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Semi Automated Crop Monitoring System

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Abstract: ***Agriculture is said to be the fundamental source of income for the developing nations. The better crop yield obtained by a farmer not only gives better prosperity for his family but also the nation. Our paper describes a product that we developed to help the farmers to produce a better yield. The Product is designed in a way to provide the data of moisture and temperature across various parts of the field. The temperature of the soil indirectly affects the water, nutrition uptake and root growth of the soil. The data of moisture and temperature are taken from various parts of the field and pushed to the cloud. The data can be viewed through the mobile application that we developed. This application not only exhibits data but rather it also allows the user to control the product without getting in physical contact with it. The device required the internet to work but we provide the user with an alternative switch by that they can turn the device to normal mode in which the data are sent through normal text messages to the user's mobile phone.***

Keywords: Moisture - liquid diffused in solid, Cloud – Server that is accessed over internet, Mobile Application – Software designed to perform certain task, Developing Nations –Countries with low Human Development Index (HDI) when compared to developed countries

1. Introduction

In countries like India, the agriculture sector plays an important role in the nation's development. If we go through the complete statistics of India approximately 70 percent of the rural households depend on agriculture for employment and it provides about 17% GDP for the nation and the agriculture sector employs about 60% of the total population. When we consider these statistics it is clearly understood that if the country properly works in the agricultural sector there can be an increase in its GDP. The agriculture sector must be automized and the machines that are created must assist farmers as well as give accurate measurements in the form of data to the user. The upcoming generation is not completely involved in agriculture so they need to be guided to participate in this domain having all these parameters in mind we designed a product. For the study purpose, we took sugarcane plantation. The major problem faced by the sugarcane planters is that they are unable to enter the field once the crop is grown. It's difficult for them to check the moisture and temperature level inside the field.

The product consists of hardware and software. The product's hardware is directly placed in the field to measure several parameters of the soil in several places. Once the readings are obtained it is updated to the blynk cloud, the updating of the data to the cloud is at regular intervals. The product's software consists of a mobile application that can be installed on any device. The application consists of monitor screens to view the data and buttons to control the hardware from any part of the globe.The product also consists of a GSM module to send the data through SMS, this is done to overcome the problem of internet connectivity to upload in the cloud.

2. Related Works

The project proposed by Kavitha BC, Shilpa D P, Thanushree KS, Swathi A M, and Ranjitha M K on "Agricultural Crop Monitoring Sensors using IOT-A Study" It explains about a IoT technology that's used to obtain and also transmit the information about weather, moisture, temperature, and fertility of the soil with online monitoring platform which helps to detect the weed, level of water, pest detection, animal intrusion into the field, crop growth, agriculture. Wireless sensor networks are placed to monitor the farm conditions and microcontrollers are used to control and automate the farm processes. To view remotely the data are transmitted in the form of image and video.

Nivetha.R, Anitha.M, Elavarasi.D, Vivetha.V "IOT Based Wireless Sensor for Agricultural Monitoring" It explains about the recent changes in climate have increased the importance of agriculture monitoring, making it a topical and highly active research area. This project aims to collect fundamental field information like air moisture, air temperature, soil temperature, humidity, and salt of agriculture land using a wireless sensor network system during the growing season. data is posted to the user through IoT. This data is can be updated frequently to the cloud and the user can monitor the field condition based on sensor values and motor status also. IoT based monitoring system is proposed for continuous monitoring of the field by using a specified user address. Thus, the user transmits the information of the field to the user using RF trans receiver with 8 channels, and 2 GHz specification for analyzing the field. Another advantage is that the user can switch ON/ OFF the motor from the browser terminal, and motor based on the moisture of the soil. According to the moisture level, the

motor was automatically ON/OFF within the agriculture land and this status was posted to the monitor section. Thus, we propose a technique to send data fast with minimum energy for a higher distance.

3. Proposed System

In the proposed system the hardware is directly placed in the field. The hardware consists of several, moisture and temperature sensors that are controlled by a controller. These sensors can be placed in any part of the field by the user. Moreover, the proposed system can measure moisture and temperature across various parts of the field. This property of measuring soil parameters across various parts of the field gives the user a rough view of the field. Once the data is analyzed by the controller it is forward as data packets to the cloud. The software application of this system can be installed easily installed in the device. This application is used to retrieve the data from the cloud and update it to the user. The user is provided with an opportunity to view the parameters of his soil from any part of the globe. With the use of the application, the user can even control the motor and the hardware that is placed in the field. If the user wants to stop the hardware he can go with a manual mode button that is provided in the application.

