Automatic Irrigation System using Soil Moisture Sensor with Bigdata

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Abstract

The lack of rain water and scarcity of water in reservoirs and poor conservation mechanisms of water affects the production of food products. This motivates us to do an extensive research for conserving water in agriculture. The advancements in wireless sensor network help to sense several factors like soil moisture, temperature and humidity. Thereby deploying sensors in agriculture fields to monitor we can conserve water for irrigation. This paper briefly explains the Automated Irrigation System using Soil Moisturbe Sensor. In the proposed system, the data of the moisture content updated for regulating the water pump. This paper will give a clear knowledge about the suitable method for the better irrigation.

I. INTRODUCTION

The continuous increasing of food demand requires the improvement in food production technology. The food production requires continues monitoring of crops for irrigation with the help of humans. This continuous monitoring by humans is not possible for all the time. Hence automatic irrigation system is a suitable one which helps to irrigate the crops without the help of human intervention. This system will have continuous monitoring that helps better production.

Automatic irrigation system is a new model developed using advancement in communication technology. This system will monitor the soil moisture and environment temperature using wireless sensor networks. The sensed information are send to a centralized computing server for making computation and to report the need of irrigation based on the values received from the sensors. The WSN is integrated with the microcontroller for regulating the functionality of the motor pumps which are part of the system. When the soil requires water the microcontroller instruct the motor pumps to supply water in the field.

The most commonly used soil moisture tester and temperature sensor dht11 is employed for sensing the data from the field. The most popularly used microcontroller NodeMCU is used for processing the sensed information and regulating the water pipe. The NodeMCU is constructed with ESP8266 chip which is developed with wifi and Bluetooth. The NodeMCU is very inexpensive and it is very easy to work with Arduino IDE. The Arduino IDE works by installing the ESP8266 board manager. To have a good system for irrigation; it can be updated with various technologies. In this paper, we have discussed several methods for the maintenance and better irrigation of crops.

This paper is organised as follows section 2 gives an overview of Automatic Irrigation System. The several methods employed for Automatic Irrigation System are discussed in the section 3. The section 4 gives the proposed method of Automatic Irrigation system finally conclusions and future enhancements are given in section 5.

II. AUTOMATIC IRRIGATION SYSTEM

Irrigation plays a vital role in the plantation of crops. The manual supply of water does not give an ultimate result for food production. The better production needs a correct amount of water at a right time. The introduction of Automatic Irrigation System aims to lessen the consumption of water from the over usage of water in the agricultural field. The Automatic Irrigation System improves the monitoring of crops often without the help of manpower.

The Automatic Irrigation System designed with the Wireless Sensor Network and Mobile communication. The WSN consists of sensors which are employed in the agricultural field for sensing the moisture and temperature of the soil. The sensed data are bring under the microcontroller for regulating the valve of the pump. If the moisture of the soil gets decreased, the sensor sends the data to the microcontroller. Then the microcontroller instructs the valve to turn on. After reaching the threshold value of the moisture, the microcontroller instructs the valve to turn off. The updated value of the moisture and temperature and the action taken by the microcontroller will be send to the user.

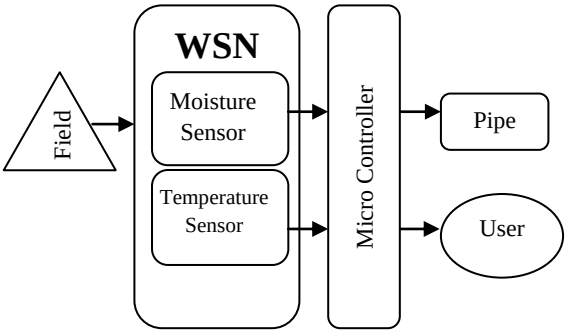

Fig. 1: Block diagram of Automation Irrigation System

A block diagram reveals in which scenario the automation irrigation system works. The moisture and temperature sensors are employed in the agricultural field for sensing the level of moisture and temperature of the soil. The sensors are integrated with the single chipped microcontroller which is used to calculate and process the data from the sensor. The sensed information is send to the microcontroller in the form of digital signals. The microcontroller processes the digitalized data and takes relevant actions to regulating the water pump. If the processed data of the soil moisture is low, the motor is indicated by the microcontroller to turn on the water pump.

