Smart Water Monitoring System for Agriculture

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Abstract— **Agriculture is considered as the main source of food and raw materials. In India many farmers are still using the traditional methods for agricultural field. These traditional methods can be replaced using the current technology. This project describes us how irrigation system can be handled by IOT. It helps in saving and conserving the water by automatically providing the water to the plant according to their respective water requirement. The growing demand for food in terms of high quality has increased for the industrialization in the agriculture field. Internet of things(IOT) is high performance technology it is offering solutions and innovation to the agriculture field. The main objective of this project is to Help the farmers using IOT technology.**

Index Terms— **Agriculture, IOT, Sensors.**

I. INTRODUCTION

This Project is for the automation of Irrigation system in the agricultural field. It can monitor the irrigation system, the water level present in the field and also water level present in the submerged pump. We can be relieved from the responsibility of irrigating the field and checking the water content in the soil. We were inspired to do this project from the farmers who struggle day and night in the worst climates and also walk miles just to irrigate the farm to get good yield in the fields. The proposed system will allow the farmer to monitor the water level present in the field and controlling the supply through the internet. When water level goes below certain level then the system will automatically pump the water to the field and achieves the good irrigation system using the Internet of Things.[1] India has Agriculture as its primary occupation. According to IBEF (India Brand Equity Foundation), 58% of the people living in rural areas in India are dependent on agriculture.[5] Under such a scenario, the usage of water especially the fresh water resource by agriculture will be enormous and according to the current market surveys it is estimated that agriculture uses 85% of available freshwater resources worldwide, and this percentage will continue to be dominant because of population growth and increased food demand.[6] Water monitoring system for Agriculture is proposed in this paper which will use concept of IOT, and cloud computing to help farmer plan an irrigation schedule for his farm through an agriculture profile which can be used for their field as per their requirements.[2] Based on the users input an automated irrigation system is developed to pump the water to the field for agricultural crops based on crop's water requirement. The

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system has a distributed network for soil- moisture and temperature sensors placed in the field so that it can check the water level present in the field and pump the water to the field according to its requirement . [4]

The several factors which affect the amount of water required by crops in various climatic conditions are: Temperature Humidity Moisture Sunshine Windspeed These are the main reason for the effective production of crops in the field. IOT based Smart Water Monitoring System for Agriculture gives more information about irrigation and making decisions depending upon real time data from fields.[3] All these operations can be controlled with IOT devices placed remotely all these sensors are used to perform the operation along with WIFI modem. This wife modem collects the real time data from field using the IOT sensors and all these data is sent to the database through the GPS to control irrigation according to database available with the system. The work proposed in the system gives the use of IOT in all the phases like growing, harvesting and transportation. IOT is the thing which needs proper internet connection to interface with the user requirements.[10]Real time data provided by the sensors will help the system to pump the water to the field according to its requirement and also help to cultivate the crop effectively.[5] Paper produces an agricultural model in IOT environment. It describes IOT which helps to remove the inadequacy and lack of management in the Agriculturalists project will help to give the good yield production in the agricultural field so that it may help in the economical growth of the country.[6]

II. LITERATURE SURVEY

• Researchers have proposed different types of IOT based application in the agricultural field that are increasing the high-quality production. IOT based project also helps to improve the quality and increase the agricultural productivity. The proposed system provides cost effective and timely monitoring solutions to monitor the soil conditions like temperature, humidity, moisture and also it monitors the crop.[7]Agriculture is the big sector of our life. Agriculture is derived from ager (field) and culture(cultivation). Agriculture is art of farming including the work of cultivating the soil, producing crops, planting forest plants/trees.

Water Requirements
• The water requirement of a crop means the total amount of water is pumped to the field according to its crop requirement.
• The water requirement changes with the crop.
• each crop will have different water requirement.
Soil

• Red soil is found over crystalline igneous rocks in areas of low rainfall.

• Red soil has good moisture retention capacity.

• This type of soil is helpful for dry farming.

• Black Soil is the best soil for cultivation.

• Black Soil is known as 'Regular soil', 'Black Cotton Soil'.

• Formed due to the solidification of lava-Deccan Plateau.

• Suitable for rain fed crops.

• Rich in lime, Iron, and magnesia.

• They absence in phosphorous, nitrogen and organic matter.

III. METHODOLOGY

• The scope of agriculture can vary , irrigation , cultivation of agriculture depends on the resources available.

• The main source for agriculture is water. Different crops have different water requirement. Although the main of an agriculture is to provide primary data on the structure of the agriculture field.

