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An IoT Enabled Green Farming using Image Processing.

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Abstract:
From the very beginning, agriculture contributes a major portion to our national income. In India over two-third of our population are engaged directly and also depend for their livelihood on agriculture. Current agricultural practices are economically and environmentally not sustainable and results in low productivity. This paper presents a new solution to plant automatically and monitors remotely using computer technologies. Firstly, the model describes the model of plantation in depth. Then the CPU plays a major role to manage irrigation and the whole system. The sensors like soil moisture sensors are implemented to measure the water content in soil and thereby used to estimate how much irrigation is required. Further all the plantation is supervised by cameras and images are uploaded to cloud frequently. Then these images are processed to analyze the process of development of crop. Therefore using IoT and Image processing technologies, the model estimates the best harvesting time and assures the mass foodproduction.

Keywords*— Internet of Things, Image Processing, Android.*

I. INTRODUCTION

Agriculture is the major sector of Indian economy .India is the world's largest producer of rice, wheat, spices and pulses etc. India is emerged as the second largest producer of vegetables and fruits in the world. It contributes 22% to the Gross domestic product(GDP).There are many industries which mainly depends on agriculture like textile industry ,small and cottage industries, handloom, oil industries ,rice mills etc. for their raw material. Hence development of agriculture is very much important in country'swelfare.For a long time agriculture remained under developed. Indian citizens are facing food scarcity problem and many grains are imported from other countries. Also rain water is the only source for irrigation. But the things are changed now, use of new technology and equipment replaced almost all the traditional method of framing .Now India is producing self-sufficient food-grains .Also, now it is in position to export agricultural products to other countries.

There are many problems which farmers face during the agriculture process, which indeed causes the decrease in the Indian economy. This leads to the main cause for depletion of soil which results in their low productivity. This is a harsh problem

May – June 2020
ISSN: 0193-4120 Page No. 142 - 146

which needs to be solved, this can be done by using more organic manures and fertilizers. Irrigation is the most important agricultural input in a tropical monsoon country like India where rainfall is uncertain India cannot achieve viable progress in agriculture unless and until more than half of the cropped area is brought under some convinced methods of irrigation. These are the some of the problems which effect the agribusiness.

In agriculture sector there is a vast enhancement of different tools and techniques and technologies. To reduce time, cost and human involvement and also to improve the productivity, efficiency and market, IoT is used. IoT includes lot of sensors, network components, software's and other electronic devices. Because of features like faster access, efficient communication, minimum human efforts, efficient communication IoT is more efficient. Using IoT farmers get huge information and knowledge about recent trends and technology. To increase productivity and to minimize the barriers in fields of agriculture, the new technique called IoT is used. Using IoT water management can be done efficiently. Crop management and soil management can also be done easily. IoT reduces manual work, reduce work, reduce time and make farming more efficient by continuous monitoring ofland.

Image processing is another technique used in this paper. Image processing is a form of processing the signal which takes the image or video or series of images as input and produces an image or parameter related to image as output. Image processing has applications in agriculture such as detection of weed, fruit grading, and imaging techniques, detection of diseased leaf, stem, and fruit and so on. Majority time's expert availability and their services may consume more time and may not be easily affordable. In order to overcome this problem Image processing is used.

Nowadays Machine learning is another trending technology which can be used in modern agriculture industry. More healthy seeds can be created by using machine learning in agriculture. The agriculture can benefit from machine learning at every stage of species management, water management, field condition management, crop management, detection of weed, detection of disease and so on. Machine learning plays a major role in automated irrigation systems which are used to continuously maintain the soil conditions to increase the yield. Humidity and temperature in artificially conditioned greenhouses can be regulated using artificial neural networks and fuzzy logiccontrollers.

