Smart Irrigation System Using IOT

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Abstract- *Agriculture in villages and cities plays an essential role in developing the country. Basically, agriculture depends on the monsoons but because of global warming we don't have enough water sources. To overcome this problem, the Smart irrigation system using Iot is employed in the field of agriculture. In this system, based on the soil type and moisture level, the water will be provided to the agricultural field. This particular project is an application of Internet of Things (IoT) Technology.The setup uses soil moisture sensors which measure the exact moisture level in soil, and Rain Sensor which indicates that it is raining and will stop the motor. Hence, saving the electricity. This value enables the system to use appropriate quantity of water which avoids over/under irrigation. Cloud Computing is an attractive solution for data analysis and to the large amount of data generated by the wireless sensor network. This paper proposes a cloud-based wireless communication system to monitor and control sensors and actuators to assess the plants water requirement.*

Keywords- Arduino Uno, Sensors, Microcontroller, IOT

I. INTRODUCTION

Agriculture is the unquestionably the largest livelihood provider in India. With rising population, there is a need for increased agricultural production. In order to support greater production in farms, the requirement of the amount of fresh water used in irrigation also rises.

Currently, agriculture accounts 83% of the total water consumption in India. While water saving is most crucial, it is equally important to provide water for irrigation to increase the food production and livestock husbandry, to ensure food security for the increasing population [1].

The Internet of Things (IoT) is concerned with interconnecting the communicating objects that are installed at different locations that are possibly distant from each other. Internet of Things (IoT) is a type of network technology, which senses the information from different sensors and operates accordingly to join anything to the Internet to exchange information [2].

The global irrigation scenario is categorized by increased demand for higher agricultural productivity, decreased availability and, poor performance of water for agriculture. These problem scan be appropriately rectified if we use automated irrigation system [3].

Recent advances in soil water monitoring combined with the growing popularity of Wireless Sensor Networks make the commercial use of such systems applicable for agriculture and Gardening. The system designed is programmed to irrigate at regular time intervals for predefined periods of time [4]. The traditional farmland irrigation techniques require manual intervention and with the automated technology of irrigation, the human intervention can be minimized.

In traditional irrigation system water saving is not considered. Since, the water is irrigated directly in the land, plants under go high stress from variation in soil moisture, therefore plant appearance is reduced

The absence of automatic controlling of the irrigation system result in improper water management system and the presence of human error is maximised.The main objective of this paper is to provide an automatic irrigation system thereby saving time, money & human efforts.

The main theme of this project is to develop a device that can monitor the moisture content of the soil and turn on/off the water pump automatically whenever the moisture drops below or goes above a threshold value. It also uses Rain Sensor which detects the rain, if it is raining then it turns off the motor. This device can also be programmed to send an email to the user regarding the moisture status from a remote location.

II. LITERATURE REVIEW

Development of Smart Irrigation System designed by Archana and Priya (2016) proposed appear in which the soil and humidity moisture sensors are placed in the root area of the plant. Based on the sensed values the microcontrollers used to control the supply of water to the plant. This system doesn't provide the status to the farmer [5].

Arduino based smart irrigation system using Iot is designed by R.Nandhini1S.Poovizhi2, PriyankaJose3, R.Ranjitha Dr.S.Anila5 (2017) proposed a paper in which soil

parameters such humidity, soil moisture, pH value and temperature are measured for getting field information from soil. This system is automated which turns the DC motor ON/OFF as per the level of moisture in the soil. The current field status is given to the farmer. No cloud software are used to analyze the data retrieve from the sensors.[6].

Ms. Swapnali B.Pawar1, Prof. Priti Rajput2, Prof. Asif Shaikh3proposed a paper in which the system derives The system is a combination of wireless sensors and a wireless base station which can be used to provide the sensors data to automate the irrigation system. The system can use the sensors such as soil moisture sensor and temperature sensor. This system uses raspberry pi microcontroller which has limited memory storage. [7].

Smart irrigation system using moisture sensor using Iot is designed by S Nalini Durga1, M Ramakrishna2 has proposed a paper that can be used for application of accurate amount of fertilizer, water, pesticide etc. to enhance productivity and excellence. Sensors are hopeful device for smart agriculture. The real time environmental parameters like soil moisture level, temperature level and tank water level have continuous influence on the crop lifecycle. This system does not intimate any information to the user or farmers. [8]

Arif Gori1, Mangles Singh2,Ojas Thanawala3,Anupam Vishwakarma4,Prof. Ashfaque Shaikh5 has Proposed a System in which the project aims at saving time and avoiding problems like constant vigilance. It also helps in conserving water by automatically providing water to the plants/field depending on the water requirements. This system can also prove to be helpful in agriculture fields, parks, cricket field and lawns. The objective of this system is to detect the moisture content of the soil and depending on it sprinkle water. The system does not use any cloud software for analysis of data. [9]

III. PROPOSED SYSTEM

This system is a combination of hardware and software components. The hardware part consists of different sensors like soil moisture sensor, Rain sensor , microcontroller ,etc whereas the software part consists a cloud based web application which we are using BOLT cloud connected to the arduino UNO board and other hardware components using Internet of Things (IoT).

