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Iot Based Multiple Crop Cultivation System Using Open CV

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***Abstract* – Purpose of this project to monitor the growth of multiple crops in the farm as well as providing the water to the particular crop as much it is required. It uses two sensors namely Soil Moisture Sensor(YL-69) and humidity and temperature sensor(DHT11). Soil moisture sensor it sense moisture of soil and DHT11 senses the humidity and temperature. By providing all these information it provides water to the plant. Apart from these image is captured through the pi-camera by which we compared the growth of plant by camera to the data saved on server. For daily water supply if there is rain outside then water is already absorbed by soil then water requirement of plant is change, then according to the need we provide the water to plant. The data of previous water supplied to the plant is stored on server also requirement of water for crop is determined through the information recorded on the server.**

***Keywords*- Raspberry pi-3, Soil Moisture Sensor (YL-69), Humidity and Temperature Sensor (DHT-11), Pi-camera, Motor for watering**

I. INTRODUCTION

Farming in India is done using various ways. The fact that most of the farmers lack proper knowledge makes it even erratic. A large portion of farming and agricultural activities are based on predictions, which at times fail. Farmers have to bear huge losses. Since we know that proper soil moisture and its quality, humidity and air quality, the growth of crops cannot be ignored for proper cultivation of the crop. Mostly in the farming the continuous observation and care is very important part.

For the large portion of farming area and for the multiple crops it is difficult to observe the each and every crop for its growth and daily water requirement its soil structure and other farming factors so the sensors will do this work automatically by taking information from sensor and compares it by the data on the server.

Using the pi camera and IOT platform the data is saved on the server which provides the information about the each parameters like soil moisture, humidity and temperature, water requirement of the crop according to its requirement. Image processing is also main part of this project which discards the old frame structure of the IOT and gives the output in presentable graphs and pie charts. This image processing is done on the image which captured by the pi camera.

II.LITERATURE SURVEY

Previously lots of researches are done in the area of Crop Monitoring System. They all follow various technologies for Crop Monitoring System. The main purpose of a survey is to study existing data and implement new technologies in the industry. Some are the papers mentioned below.

Kavitha B. C, Shilpa D. P, Thanushree K. S, Swathi A. M, Ranjitha M. K. this paper describes the IOT technology helps in collecting information about conditions like weather, moisture, temperature and fertility of soil, Crop online monitoring enables detection of weed, level of water, pest detection, and animal intrusion in to the field, crop growth, and agriculture.Wireless sensor networks are used for monitoring the farm conditions and micro controllers are used to control and automate the farm processes. 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.

G. Naveen Balaji, V. Nandhini, S. Mithra, N. Priya, R. Naveena this paper describes that in order to improve the crop productivity efficiently, it is necessary to monitor the environmental conditions in and around the field. The parameters that haveto be properly monitored to enhance the yield are soil characteristics, weather conditions, moisture, temperature, etc. Internet of Things (IOT) is

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being used in several real time applications. Theintroduction of IOT along with the sensor network in agriculture refurbishes the traditional way of farming. Online crop monitoring using IOT helps the farmers to stay connected to his field from anywhere and anytime. Various sensors are used to monitor and collect information about the field conditions. Collectively the about the farm condition is sent to the farmer through GSM technology.

Rajendra Akhil Kumar, Gone Sri Vaishnavi, Pilli Sathavardhana Rao, Diwakar. R. Marur this paper presents the trending and future technologies like IOT, digital image processing alongside sensor networks has demonstrated their evitable accomplishment in different applications individually, but the combination of these is so far non-existent. The idea of work manages combining these advancements in agricultural sector which requires present day mechanical impressions. The principle objective required for product development (crop) is information that is the data about the climatic, soil and water conditions.

All the information about the dynamic ecological conditions is detected utilizing wireless sensors. While the monitoring of the field is done by capturing the crop at regular intervals using camera these pictures undergo image processing to perform histogram analysis in the MATLAB software. Results of above processes are shared using IOT to Client through Cloud.