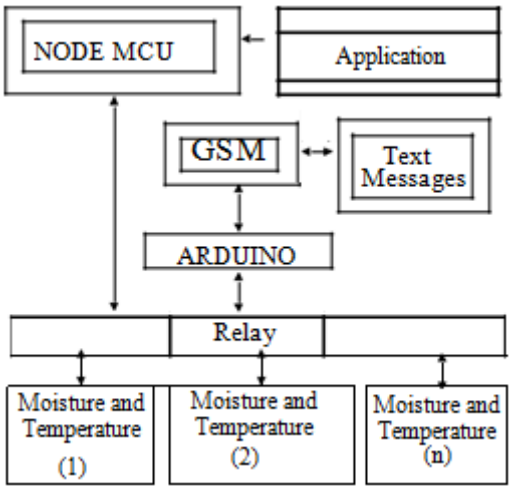

Figure 1.1: Block Diagram

In case the user is unable to provide the internet to the device there is an alternative where the data can be sent to the user via normal text messages. This operation can be performed by switching the device to a normal state. In a normal state, the data is obtained by the controller and not uploaded in the cloud but rather it is updated in the GSM module. This GSM module operates for transmitting the readings via text messages to the user mobile phone. Due to this operation, the system comes out to be real-time.

The proposed system does not require an expert for the installation. The person who buys the system can easily install it in the field. Placement of sensors is given in the hands of the user so that the user can place the sensor at any part of the field as per their wish. This system is highly effective in drip irrigation. If there is a block across a particular section of the pipe it can be directly found. Since the proposed system calculates soil parameters across various parts of the field, If there is a block in a particular section it makes the place dry which intimates the user with a notification that was developed.

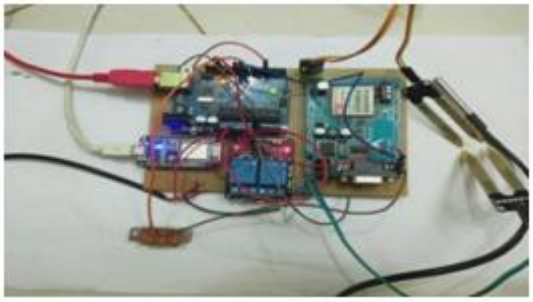

Figure 1.2: Proposed System

4. Architecture

The architecture explains the connectivity between the elements used in our system. There are two architectures used in the system.

Hardware Architecture

The combinations of all the components are made compact in a box and placed in the field. The moisture and temperature sensor is taken out from the box and placed at several parts of the field. These sensors measure the moisture and temperature across various parts of the field and updated to the cloud. The path to the cloud is created by NodeMCU. NodeMCU is a wifi-enabled controller. If the user is unable to connect to the cloud then he can switch to GSM in which the data are given to the user via normal text messages. The relay is controlled by a micro-controller to switch between several sensors placed in the field.

The user can place the wifi router near the product to get the data via the cloud. If the user cannot provide the wifi router near the device then the device will work in normal mode where the data are sent through normal text messages.

Software Architecture

The mobile application was developed using an IOT platform called Blynk. This application also provides cloud access for the creator. The data's from the hardware is stored in the cloud and then retrieved by the application when a user wants to view the data. The Application consists of buttons and value display widgets. The user can view the soil parameters across various parts of the field by switching the buttons.

Figure 1.3: App Output

The application also consists of an alert system in which if the parameters get reduced or increased concerning the threshold value, then the user is alerted via message and email system. The user is given an option to change the device to manual mode in which the device gets deactivated and the user can himself monitor the field and perform the operations. If the device is not connected to the cloud the data are received via normal text messages and the application provides the previous value that was gathered

Figure 1.4: Text Output

5. Conclusion

This system is completely different from the existing system. It was completely developed for real-time applications. It is easy to use and does not require any installation effort. The software application will be available in all the platforms so that the user can download from the store and register their hardware device. Users can control the device from any part of the globe. The cost of the system is very less and it can be affordable for low scale farmers.

6. Future Enhancements

Shortly the application is going to be developed in such a way that the entire map of the field will be visible to the user and the part with correct moisture and temperature will be given as green and the other parts as red. The device will be made still more compact and cheaper. The power conception of the device will be reduced and will be optimized. At present we use a power bank to charge the device in the near future we are planning to replace it with rechargeable batteries so that both device size and cost can be reduced. We are also planning to give power for the rechargeable batteries through solar power so that once the charge reduces the device can charge via the direct sunlight. Users need not move the device from one place to another.

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