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Smart Crop Irrigation System using IOT and Detection of Leaf Diseases

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Abstract – **Agriculture plays an vital role within the development of agricultural country like India, China. That can issues the concerning agriculture are always hindering the event of the country like India. The solution of this problem is sensible agriculture by modernizing the present the traditional methods of agriculture using IoT. Hence the proposed ideas to creating the agriculture smart using automation and IoT to detect the plant leaf diseases using various mobile applications. Internet of Things (IoT) enables the various applications like crop monitoring and selection of irrigation time, irrigation decision support and also uses the fertilizer, analysis and update the data in certain report in thinkspeak ad also detect the leaf diseases etc. A Raspberry Pi is predicated to use the automatic irrigation of IoT system is proposed to modernization and improves production of the crop and growth, which main aim of this proposed crop development on low quantity of water consumption, so we can focus the water available to the plants at the specified time for concern level, to avoid the most of the farmers time within their fields. The management of water should be developed, therefore the system complexity be reduced. The proposed system developed the report which sent from the sensors and estimate the water level needed for the soil to concern on the time. The main target of this work is to implement image analysis & classification techniques for detection of leaf diseases. The two sensors are get the info of the humidity and temperature of the soil, duration the sunshine. The systems support the values and calculate the water quantity for irrigation is required for the crop. The main advantage of the system is implementing of Precision Agriculture (PA) with an cloud computing on thinkspeak, which optimize the water scarcity on during summer. The Raspberry-Pi 3 B model and cloud based IoT system obtain the data from crop field. The system mainly focuses the moisture various correlate with temperature changes data by using smart sensors and controls irrigation systems on the field.**

Keywords – **IoT (Internet of Things), Humidity sensor, moisture sensor, Raspberry pi 3, Cloud computing, Leaf Diseases detection.**

I. INTRODUCTION

The Internet of things (IOT) is mainly remodelling the agriculture which enabling the farmers with the wide selection of entries in the field. IoT technology which helps to collecting the different data's about the conditions like weather condition, soil moisture, and fertility of the soil condition. The best problems are faced by the world is water scarcity and agriculture being a demanding occupation of farmers, where consumes more water within the land. A smart irrigation system estimated and measures the existing plant moisture where works an irrigation system, restoring the water level as we required to minimizing the supply of water use.

II. LITERATURE SURVEY

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In India, agriculture is backbone of our country, where 50% of the population is involved in farming in directly or indirectly. Different sorts of fruits, cereals and vegetables are produced here and exported to other countries like Singapore, Malaysia. In this paper "**IoT based smart crop-field monitoring and automation irrigation system**"

The farmer where provided the water to crops at different time and different quantity. In the irrigation system which observes the moisture sensors and temperature variations on crop area that's gives a data timing of operation. As the Automation which avoids the human errors and check the moisture level

In this paper "**Detection of Leaf Diseases and Classification using Digital Image Processing**"

Image processing techniques are used to detect the leaf diseases in different crops. The main objective of the

paper is detected the leaf images and analysis the classification of the leaf diseases. On this proposed system consists of four major parts. (1) Image pre-processing (2) Segment of the leaf disease using K-means (3) feature extraction of leaves & (4) Classification of diseases.

In this paper "**Smart crop-field monitoring and automation irrigation system using IoT**"

On the real time results and the status of the sensors in the system were taken on the mobile phones. The system where displays the temperature and humidity level of the field based on the soil, from the temperature and humidity level. The status of crop filed can also be monitored by IoT technologies. Two sensors are used to control the soil irrigation system on the trouble shooting can easily done.

Hence it's necessary to supply top quality products with an optimum yield. As diseases of the plants are unavoidable, detection of plant diseases is important within the field of Agriculture.. The viral disease is thanks to environmental changes, fungus disease is thanks to the presence of fungus within the leaf and bacterial disease is thanks to presence of germs in leaf or plants.

The proposed framework are often wont to identify leaf diseases. Automatic detection of plant diseases is a crucial research topic since it's ready to automatically detect the diseases from the symptoms that appear on the plant leaves. Barbedo proposed an automatic method of disease symptoms segmentation in digital photographs of plant leaves, during which colour channel manipulation & binary operation are applied on binary mask of leaf pixels. He proposed the tactic of semi-automatic segmentation of plant plant disease symptoms during which the histograms of the H and color channels are manipulated.