A. Sensor

The sensor is electronic equipment employed to identify and react to the natural phenomena and takes it as their input. The input such as moisture, pressure , temperature, heat and light. The signals are generated as the output of the signal which is in the form of human-readable format to the specified location is transmitted through a network for further analysis or processing. In this paper the two sensors are used majorly for sensing which are listed below.

B. Soil Moisture Sensor

Soil moisture sensor is used for the measuring of the water content in the soil. The traditional quantities description of the soil requires a various methods such removing drying etc., but the soil moisture sensor indirectly measure the water level of the soil by using the another set of property such as electrical resistance, dielectric constant or the synergy of the neutrons. The soil moisture may vary according to the temperature, soil type and the electrical conductivity. The set of moisture sensor will help to find out the potential of the water, hence this type of sensors called soil water potential sensors.

C. Temperature Sensor

Temperature sensor senses the temperature from the various range of physical body. It is one of the main thing had often calculated. The sensing of the temperature using temperature sensor is done by two ways either by direct or indirect method. The direct method is done by made a contact with the source and the indirect method is done without contacting the source body instead of that using radiated energy of the source. In this project, we are using DHT11 which is the temperature sensor. It consists of four pins, the first pins is used for the voltage supply, the second pin is used as the output pin, the third pin is considered as NULL pin and the last pin is used for the ground supply.

III. LITERATURE SURVEY

In this chapter, we have discussed various types of Automatic Irrigation mechanism for better irrigation. Let us discuss each and every technique of Automatic Irrigation System.Irrigation Management System Using Soil Moisture Sensor and Arduino , SP.Maniraj et al., proposed that the automated irrigation system is done by soil moisture sensor and arduino. In this system, the contol is used to on and off the motor without the help of humans which is done by microcontroller. The LED is provided for the indication of working of the arduino. The moisture level of the soil will be checked and the irrigation status will be sent to the local host or server.

Automated Irrigation System Using a Wireless Sensor Network and GPRS Module, Joaquín Gutiérrez et al., proposed an automatic irrigation system was introduced to help farmers. In this a wireless network of soil moisture and temperature sensor are employed to senses the information. The gateway unit initiate the actuators and transmits the data which is between the web application and the farmer for the irrigation schedule. The photovoltaic panels are used for the power supply of the system.

Development of Software for the Microcontroller Based Automated Drip Irrigation System Using Soil Moisture Sensor, N.V. Gowtham Deekshithulu et al., proposed the design of irrigation system based on the soil moisture sensor and microcontroller to help the farmers to irrigate the lands with right amount of water. keil vision 3 software is employed with 8051 microcontroller and sensor. When the land reaches the 70% of moisture the pump will turn off and for below 70% the pump will turn on till it reaches particular level of moisture. The regulating of water pump is done with solenoid valve.

Shiraz Pasha B.R., Dr. B Yogesha (2014) The International Journal of Engineering and Science (IJES) developed the Microcontroller Based Automated Irrigation System to irrigate the land with the automation technique. The moisture sensor is inserted into the soil. The sensor senses the information and sends the data to the microcontroller. The controller indicates the relay to turn ON the pump if the moisture is below the threshold value and the pump will turn OFF automatically after the moisture level is sensed from the sensor. It will be displayed in the LCD of the controller.

S. R. Kumbhar, Arjun P. Ghatule (2013) International MultiConference of Engineers and Computer Scientists developed the Microcontroller based Controlled Irrigation System for Plantation for irrigating the lands without the manual support . It was developed with the humidity sensor and the microcontroller. If the set-point value of the humidity sensor goes low the microcontroller turn on the motor to supply the water, after reaching the set-point value then the motor will turn OFF.

Karan Kansara (2015) proposed Sensor based Automated Irrigation System with IOT for the welfare of farmers in the field of irrigation. The connection of the microcontroller from the android app and to the GSM is done by GSM and MAX232 respectively. The moisture level becomes low, the microcontroller initiates the mobile to activate the buzzer for the opening and closing of the valve.

Pavithra D. S, M. S .Srinath (2014) proposed GSM based Automatic Irrigation Control System for Efficient Use of Resources and Crop Planning by Using an Android Mobile in which the low moisture content of the soil will be deducted. The moisture data will be sent to the microcontroller. The microcontroller calls the mobile to press the button after hearing the buzzer indication. After that the valve is opened for the supply of water, and then it will attain the certain level of moisture content the sensor updates the moisture level and the valve will be closed by the signal of the microcontroller.

