IOT Based Monitoring of an Automated Irrigation System

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Abstract- In this Modern World, IoT is a network of objects which enables devices to connect and exchange data. IoT plays an important role in agricultural which is one of the fundamental resource of food production which feed billion of people's on earth . In this paper, a system is developed using sensors for monitoring and controlling the irrigation-field and it also describes how farmers can utilize the android application. The data from sensors are send to the server which in turns notifies to farmers mobile periodically from anywhere in the world. This will reduce the burden of farmers from severe environmental conditions.

Keywords: Automation, IoT, Sensors,Wi-Fi, 328P Microcontroller.

I. INTRODUCTION

Nowadays mobile devices(e.g. Smart phones and Tablets) have been developed drastically throughout the world for computing, sensing, and connectivity resource and used for controlling and accessing Applications for multiple purposes. This devices have common characteristics like high speed processors at low-power consumption, running frequencies starting from 1 GHz to 2.4 GHz, with lots of memory with high-resolution touch screens with graphics capabilities. This devices is not only used for computing but also for communication purpose, which is done using technologies like Bluetooth, GSM, GPRS, global positioning system(GPS), and Wi-Fi. This device have a multitasking operating system for running first- and third-party applications ,resulting an attractive developing platform for a specific applications in different domains. By using this technologies we can not only use it for communication field but can used for in other fields like Home, Agriculture, Medical, Industrial, etc., using IoT .

IoT(Internet o Things) has the capability to transform the world we live in; more efficient industries, connected cars, smart cities and Automation. Agriculture is the fundamental resource which play important in the economy of the country. Indian population relies on agriculture for their sustenance. However, the application of technology like IoT in agriculture could have the greatest impact throughout the world.

This paper focus on key aspect that how IoT can be used in the Agricultural Field. In the past years, agriculture has been so reduced that most of the farmers are unable to crop the field using their hard work,because there are so much of monitoring is to done for managing their crops like watering, controlling the environment, checking the moisture of the soil, etc.,. This can be done using the Arduino UNO microcontroller which is based on ATmega328 , which gets the data of the field using sensors and send that data to cloud using Wi-Fi module , which in turns sends the data to the farmers application. By using this data the farmer monitors and controls the irrigation field in a secure manner.

These are some methods that have been used so far to improve irrigation system,

decrease crop wastage and increase crop productivity. In this work the system is developed using sensors to monitor crop -field and automate irrigation system. The system is tested and gave good results.The wireless transmission of sensor data from field to the coordinator, storing it in a database, controlling field from mobile application and irrigation control are worked very well. The water usage is more efficient than any other traditional and other modern irrigation methods.

II.SYSTEM DESIGN

In this work soil moisture sensor, temperature and humidity sensors rain sensor are used. They continuously monitor the field and send it to the web server using ESP8266 is a Wi-Fi trans-receiver which is used for internet connection. The sensor data are stored in database. The application is designed in such a way to analyze the data received and to check with the threshold values of moisture, humidity , temperature and rain. The decision making is done at server to automate irrigation. If soil moisture is less than the threshold value the motor is switched ON and if the soil moisture exceeds the threshold value the motor is switched Off. This method can also be used in many ways where in addition light intensity. The system design is represented in Fig. 1