Pang et al proposed the tactic of automatic segmentation of crop leaf spot disease images by integrating local threshold and seeded region growing. Singh and Misra proposed detection of plant leaf diseases using soft computing techniques.

Du & Zhang proposed a way to segment leaf image with non-uniform illumination supported maximum entropy and genetic algorithm (GA).

Dhaygude & Kumbhar proposed agricultural plant plant disease detection using image processing during which the feel statistics are computed from spatial gray-level dependence matrices (SGDM).

III. EXISTING METHOD

Automatic plant irrigation system is regular monitoring without human. The main system uses a hardware, which is subjected to different environmental conditions employing a moisture sensor and humidity and faced problems in the field. Sensors are measuring the soil moisture and soil temperature components are developed and evaluated the scheduling irrigation on the crop field. This technique is majorly restricted the concerned water capacity. Proper scheduling of irrigation is very critical for efficient water to the crop filed, particularly under different conditions of water scarcity. And majorly the leaf diseases can be detected by some image processing technique within manual process, and also to treatment of the leaf disease by manually. Automation of some technique is not properly detected.

Disadvantages:

- Automation identification is low.
- Power consumption More (>12V)
- Temperature is high

IV. PROPOSED TECHNOLOGY

This proposed idea, helps the farmer for providing the water to the crops. On the analysis of the rate of moisture level and humidity level will be in the data report converted to excel sheet with Thingspeak data sheet.. It avoids the human errors. It will exhibit with the smart technology. The full hardware circuit is very low complexity level, showing the connections for the monitoring. Leaf diseases can be identified with image processing technique on the mobile application. Automatically control the system using webpage. Leaf disease identification with image processing technique by using K-Means algorithm, then classification done using SVM shown in figure 1.

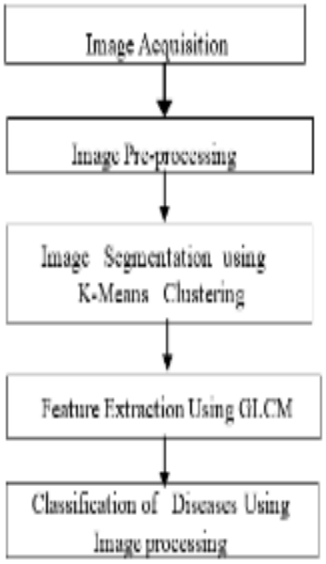

Fig.1. Overview of the proposed Method.

Advantages:

- Easy irrigation
- Suitable for fertilizing system
- low consuming of water
- Under conditions of water scarcity

Block Diagram:

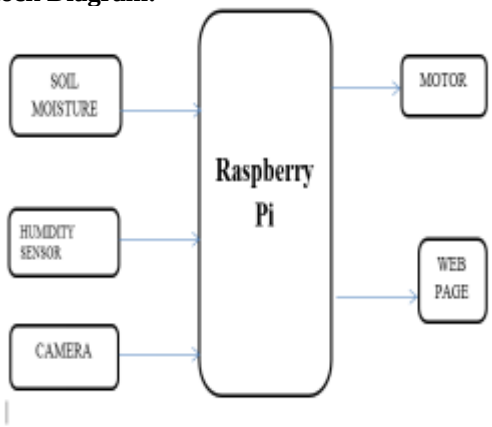

Fig.2. Block diagram.

V. HARDWARE DESCRIPTION:

1. Raspberry PI 3 - Model

The Raspberry Pi 3 is an upgrade ARMv7 multi core processor and Single core processor, Gigabytes of the RAM, it can be able to move from being a 'toy computer' to a real desktop-PC requirement. The fig 3 shows the circuit board of raspberry Pi 3 Model B. Fig 3 shown big upgrade is a move from the BCM2836 (ARMv6) to BCM2837 (ARMv7). The Processor speed of the Raspberry increase 2times of the time is equal to multi core processors. By efficiently using the architecture of Raspberry the speed may increases from 4 to 7.5 times on quad core.

The Raspberry Pi 3 will be run the all other daughter boards at 99 % efficiency. Pi 3 model B is quad core 64-bit CPU and on- the board have an the Wi-Fi and Bluetooth connections. The RAM is 1GB and there's no change of the USB and Ethernet ports on the board. However, the upgraded power system should mean the Pi 3 Model B can make use of power-hungry USB devices on the board.