M.Jagadesh (2018) International Journal of Creative Research Thoughts (IJCRT) Wireless Sensor Network Based Agricultural Monitoring System proposed to monitor the field with the help of sensors such as moisture, temperature, pH and water level. The data from those sensors will be transmitted to the arduino with the help of zigbee technology. The data also processed in the Raspberry pi for regulating the water pump. The live status of the field will send over the webpage which is obtained from ip address which is pre-defined in the module. Indu Gautam and S.R.N. Reddy (2012) International Journal of Computer Applications proposed an Innovative GSM-Bluetooth based remote controlled embedded system for irrigation which predefines the irrigation time according to the sensor's data and also depend of crop type for the automation of the system. The system interacts with the user via the SMS. The GSM technology is employed for the message transformation. The SMS charging will be avoided by the use of Bluetooth technology within the particular meters.

Purnima, S.R.N. Reddy (2012) International journal of computer Applications proposed Design of Remote Monitoring and Control System with Automatic Irrigation System using GSM-Bluetooth for remote controlling and monitoring of the irrigation with low cost and less power consumption. The system is designed with sensor and the microcontroller which is interfaced with the Bluetooth for the data transformation within the short range of place for eliminating the charging of the SMS. The GSM technology is employed for the sending of data such as CO2 concentration, low moisture level and the high temperature via the SMS to the farmer.

IV. PROPOSED SYSTEM

Automatic Irrigation System is used to irrigate the land without the help of manpower. It works by using soil moisture and temperature sensor (dht11). The Wireless Sensor Network is employed in the field for sensing the moisture and temperature of the soil. The WSN is connected with the NodeMCU for processing the sensed data from the sensor. The data manipulation is done by the centralized Server. Fig 2 Show the working system of the Automatic Irrigation System.

In the Automatic Irrigation System, The soil moisture tester and the temperature sensor are connected by connecting wires. The connection between the microcontroller and the sensor is done by connecting the ground of the microcontroller and the sensor, the power supply will be given to the Vcc pin of the NodeMCU and the A0 pin of the microcontroller and the sensor are connected. When the moisture of the soil is below the threshold value, the sensor intimates the microcontroller to switch ON the valve. After reaching the threshold value, the sensor intimates the controller to switch OFF the pump. The regulating of the water pump is by using relay. The routine activity of the irrigation is send to the user. The communication between the microcontroller and the user is done with the help of GSM module.

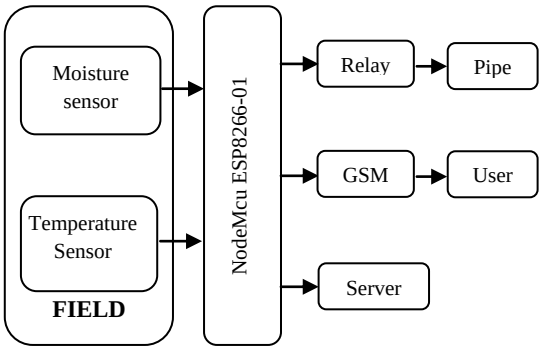

Fig 2 : Automatic Irrigation System

The Wireless Sensor Module consists of Soil Moisture Tester and Temperature Sensor. The soil moisture and temperature sensor are used for sense the moisture and temperature of the soil. These two sensors are dipped in the crop field for continuous monitoring of soil moisture and temperature of the soil. This sensed data will be send to the microcontroller for further processing of the sensed data from the sensor

A. Controlling Unit

The control unit consists of microcontroller which controls the execution of operation and the sensing unit consists of different sensors such as DHT11 sensor and soil moisture sensor. The microcontroller used in this project was the NodeMcu ESP8266.The DHT11 sensor and soil moisture sensors are interfaced with the NodeMcu which is developed with inbuilt wifi ESP8266. The sensing units send the corresponding data values for two times in a day.

The readings from the temperature sensor are in analogue form. These can be converted into digital form by using ADC converter which is internally present in the microcontroller. The Wireless Sensor Unit operates as a closed loop operation to the system. The microcontroller interfaced with the relay for controlling the switching

ON/OFF the motor. The microcontroller gets the sensed value from the Wireless Sensor Network and compares the sensed data with the pre-defined threshold value. If sensed data exceeds the threshold value, the microcontroller controls the motor to Switch OFF. If sensed data is below the threshold value, the microcontroller controls the motor to Switch ON.