• It also depends on type of soil which field has, temperature, moisture and humidity.

• We decided to use IOT technology for this project because it helps to improve the productivity in the agricultural field.
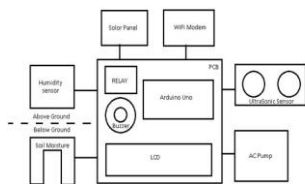

Fig 1: Block Diagram.

IV. SYSTEM ARCHITECTURE

The work proposed in the system gives the use of IOT in all the phases like growing, harvesting and transportation. Real time data provided by the sensors will help the system to pump the water to the field according to its requirement and also help to cultivate the crop effectively. Paper produces an agricultural model in IOT environment. It describes IOT which helps to remove the inadequacy and lack of management in the Agriculture.

V. PROPOSED SYSTEM

The development of a Water Monitoring System for Agriculture using sensors, Arduino within an IOT system is presented. The aim of the implementation is to describe the smart water monitoring system for agriculture to allow the decisions to be taken on watering the plants based on the continually monitoring of the environmental conditions in the field. The system is shown in the Fig .1. It also aims at a predefined irrigation system based on the farmers requirement and convenience and the system is developed for the same. This system consists of the soil moisture sensor, humidity sensor where these all sensors will help to detect the

moisture, humidity and temperature present in the field with an Arduino board. These sensors continuously monitor the sensor and send the real time data to the system through the Wi-Fi modem. These all things act like IOT gateway which help the user to irrigate the field with the present information in the system. The data being uploaded to the database will endlessly monitor the parameter from the comforts of their requirement. [3]The system has the capacity to adapt based on the user input which farmer can input through the website. The farmer can select the profile based on the crop for irrigation and schedule the plan for pumping the water to the field. The volumetric water content in the soil is the primary factor which gives information to the user how much water is required for the field. In the absence of this system farmer has to manually detect the water level present in the soil which is time consuming and straining. So, the system is proposed which informs the user whenever the water level in the soil goes below the threshold value.

VI. SYSTEM DESIGN

The system architecture consists of an Arduino Uno board. We used different sensors like humidity sensor, soil moisture sensor, buzzer, LCD, ultrasonic and relay It monitors the sensors and gives information about the humidity, temperature and moisture present in the field. The Arduino Uno board is equipped with digital and analog pins which is interfaced with different type of sensors.

• Humidity Sensor: It is used to detect the moisture level present in the field. It consists of vcc, ground and data pin where vcc andgnd pin are connected to the vcc and gnd pin of Arduino board respectively and data pin is connected analog (A0) pin of Arduino.

• Soil moisture sensor: This sensor is used to detect the moisture level present in the soil as well as the temperature. Ao (analog pin) of soil moisture sensor is connected to A1 pin of Arduino circuit.

• Ultrasonic-sensor: It is used to detect the object in contact. Both trig and echo pins are connected to Arduino digital pins (2 and 3) which are interrupt pins. Vcc and gnd pins are connected to Arduino board.

• LCD: LCD is used to display the sensor values from Arduino board which is sensed directly.

• Buzzer: Buzzer is used to give an alarm to the farmer to give him information whether the threshold value of the water has become low. So that the farmer can get to know that whether he has to on the motor or not.

After all these connections the code for all sensors is uploaded into the Arduino kit. After successful compilation it will detect the ultrasonic sensor, soil moisture sensor, humidity sensor and display the value on LCD which is connected with Arduino board, the buzzer will give the alarm sound to alert the user to get information about the water level present in the field. If it is below the threshold value then the user can make the water pump to the field. Different crops have different water requirement. It also depends on the type of soil the field has. If it is Red soil then it requires more water because it consist of macro pores it cannot hold the water for longer time. If it is black soil then it requires small amount of water since it consist of micro pores it can hold the

water for longer period of time. Once all these things are set up, the software part is developed. Where the website is created. The software consists of a website which includes setting up of the profile for different type of crops. The Arduino board controls all the sensors which act like IOT gateway. If the website is opened the user first gets into the login page, then he should login to the website using his credentials and password. Then he should select the crop with its appropriate water requirement as he requested to the website according to the crop's water requirement if the water level present in the soil goes below the threshold value it will get pump to the field automatically. So that it will help the farmer to get the good yield in the irrigation. The database will maintain the data received from the IOT gateway. If the water level goes below the threshold value it shows notification to the farmer through the IOT gateway. Which will help the IOT to pump the water according to the crop requirement.

