart agriculture system. As every sensor must be provided and monitored and work must be done according to the need. And also these must be done in the low cost and efficient way of controlling the conditions either manually or automatically in the dependency of the user. And the main thing in developing is weather-based smart watering system.

These researchers Anushree Math, Layak Ali, Pruthviraj U states that the India represents agriculture and plays a vital role in the world. And they believe that water which makes the crop in perfection of art. So we use the Raspberry pi camera for monitoring the crop where no excess or lack of water will reach to the crop how is needed is only sent and we can have the very good output. This data is read and analised in the website which we use and there are automatic and manually controlled plant watering system. These group of researchers so called as Dweepayan Mishra, Arzeena Khan, Rajeev Tiwari, Shuchi Upadhaye, have proposed the terrain- specific programmable water system, which is very needed for the farmers who lives in terrain type of lands. Here the arduino kit is needed and the sensors which shows uses of it and water and other instructions are done according to the necessary actions were the work is done according to the analysis of the data.

As we can see 2 researchers called Aman jain and Abhay kumar they proposed a new element in the utilization of IOT and they also added the image processing in which these things represents the mineral composition the effects the crop increment. They also proposed the controlling level of water level in the farming field and also represents the measurement of temperature and humidity . Here the researcher Dr V. Nagaveni talks and explains us about the greenhouse monitoring system based on Zigbee connectivity which is being replaced by the many other connections like Arduino uno and etc., and took the control nodes from CC2530F256 as the main important component which controls the environment data. This ZigBee consists of the terminal node which analysis's of temperature from the temperature sensor and sends the data to user at the same time called real-time processing, and from the terminal node the data is sent to intermediate node reads the data , and after that the data is sent to PC through the serial port. Here comes the interesting part which the process is done behind and we can watch everything on time even the process is running behind that's why we choose Zigbee.

The researcher Adithya vadapalli have proposed different modalities for the farming field which needs the use of modern technology where we can check and make the field/land wet by the drip irrigation process were the motor gets the commands from the user and sends the water through the pipeline provided in the field/land. Which we call this process water level management. This is being done by the Bluetooth model for receiving and sending the data were we have some limits which we need the limited range and the device should be accommodated.

These researchers called Anand Nayyar and Er. Vikram puri has the crucial role in the object and aim of this paper which explains why they have to call the Novel smart IOT based Agriculture assisting farmers in getting the live from of data from the sensors which are fixed for their exclusive use.

As called efficient environment monitoring which makes the farmers easy and also lazy of their work because physical damage to the body is more than anything to them as they do their work without watching the weather may be its rainy, sunny, cloudy etc., this things enables the word smart farming and also increases the product quality. Talking of the farmers in India our country is known as the mother which produces maximum amount of food in the world but the farmers in India are struggling and getting suicides as we can see in newspapers and internet which is very sad.

III. PROBLEM STATEMENT

In India agriculture sector is shrinking day by day which disturbs the ecosystem’s production capacity. There is a burning requirement to resolve this problem to resolve this problem in the area to reestablish vitality and place it back on higher progression.

Internet of Things technology can diminish some of the problems of Indian farmers. So, we need to store data (information regarding agriculture and there framing information). It helps for resolving agriculture issues. By further analysis.

Weather is also a key part for agriculture using IOT device we can able to monitor weather details. This is the project from the motivation of the farmers working in the farm lands are solely dependent on the rains and bore wells for irrigation of their land. In recent times, the farmers have been using irrigation technique through the manual control in which the farmers irrigate the land at regular intervals by turning the water-pump ON/OFF when required. And can able to monitor the soil moisture value and weather information using mobile application anywhere.

IV. EXISISTING SYSTEM

Smart agriculture system which is based on IOT, in existing model Arduino uno board which is a basic model and other sensors which are used for to collect soil moisture, humidity and temperature and displayed on led which is delay process. This system also gives accurate values of soil moisture, humidity and temperature, this system has less priority to recommend to the farmers. This system needs more components to connect to the cloud which is high cost, so it is not recommended to farmers.

In existing methodology Arduino uno and nano boards are used and separately WIFI and BLUETOOTH modules are used which cost high. By using esp32 which comes with inbuilt WIFI and BLUETOOTH and cost less than Arduino uno will be better option for the project. And connections will be less and easy to configure esp32 other board which is similar to the esp32 is esp8266 which comes only WIFI which costs same.

V. PROPOSED SYSTEM

This project presents proposed model for Smart farming Monitoring System to develop real time monitoring system for soil properties like Temperature, Humidity and moisture, crop yield identification using Monitoring applications. It will also be possible to control various operations of the field remotely from anywhere, anytime by mobile application. The IOT based agricultural monitoring system has been used to maximize the yield of crop by monitoring the environmental parameters and thus providing the required information to farmer remotely. This system can be implemented in any type of agricultural field with varying soils. The use of IOT over the other technology one aides for deploying it in any type of environment for monitoring, making it flexible and the proposed system is developed for the goodwill of farmers. The system greatly reduces the human interaction, labor cost and wastage of water.

In Proposed Method Realtime database is used where the Realtime values are stored and updated faster. Here we used firebase database which is a free database which comes with 5gb of cloud storage which is fast and easy to implement. The sensors which are used in existing and proposed are same

METHOD	EXISTING	PROPOSED
CONNECTIVITY	USB PORT	WIFI, USB, BLUETOOTH.
COMPONENTS	SOIL MOISTURE, DTH 11.	SOIL MOISTURE, DTH 11, WATER PUMP
OUTPUT	LCD DISPLAY	ANDROID APPILCATION FIREBASE (CLOUD)
DATA BASE	ARDUINO UNO MEMORY	CLOUD MEMORY

VI. IMPLEMENTATION

Here we are using ESP32 Arduino board which comes with Bluetooth and WIFI module inbuilt module. It has 34 GPIO pins. Soil Moisture sensor, DHT11 Sensor, Water flow sensor are used in this project. In this project Firebase Realtime database is used where all the sensor values are stored. Using android application, the values can be viewed.