B. Sending message using GSM

The GSM module is interfaced with the output of the microcontroller. The microcontroller sends message to the user using GSM module. The microcontroller sends an alert SMS about the value of the temperature or soil moisture from the sensor unit to the end user. The irrigation actions done by the microcontroller also send to the end user.

V. CONCLUSION

The agriculture is emerging as the backbone of the country. From our ancient days, irrigation is carried out by traditional methods. Now, the irrigation is carried out by the automation systems. The proposed Automated Irrigation System is designed for the welfare of the farmer. This system is said to be a real time feedback control system which helps to irrigate the land in an efficient manner. This system is Very reliable and user- friendly. This System can be used at anytime from anywhere. The moisture and temperature sensor will be monitored in the base station. The employing of wireless network and mobile communication (GSM) reduces the regular monitoring of the field. The employing of Bluetooth helps in eliminating the SMS charge within short range of area. The proposed system is scalable that can deduct other such parameters such as nitrogen content and CO_2 level to the multiple users by updating the wireless sensor networks.

REFERENCES

[1] R.Suresh, S.Gopinath, K.Govindaraju, T.Devika, N.SuthanthiraVanitha, “GSM based Automated Irrigation Controlusing Raingun Irrigation System”, International Journal of AdvancedResearch in Computer and Communication Engineering Vol. 3,Issue 2, February 2014.

[2] Pavithra D.S, M. S .Srinath, “GSM based Automatic Irrigation Control System for Efficient Use of Resources and Crop Planning by Using an Android Mobile”, IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) Vol 11, Issue I, Jul-Aug 2014, pp 49-55

[3] S.P.Maniraj , Tanya Chaudhary , Akanksha Agarwal , Nandini Kishore , Vaibhavi Verma “ Irrigation Management System Using Soil Moisture Sensor and Arduino” Journal of Network Communications and Emerging Technologies (JNCET) Volume 8, Issue 4, April (2018)

[4] Joaquín Gutiérrez, Juan Francisco Villa-Medina, Alejandra Nieto-Garibay, and Miguel Ángel Porta-Gándara “Automated Irrigation System Using a Wireless Sensor Network and GPRS Module ” ieee transactions on instrumentation and measurement, vol. 63, no. 1, January 2014

[5] N.V.Gowtham Deekshithulu, G. Ravi Babu,R. Ganesh Babu and M. Siva Ramakrishna “Development of Software for the Microcontroller Based Automated Drip Irrigation System Using Soil Moisture Sensor” International Journal of Current Microbiology and Applied Sciences ISSN: 2319-7706 Volume 7 Number 01 (2018)

[6] Gautam, I., and Reddy, S. R. N., “Innovative GSM-Bluetooth based remote controlled embedded system for irrigation”, International Journal of Computer Applications, Vol. 47, No. 8, 2012, pp. 1.

[7] Purnima, S.R.N. Reddy “Design of Remote Monitoring and Control System with Automatic Irrigation System using GSM-Bluetooth” ,International journal of computer Applications Volume 47– No.12, June 2012

[8] LaxmiShabadi, NandiniPatil, Nikita. M, Shruti. J, Smitha. P&Swati.C, “Irrigation Control System Using Android and GSM for Efficient Use of Water and Power”,International Journal of Advanced Research in Computer Science and Software Engineering, Volume 4, Issue 7, July 2014.

[9] Abhinav Rajpal, Sumit Jain, Nistha Khare and Anil Kumar Shukla, “Microcontroller based Automatic Irrigation System with Moisture Sensors”, Proceedings of the International Conference on Science and Engineering, 2011, pp. 94-96.

[10] Mahesh M. Galgalikar and Gayatri S. Deshmukh, “Real-Time Atomization of Irrigation system for Social Modernization of Indian Agricultural System”, Proceedings of the International Journal of Computer Applications, Volume 1, 2010.

[11] K.Prathyusha, M. Chaitanya Suman, “Design of Embedded System for the Automation of Drip Irrigation”. IJAIEM (2319-4847), vol 1, Issue 2, October 2012

[12] Rajeev G Vishwakarma, “Wireless Solution for Irrigation in Agriculture”, Proceedings of the International Conference on Signal Processing, Communication, Computing and Networking Technologies,2011

[13] Chaitali R. Fule and Pranjali K. Awachat, “Design and Implementation of Real Time Irrigation System using a Wireless Sensor Network”, Proceedings of the International Journal of Advance Research in Computer Science and Management Studies, Volume 2, Issue 1, January 2014