Mrs. T. Vineela, J. NagaHarini, Ch. Kiranmai, G. Harshitha, B. AdiLakshmi this paper describes IOT is a shared Network of objects where these objects interact through Internet. One of the important applications of IOT is Smart Agriculture. Smart Agriculture reduces wastage of water, fertilizers and increases the crop yield. Here a system is proposed to monitor crop-field using sensors for soil moisture, humidity and temperature. By monitoring these parameters the irrigation system can be automated if soil moisture is low.

III. PROPOSED SYSTEM

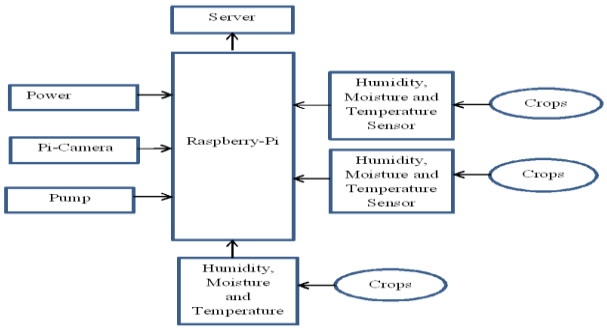

Fig. 1 Main Block Diagram.

The architectural design to IOT based crop cultivation system is shown in figure above. In this implementation model we used Raspberry-pi board, humidity sensor (DHT11), temperature sensor (LM35), soil moisture sensor (YL 69), Node MCU. Our multiple crop system is new way of automated farming system developed by using IOT infrastructure. The system connected through the three main components that are monitoring sensor, controlling raspberry pi and gateway IOT sensor. All sensors and controllers are connected with the IOT gateways in turn connected with the IOT service platform. End users (i.e., farmers) can interact with the connected farm for monitoring its environmental conditions or triggering some farming utilities.

The overall operational procedure is as follows. First, each device (i.e., sensors and controllers) deployed in the connected farm are registered on IOT platform. Once the all sensors are registered successfully then the data is started receiving from the sensors and images are captured through pi camera which is displayed on the webpage which is created. Each sensor uploads the data collected from its surrounding environment to the server at a certain interval of time.

1. Working

In this crop cultivation system the main part is controlling the moisture in soil by providing appropriate water according to the temperature and humidity present in the air .This all done through the sensor which is connected to the processor Raspberry-pi.It requires the power supply of 5v which is provide through the desktop.

On this desktop or screen all the data is stored through the software and compared weekly. According the data uploaded on the server analysis is done and then amount of water is decided required for the different crops. Server stored all the data of how much amount of water is used in past seven days in tabular form with raining records.pi-camera is used for the capturing the picture of different crops and identify crops status through the picture whether it is tomato crop,chilli or Rose plant.

2.Flow Chart

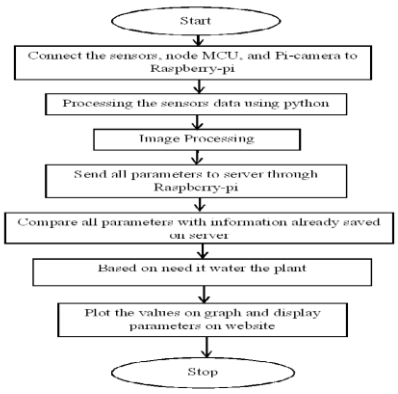

Fig. 2 Flow Chart .

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3. Hardware Used

3.1 Raspberry Pi

The Raspberry pi is a series of small single – board computers developed in the United Kingdom by the Raspberry Pi Foundation to promote teaching of basic computer science in school and developing countries. Processor speed ranges from 700 MHz to 1.4 GHz for the Pi 3 model B+ or 1.5 GHz for the Pi 4; on board memory ranges from 256 MB to 1 GB with up to 4 GB available on the Pi 4 Random –Access Memory (RAM). The board has one to five USB ports for video output, HDMI and composite video are supported with a standard 3.5 mm tip-ring-sleeve jack for audio output the first generation was released in Feb. 2012. The Broadcom BCM2835 SOC used in the first generation Raspberry Pi includes a 700 MHz ARM1176JZF-S processor, Video Core IV graphics processing unit (GPU) and RAM.