II. Literature Survey

During the old days, farmers used to determine the yield on the basis of soil ripeness and the suspects which influence the soil. IoT also assists in finding facts on states like climate, humidity, irrigation, level of water, good yield and horticulture .Using IoT farmers have benefits such that they can operate on the farms from their residence whenever and at a whatever point. To watch these conditions as picture and video, remote cameras have been used. By using IoT it reduces the price and update the productivity of standard developing. In this paper, the Agriculture framework are using an IoT technology and system availability that ensembles these objects and helps in deal the information. This paper comes with a solution of improving the soil efficiency. This comes with the nature of harvest and giving recommendations. IoT advances on the situation like atmosphere, temperature, and soil productivity, harvesting and cultivation. Remote sensors frameworks are used for checking the farm conditions here and when needed. An advantage of using IoT in smart farming is that all data can be collected with the help of installed sensors. Such data like weather condition. Data is stored in one place, and farmers can easily check it and analyze to make it right decision. And when the farmers collect all the updated information, they can analyze the situation in the future so for this they can predict the problems that arise and can correct this by using the data to improve their sales and business processes. Disadvantages of using IoT in smart farming are that every soil type needs to be calibrated. So, it may

May – June 2020
ISSN: 0193-4120 Page No. 142 - 146

take a lot of time to analyse the things and it may even cost more. Another disadvantage is that the smart agriculture needs availability of internet on daily basis. Rural part of the country does not fill this requirement. Moreover internet is slow.

In order to send or store data retrieved from sensors, before HTTP was used for data communication. But, In IoT technology based communication large amount of tiny packet has to be sent .This creates overhead while using HTTP. So, In order to overcome this problem MQTT protocol isused and it also increases efficiency. For communication with server, asymmetric communication is needed because IoT technology is distributed in every device. Publish and Subscribe are the two messages supported by MQTT . With the help of Publish message, we send data to server where message will be received by Subscribe message . Advantages of MQTT are it requires less code footprint, network bandwidth will be less, response time will be more, less power requirement. In order to examine data, There is an app called Blynk app which helps us in controlling hardware and monitor its activities from anywhere. It can display sensor data and it can also store data .The disadvantage is that we need to install Blynk app and we have to deploy our project into this app. We will not be having our own application .There is no proper documentation facility in Blynk app, we cannot make own widgets.

The production of crops is influenced by different seasons, biological patterns and market. By using the knowledge of soil types, pressure, crop type and weather, this factor can be minimized. By using useful dataset, the weather and crop types can be predicted. In order to predict crop yield certain algorithms are developed. This paper focuses on crop yield prediction, there by achieving smart farming. The advancements like Big Data, cloud based administrations, GPS and machine learning is picking up pace in agribusiness business. The study presented in this paper introduces to smart farming, cheap, practical and easy to develop task and these tasks are used to increase productivity of agricultural products. In this machine learning project they have used two main types namely datasets and algorithms. Many issues of agriculture can be solved using the combination of smart irrigation and control to machine learning algorithms. The main advantages of this paper are it can be implemented on a large scale in future and also very adaptable in terms of expansion. Some new technologies have been used in this paper since the population is growing rapidly and many new technologies are emerging during the years. The disadvantage concerned with this paper is it is not connected to mobile application. Hence farmer cannot monitor the crops from distance. This project can be more implemented and can be connect to the mobile application so that farmer can do the work when they are not present in theirhome.

The important factors that affects crop yield are climate, soil fertility, availability of water , growth of a plant, chlorophyll content and disease or pests. These factors can pose a major risk to crop yield when they are not managed and monitored properly. This paper focuses on the measurement of growth or height of the crop at periodic interval using image processing technique by capturing the crop image using digital camera .A field server is installed in the field which consists of camera set up with sensors, communication and control unit which captures the crop image at periodic interval during a day. A marker pole is also installed in the focus area of camera so that all the captured images must include the marker pole which is considered as a reference level for crop height measurement. These images are then converted into R,G,B components and then computes three more components referred as excess red, green and blue for proper vision of marker pole with that crop. Followed by filtering and simple segmentation. Lastly, the height is measured.