Fig.3. Raspberry pi 3 model B.

2. Software Used

Python is widely used programming languages in the world. For the Raspberry pi 3 Model B also used the python programming. The main advantage of python programmer can be writing the low number of codes that can be used for programming languages. Example: JAVA or C++ at large programming modules

3. Data Acquisition System:

An advance data acquisition is chosen on single chip which includes sample and hold circuitry. MCP 3208 is one of the advanced IC which converts analogy to 12-bit digital signals. It programmable either single or differential pair inputs. Accuracy in differential nonlinearity is specified at 1 LSB and integral nonlinearity is 1 LSB. It has SAR architecture.

4. Soil Moisture Sensor (OKY3442)

Precision soil moisture consists two probes that are inserted in to soil. When the current pass through the probes, the soil contains low moisture offer a less resistance and passes high current. That is variable resistance is that the parameter to spot the extent of soil moisture. Vegetation and crops always depend more on the moisture available at root level then on precipitation occurrence. Water budgeting for irrigation planning, also because the actual scheduling. The gypsum block is employed to live soil moisture. The electric resistance between electrodes embedded during a porous medium (block) is proportional to its water content, which is said to the soil water metric potential of the encompassing soil. Thus, the wetter a block is, the lower the resistance measured across two embedded electrodes.

5. Temperature Sensor (LM35)

The LM35 sensor series are precision integrated-circuit temperature sensors whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 doesn't require any external calibration or trimming to supply typical acquire of ¼ C at temperature and ¾ over a full -55 to +150 temperature range. Moreover, they are very inexpensive and quite easy to use. The LM35 is rated to work over a -55 to +150 C temperature range. As it draws only 60 f from its supply, it has very low self-heating, less than 0.1 C in still air.

6. RELAY {SPDT [Single pole double throw]

A relay is employed to regulate the A.C motors from the controlled DC signal. It can isolate one operated circuit to a different . The principle behind the electromagnet operates the close and opens the circuit. Relays are applied wide area electronics circuits such as industrial control circuits a high-power amplifier, telephone exchanges etc.

7. Buzzer

A buzzer or beeper is used this proposed work to give warning signal that motor is turn on/ off. This provide

audio alarm either by mechanical, electrical, or electronics operated. A buzzer or beeper is an audio signalling device, which can be mechanical, electromechanical, or electronic. Various types of buzzers presently available such as alarms, timers, mouse click or keystroke.

8. DC Motor

We add a raw power then simply hook up with our robotics applications with this close to 6V - 24V compatible with a 20A capable DC motor driver. DC motor driver is ideal for applications where the motor requires up to 20 Amperes of current during start-up and during normal operations. It is also comfortable with motors that run at 6V - 24V.Driver circuits come with a simple TTL/CMOS based interface which can be connected directly to the IOs of an MCU.

VI. WORKING

Irrigation system is automated once the control is received from the web application or mobile application. The system displays the temperature and humidity level of the crop in the field that based on the input from the temperature and humidity sensors respectively. The status of crop health can be also monitored from remote places by using image recognition system and cloud computing. Here two sensors are used to control the irrigation system so that trouble shooting can easily be done whenever it is necessary of working. Threshold voltages are chosen for calibration of the sensors by considering the past month temperature and soil moisture values. Threshold values vary depending upon the crop and graphical presentation of the plant. Hardware resources in agricultural information network are integrated with some of the resources in the pool by using vitalization technology and achieving dynamic distribution of resource and balance of load, significantly improve efficiency of the hardware. The system designed is capable of monitoring, reading, storing and image processing the leaf which execute data using sensors and also generates some actions according to the data and IoT technology. Two sensors and Raspberry pi microcontrollers interfaced with various Nodes. All observations and experimental tests prove that proposed is a complete solution to field activities, irrigation problems and leaf diseases which implementation of such a system in the field can definitely help to enhance the sector of the crops and overall production. Cloud computing is ???a new sort of computing during which dynamically scalable and sometimes virtualized resources are provided as a service over the Internet???.

The system takes decision of automating the irrigation when the need arises according to the instruction received, that is, when the soil moisture falls below the brink without any human intervention with detection of leaf diseases with certain image processing. This system is cost effective which makes it affordable for farmers.