VII. IMPLEMENTATION

• IOT based smart water monitoring system for agriculture is used to provide decision regarding irrigation using real time data.

• IOT is used as a gate way to get the information about the field, like its moisture, temperature and humidity.

• All the sensors are connected to the Arduino Uno board where Arduino board is equipped with analog and digital pins.

• Once the sensors are connected to the board the code is uploaded into the Arduino kit.

• After the compilation it starts displaying the result of temperature, humidity, moisture on the LCD.

• The software is created like: First of all, the farmer logs into the website using his credentials like username and password.

• User is then allowed to next page to select the crop then select the water requirement for the selected crop. Real time data is displayed in the same website.

• The sensing phase senses the parameters like temperature, humidity, moisture.

• All these sensors are attached with Arduino Uno board. The board acts like IOT gateway in the proposed system. The processing data takes place in the cloud which consist of the web server which takes decisions based on the data present in the proposed system.

• Based on these values the water is pumped to the field according to the crop water requirement.
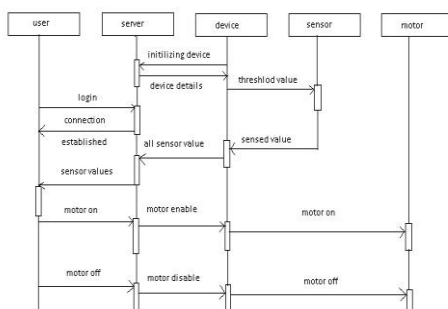

Fig2:SequenceDiagram.

This is the sequence diagram of the proposed system. When the user login to the server device details will be given to him and also gives him the information about threshold value (water level) in the field. Sensor sends the information like temperature, humidity, moisture all the sensor values are sent to the user. If the water level in the field goes below certain threshold value the user needs to enable the motor so that the required water will pump to the field. If it completes pumping the water then he needs to disable or off the motor. So, it will make him to get the better cultivation in the field.

Description of hardware items: Components Required:

• Arduino
• Soil Moisture Sensor
• Temperature Sensor
• Humidity Sensor
• Wi-fi module
• LCD
• Buzzer
• Solar Panel

A) Arduino

There are different types of Arduino boards like Arduino Uno, Arduino due, Arduino mega but in this proposed system we used Arduino Uno. few of its advantageous it can run on various operating system and it is inexpensive and provides clear learning programming.

• It is Physical computing platform.

• Serial: 0 (RX) and 1 (TX). Used to receive and transmit (TX) TTL serial data.

• External Interrupts: 2 and 3. These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value.

• PWM: 3, 5, 6, 9, 10, and 11. Provide 8-bit PWM output with the analog Write () function.

• LED: 13. There is a built-in LED connected to digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off.

B) Soil moisture:

• Soil moisture Sensor can detect amount of moisture in soil.

• Moisture sensors does not measure moisture bur measures conductivity or resistivity of soil.

• SI Unit is bar (one bar is equal in strength to the pressure of one atmosphere)

• Sensors have two probes.

– Probe1: pass current through the soil. – Probe 2: reads resistance in the soil.

C) Temperature Sensor:

Temperature sensor is a device which is used for the measurement of temperature in the environment.

D) Humidity Sensor:

Humidity Sensor measures and reports the relative humidity in the air.Therefore,it measures both moisture and air temperature.

• SI unit is g.m-3(grams of water vapor per cubic meter of air).

E) wi-fi

Wi-fi is name of popular wireless networking technology that uses radio waves to provide wireless high -speed Internet and network connection.

VIII. CONCLUSION

IOT based smart water monitoring system for agriculture can prove to be very helpful to farmers. Particular values for all the parameters like humidity, moisture and temperature is detected and based on that water is pumped to the field for the better cultivation of the crop.[9] This system produces irrigation schedule based on the sensed data from the system. Continuous internet connection is required to get the real time data from the IOT gateway. The proposed system can pump the water to the field according to the crop water requirement. It helps the farmer to get good production in the cultivation. other than that, the irrigation system will in fact reduce human efforts as the sensor will be the one who collects all the data directly from the farm , so farmer need not have to go to monitor the environment of the plantation which is impractical if the area is too wide. All this work can be done by using Internet of Things in agriculture field. There are some advantages that can be highlighted in this system. Firstly, it can save time and water as farmer do not have to personally go to the farm to do the watering. So, this system makes use of the sensor to detect the soil moisture , temperature and do watering by using the water pump. Then since the water is supply directly to the roots of the plants it may produce the good yield.

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