III. Proposedwork

The proposed work introduces green farming using IoT and image processing. For experimental purpose we develop a testbed where we sow seeds especially methi seeds. Testbed will be equipped with soil moisture sensor and raspberry pi camera module. A

May – June 2020
ISSN: 0193-4120 Page No. 142 - 146

soil moisture sensor is used for sensing soil moisture content i.e. to know whether the soil is wet or dry. This signal is sent as input to the automatic irrigation module. Based on the data collected by the sensor, the motor will run and supplies water to the Testbed if the soil is dry and vice versa. In camera module, we capture image of process of development of methi seeds with the help of raspberry pi camera module. So captured image will be stored in our local file system. Captured image stored in file system will be uploaded to firebase. MQTT protocol is used for data communication between local file system and cloud. A marker pole is also installed in the focus area of camera so that all the captured images must include the marker pole which is considered as a reference level for crop height measurement. These images are then processed by converting them into R,G,B components and then computes three more components referred as excess red, green and blue for proper vision of marker pole with that crop followed by filtering and simple segmentation.Then the height is measured. Result obtained by the above mentioned method will be conveyed through an android app which is user friendly and notification will be sent i.e., the time of harvest which provides maximum will be displayed on android app along with the capturedimage.

In order to achieve expected output, whole process is divided into 3 modules camera module, Irrigation module and android app module.