Soil Moisture Sensor is used for detecting the moisture level in the soil, because in agriculture water is important so, it is need to maintain minimum water level in the soil. The soil moisture sensor has two terminals, the fork-shaped probe with two exposed conductors, acts as a variable resistor (just like a potentiometer) whose resistance varies according to the water content in the soil. This resistance is inversely proportional to the soil moisture. So, it is mandatory to monitor the water levels. The Soil Moisture Sensor which is connected to the ESP32 Module, when the sensor reads the values the ESP32 module send the values to the cloud.

DHT-11 Sensor which reads the values of Temperature and Humidity on Atmosphere, which is directly connected to the esp32 board where humidity also plays a minor role, we can be able to predict the weather, it helps farmer in many ways. The values of Temperature and Humidity send to the cloud and displayed on the mobile application.

In this project we used ultra-sonic sensor in place of floating sensor due to unavailability. Ultra-Sonic Sensor which is used to find the distance between objects. In this project the ultra-sonic sensor is used to find the water level as it used as an alternative method because of water floating sensor is not available at the time. The data which is uploaded to the cloud using WIFI. As we place the ultra-sonic on the top of the tank it measures the water distance, if the water is low then the distance is high, if the distance is low then water level is high. It is just for a temporary purpose which is not a permanent solution.

Here we used firebase database for Realtime monitoring and uploading the data. All values can be viewed in mobile application which shows live values from the sensors the values will refresh and new values will display every five seconds. android application which is connected to the firebase has authentication page where user need to login to the application to view the values and operate the motor.

VII. CONCLUSION AND FUTURE SCOPE

Using IoT in agriculture which makes safe and secure production, by using automated systems can be able to reduce human power so the managing cost will reduce. By the information gathered by the sensors can be able to predict the land properties. There are several sensors which actually help in agriculture. Main reason to recommend this project the farmers can remotely control the motor and can view the values from anywhere from the world so it is useful to the farmer in many ways.

We can upgrade the module using adding GSM module and water flow sensor. Using GSM module, we can operate device without WIFI anywhere.

The main advantage of the implemented system is the data can be viewed from anywhere of the world because it is cloud-based data.

REFERENCES

- [1] BezaNegashGetu, Hussain A. Attia, "Automatic Control of Agricultural Pumps Based on Soil Moisture Sensing", IEEE conference publication, 2015.
- [2] Hemlata Channe 1, Sukhesh Kothari², Dipali Kadam³, "Multidisciplinary Model for Smart Agriculture using Internet-of-Things (IoT), Sensors, Cloud-Computing, Mobile-Computing & Big-Data Analysis", International Journal of Int.J.Computer Technology & Applications, Vol 6 ,May-June 2015.
- [3] Joaquin Gutierrez, Juan Francisco Villa-Medina, Alejandra Nieto-Garibay and Miguel AngelPorta Gandara, "Automated Irrigation System Using a Wireless Sensor Network and GPRS Module", IEEE Transaction on Instrumentation and Measurement, Vol.63, No.1, January 2014.
- [4] MeenaKumari G, Dr. V .Vidya Devi, "Real- Time Automation and Monitoring System for Modernized Agriculture", International Journal of Review and Research in Applied Sciences and Engineering (IJRRASE) Vol3 No.1. PP 7-12 March 2013.
- [5] Nikhil Agrawal, SmitaSinghal, "SmartDrip Irrigation System using Raspberry pi and Arduino", International Conference on Computing, Communication and Automation (ICCCA2015).
- [6] Patil K. A, N. R. Kale, " A Model for Smart Agriculture Using IoT", International Conference on Global Trends in Signal Processing, Information Computing and Communication, IEEE 2016.
- [7] N.Shakthipriya, "An Effective Method for Crop Monitoring Using Wireless Sensor Network", Middle East Journal of Scientific Research 20
- [8] Keerthana B 1, Nivetha P 2, Mathivathani M 3, " Smart Security and Monitoring Devices for agriculture". International Journal Vol 4 Issue 2
- [9] M.Vinoth, G.Vithiya "Farm Field Monitoring And Irrigation Automation Using IoT" International Journal of Engineering & Technology, vol.7, no. 2.26, 2018.
- [10] Human Jamal, AbhilshaLal, ShashankSingh, R. SaiSwaplin, ShamimBano, ShailendraSingh, "IoT Based Auto Irrigation System Using Soil Moisture Sensor", IJSRCSEIT, vol.2, no.3, 2017.
- [11] G. Sushanth¹, and S. Sujatha, "IOT Based Smart Agriculture System" 2018.
- [12] Divya J., Divya M., Janani V. "IoT based Smart Soil Monitoring System for Agricultural Production" 2017.
- [13] H.G.C.R.Laksiri, H.A.C.Dharmagunawardhana, J.V.Wijayakulasooriya "Design and Optimization of IoT Based Smart Irrigation System in Sri Lanka" 2019.
- [14] Anushree Math, Layak Ali, Pruthviraj U "Development of Smart Drip Irrigation System Using IoT" 2018.
- [15] Dweepeyan Mishra¹, Arzeena Khan², Rajeev Tiwari³, Shuchi Upadhyay, "Automated Irrigation System-IoT Based Approach", 2018.

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