3.2 Humidity and Temperature sensor (DHT-11)

This DHT11 Temperature and Humidity Sensor features a calibrated digital signal output with the temperature and humidity sensor capability. It is integrated with a high-performance 8-bit microcontroller. Its technology ensures the high reliability and excellent long-term stability. This sensor includes a resistive element and a sensor for wet NTC temperature measuring devices. It has excellent quality, fast response, anti-interference ability and high performance.

The temperature and humidity sensor (DHT11) consists of positive, output and negative pins. The positive pin of DHT 11 is connected to the 5V power supply of Raspberry pi. The output pin of DHT 11 is connected to the digital output GPIO4 of Raspberry pi. The negative pin of DHT 11 is connected to the GND pin of Raspberry pi.

3.3 Soil /moisture Sensor (YL-69)

A soil moisture sensor can read the amount of moisture present in the soil surrounding it. It's a low tech sensor, but ideal for monitoring an urban garden, or your pet plant's water level. This is a must have tool for a connected garden! This sensor uses the two probes to pass current through the soil, and then it reads that resistance to get the moisture level. More water makes the soil conduct electricity more easily (less resistance), while dry soil conducts electricity poorly (more resistance).

3.4 Pi Camera

The Pi Camera is connected to the Raspberry Pi. It is used to capture the images of crops. This Raspberry Pi Camera module can be used to take high-definition video, as well as stills photographs. The camera consists of a small (25mm by 20mm by 9mm) circuit board, which connect to the Raspberry Pi's Camera Serial Interface (CSI) bus connector via a flexible ribbon cable. The camera's image sensor has a native resolution of five megapixels and has a fixed focus lens. The software for the camera supports full resolution still images up to 1080p30, 720p60 and 64x480p60/90.

4. Software Used

4.1 Python

Python is an interpreter, object oriented, high level programming language with dynamic semantics. Its high-level built in data structures, combined with dynamic typing and dynamic binding; make it very attractive for Rapid Application Development, as well as for use as a scripting or glue language to connect existing components together. Python's simple, easy to learn syntax emphasizes readability and therefore reduces the cost of program maintenance. Python supports modules and packages, which encourages program modularity and code reuse.

4.2 MySQL as database and server

MySQL is a an open source relational database management system (RDBMS).Its name is combination of "My" the name of co-founder Michael widenius daughter and "SQL", the abbreviation for Structured Query Language .MySQL is free and open source software under the terms of GNU General Public License, and is also available under variety of proprietary License. MySQL is a component of the LAMP web application software stack. Which is an acronym for Linux, Apache, MySQL, perl /php/Python? MySQL is used by many database driven web applications including Drupal, Joomal, phpBB, and WordPress.MySQL is also used by many popular websites including Facebook, Flickr, Mediawiki, Twitter and YouTube.

IV. CONCLUSION

Agriculture are gradually being replaced and enhanced by more sophisticated and accurate digital and electronic devices. A high percentage of agriculture revenue is lost to power loss, incorrect methods of practicing. This is reduced by the use of smart sensors. The proposal is to perform the agriculture in smart and more efficient way. In addition this method advocates for the use of Internet of Things. Internet of Things has enabled the agriculture crop monitoring easy and efficient to enhance the productivity of the crop and hence profits for the farmer. Sensors are different types are used to collect the information of crop conditions and environmental changes and this information is transmitted through network to the farmer the initiates corrective actions. Farmers are connected and aware of the conditions of the agricultural field at anytime and anywhere in the world.

V.FUTURE SCOPE

The mobile application is developed in android. The mobile application helps to monitor and control the field from anywhere. The mobile and satellite communication

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applications uses PHP script to fetch data from MySQL database. In MySQL database all the sensor data are stored. The android fetches the data and encode it is JSON format to be displayed in android device. The user interface for the application is designed in a way that enables both the monitoring and control of field from the device. The internet connection should be provided to monitor and control the field.

By further enhancement of this project farmers can bring large areas of land under cultivation. Only the exact amount of fungicide and pesticide can be used. The system can further been improved by incorporating new self-learning techniques which could deployed in the cloud to understand the behaviour of the sensing data and can take autonomous decisions. The other problem farmers are facing is the crop destruction by the wild animals. So the future work include the design of the system that may monitor the farm by installing sensors at the boundary of farm and camera module which may take snapshot once the sensor detects the entrance and transmit the real time pictures by integrating it with other information.

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