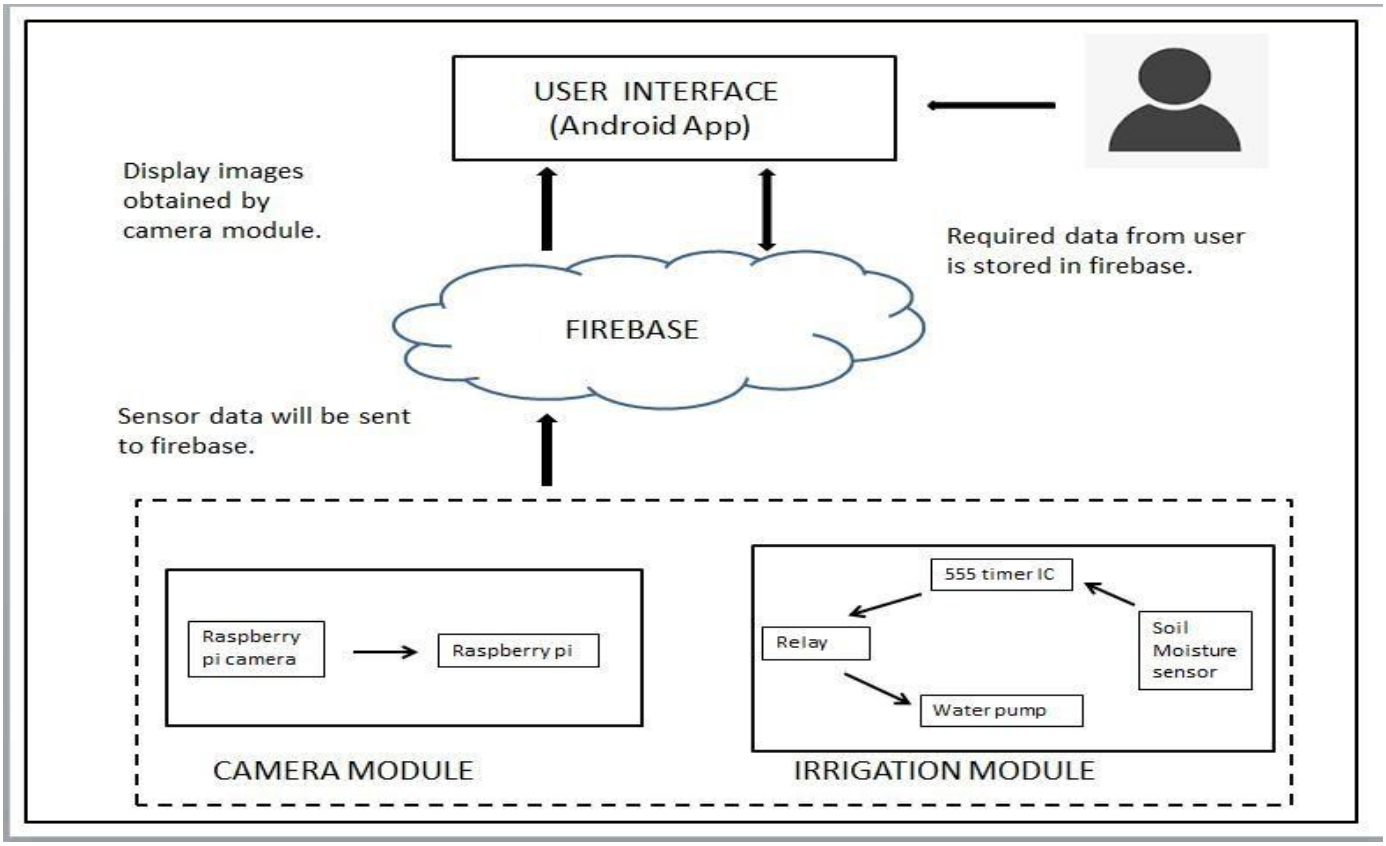

Figure 1: Architecture of a proposed system

In Irrigation module, Moisture sensor, 555 timer IC, Relay are integrated to provide automatic irrigation facility .Circuit connections are shown in figure 2. In this module, 555 timer IC is used as an inverter, Relay is used as switch whenever sensor senses moisture in the soil. Digital output of sensor will be HIGH, since sensor, is connected to IC, output of the IC will be LOW. So current doesn't passes through load that is pump . As a result of this, motor stops

TEST Engineering & Management

May – June 2020
ISSN: 0193-4120 Page No. 142 - 146

running and water flow stops and vice versa if there is no moisture content in soil.

In Camera module, Image of the farm will be captured by Raspberry pi camera module and same will be stored in firebase(pyrebase usingpython).

In android app module , necessary data like temperature, soil humidity, Ammonia content in soil will be tested(Nitrogen, Phosphorus, Potassium) taken by the user . Images taken periodically will be displayed and Notification will be sent to the user regarding harvesting time for particular crop.

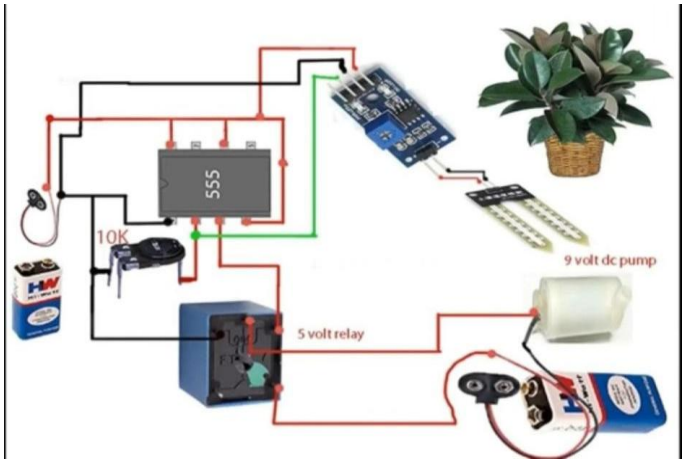

Figure 2: Circuit connections for Irrigation module.

IV. Expectedresults

In the proposed system, we are going to display the results on the app. Because it is very easy to use as it does not need more experience or training. The user will login to the app and he can upload images manually or the camera captures images and it is processed in the cloud. After processing the time of harvest is displayed to the user. Also the information like water content of the soil, temperature and humidity are collected from the sensors are displayed to user so the sensing system helps to monitor and manage environmental condition of the field in which the crops are growing. As by monitoring and comparing the collected values with the standard environmental requirements the system will be able to predict the best harvesting time which gives high profit to user. The smart irrigation system allow the user to use the water resource more efficiently compared to traditional methods .Also user is able to control sensors, cameras, water pump and able monitor the farm from anyplace. The system eliminates the labor cost as it isautomated.

V. Conclusion

Therefore, the paper provides a vision for considering the more recent face in the agriculture field to make use of the recent techniques for water supply and to find the best harvesting time which makes it easy and beneficial. The point of pursuitin irrigation is to save the water and not wasting it unnecessarily. The MQTT protocol is also described in this paper. The paper focuses on MQTT protocol because it has more advantages when compared to HTTP in IoT. In fact, the paper focuses on a surpassedIoT system using MQTT to obtain greater efficiency. The project can be implemented on a large scale in future. As the population is growing widely and many new technologies are coming forward, it is important that the agriculture sector should welcome this. This helps in great innovation in the field of agriculture so that it is easy for the farmers and the cominggenerations.

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