VII. CONCLUSION

By implementing this proposed system there are various benefits for the government and the farmers in the crop field. The Precision Agriculture irrigation system is mainly developed with lower complex circuitry. Two sensors are used efficiently for those temperature and moisture of soil in the circuit which get the calibration of some information to the system which uploads in the thinkspeak datasheet. With the help of this irrigation system completely automated and also provides the real-time information about the crop lands will help the farmers for make right decisions. It is mostly helpful for uneducated people on the water scarcity and storing the data's in database allowed for future research. Web and mobile application with a user-friendly interface make the system easy to understand without requiring any special skills. Using the automatic crop irrigation system, it optimizes the usage of more water by reducing the wastage and reduces the human intervention for farmers on the crop filed.

1. Hardware:

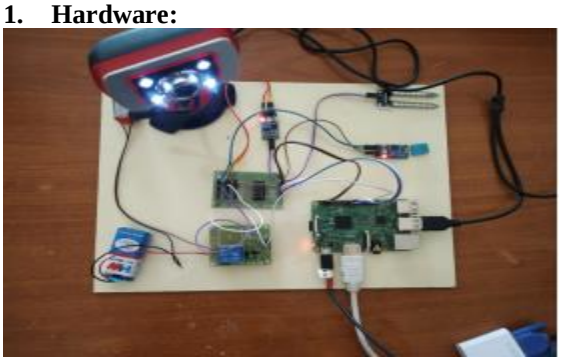

Fig.4. Prototype kit.

2. Output:

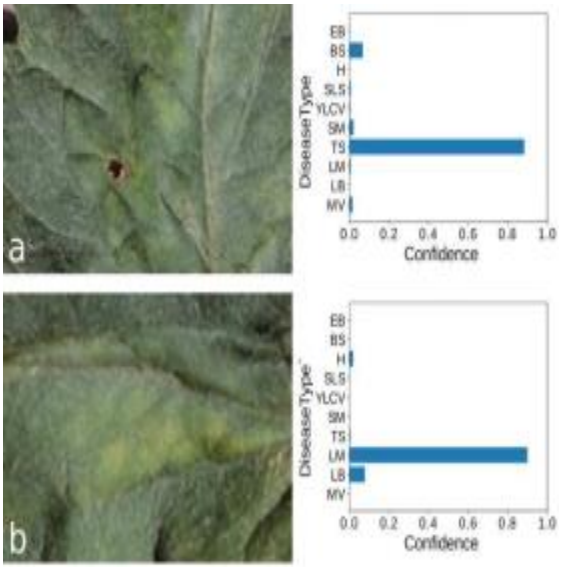

Fig.5. Leaf Diseases Detection.

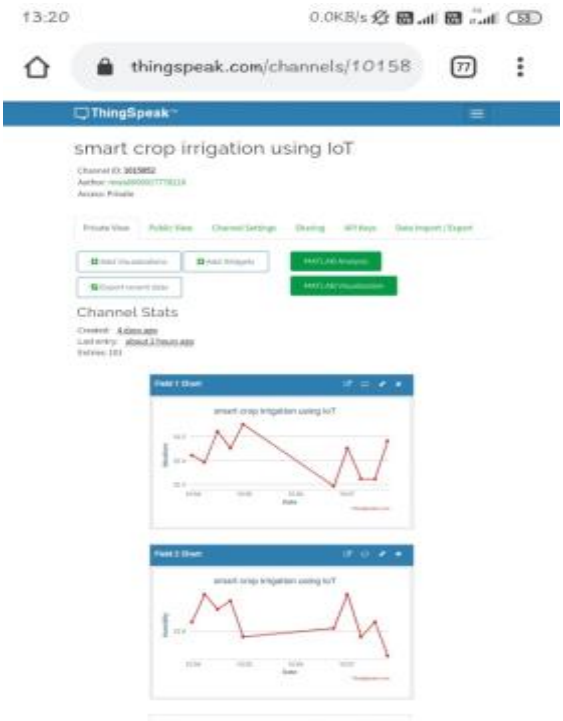

Fig.6. Output of Moisture and Humidity Sensors.

VIII. FUTURE SCOPE

It is very useful method in the agricultural field, can be look the modernization in the field of agriculture viva using the IoT and other processing unit. In future robotics device can be used to detect the leaf disease and same time put the fertilizer for certain diseases.

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