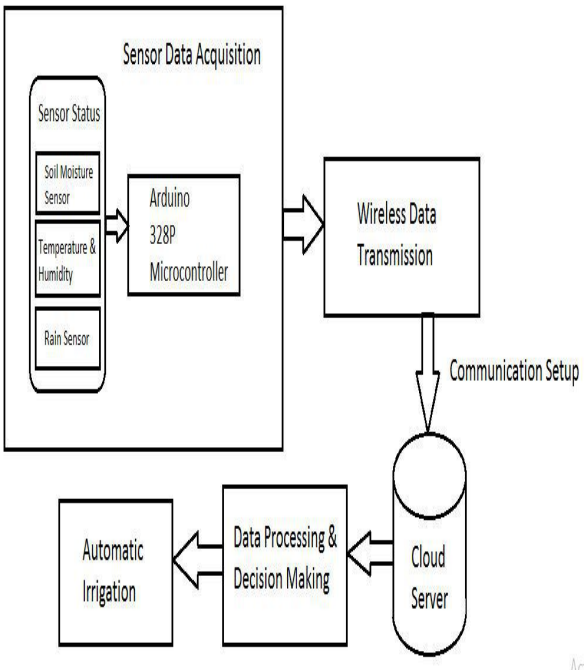

Fig. 1 System Design

A.Sensor Data Acquisition

Let discuss about data acquisition from sensors one by one. The sensor is interfaced with Arduino microcontroller and programmed. Once it is programmed it is placed inside a box and kept in the field. The soil moisture sensor YL-69 has two probes which is inserted into the soil.The probes are used to pass current through the soil. The moisture soil has less resistance and hence passes more current through the soil whereas the dry soils has high resistance and pass less current through the soil. The resistance value help detecting the soil moisture. Fig. 2. Shows soil moisture sensor.

Fig. 2 Soil Moisture Sensor

The temperature and Humidity of the environment is calculated using the DHT11 sensor. The total amount of water vapor in air is defined as a measure of humidity.. Relative humidity is calculated because when there is a change in temperature, relative humidity also changed. The amount of water droplets in air is increased after irrigation. This causes decrease in temperature which in turn increases the relative humidity of the surroundings. The temperature and humidity reading are often notified to the user so that the user can be able to know the field conditions from anywhere. DHT11 sensor is shown in Fig. 3

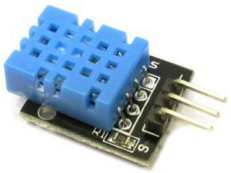

Fig. 3 DHT11 Sensor

A rain sensor is a device connected to an automatic irrigation system that causes the system to shut down in the event of rainfall. The value of the sensor gets low when rain drops fall on it, when it gets low value it sends a alert signal to the user, this is useful for preventing from excess water usage.

Fig. 4 Rain Sensor

III. COMMUNICATION SETUP

The data from sensors are send to the web server using wireless transmission. The ESP8266 Wi-Fi module (IEEE 802.11)is used for wireless transmission between the field and web server. This device acts as both transmitter and receiver for the micro-controller for sending data and receiving commands from the user. The complete setup of the system using the Wi-Fi, sensors and commands are show below in Fig 5

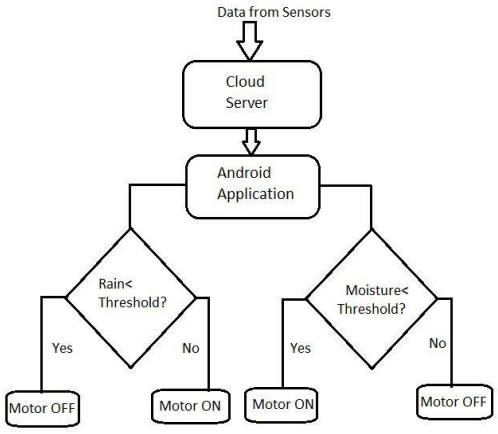

Fig. 5 Overall Process Of Automatic System

IV.MOBILE APPLICATION

In Android a mobile application is developed. This mobile application helps to monitor and control the field from anywhere. The android application fetches the data from the web server and displays the data in JSON format. The user interface with the android application for monitoring and controlling the field with the device. This application is designed in away that enables the user to interact with the system in the field. The mobile application is shown below in Fig 5

V.CONCLUSION AND FUTURE SCOPE

Automated irrigation system is designed and implemented in this paper. The system is efficient for farmers for monitoring and reducing water consumption during drought and in monsoon. This system is very useful for increasing the crops efficiently and minimizing the man-power needed in irrigation.

In the future prediction of water supply for specified crop and weather can be made using various data mining algorithms which are currently processing.

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