The main components of this diagram are Sensors, Arduino uno microcontroller, Wi-Fi connection, relay, motor, and LED.

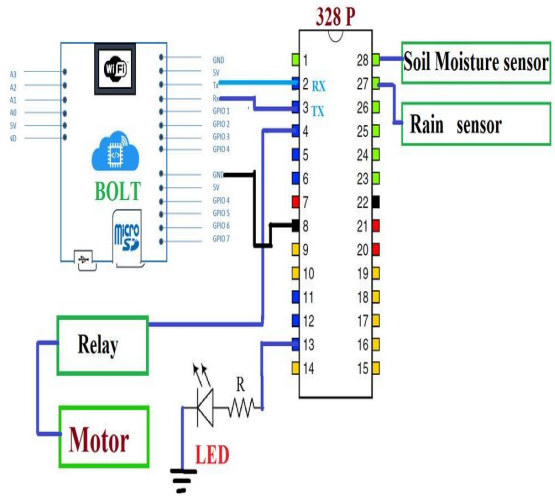
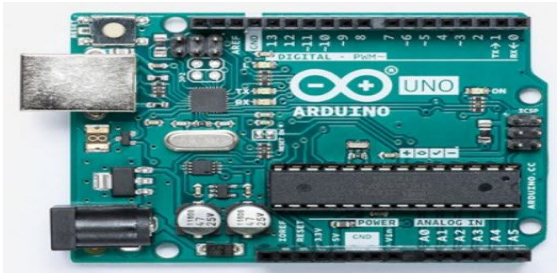


Fig 1: Irrigation Control System (Transmitting Section)

The above figure shows that main block diagram of smart Irrigation control system. In that main model is Arduino uno microcontroller, Relays, LDR, Sensors. In this control system two sensors are such as soil moisture sensors, rain sensor, are connected to the Arduino unocontroller, also Wi-Fi connection is connected to the model.

ARDUINO UNO

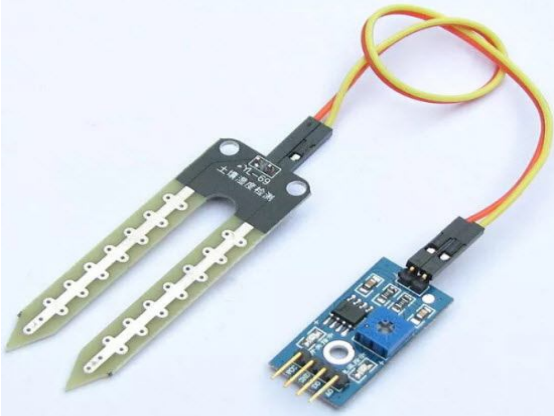
It acts as the brain of the system and sends voltage to the water pump.The Arduino UNO is one of the most used microcontrollers in the industry. It is very easy to handle, convenient, and easy to use. The coding of this microcontroller is very simple. The program of this microcontroller is considered as unstable due to the flash memory technology and it contains one SRAM of 2 KB and one EEPROM of 1KB. The applications of this microcontroller involve applications like security, home appliances, remote sensors, and industrial automation. This Arduino Uno has the ability to be joined on the internet and perform as a server too.



SOIL MOISTURE

This will be used to sense the moisture changes in the soil.Soil moisture sensor are one kind of sensor used to detect

the soil moisture content. This sensor has two outputs the analog output and digital output. The digital o/p is permanent and the analog o/p threshold can be changed. LED gives an indication when the output is Low or High.

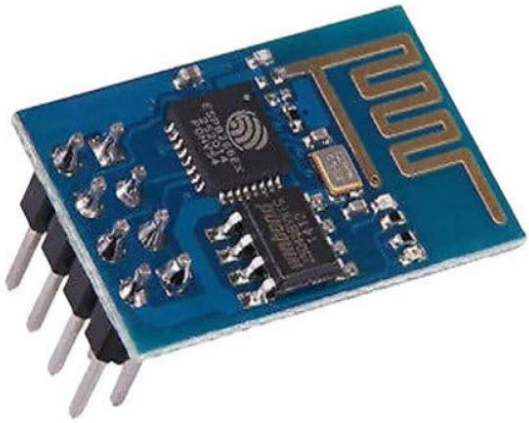


RAIN SENSOR

This will be used to sense the Rain. If it is raining the sensor will sense the rain and automatically turns off the motor. When it stops raining the rain sensor senses no rain and automatically turns on the motor. The sensor has two outputs analog and digital. We need analog output.

WIFI MODULE

In the agriculture field, sensors are used such as soil moisture sensor. The information received from the soil moisture sensors is sent to the Cloud through Arduino . In the control section, the system is activated using a web page and we can control through ON/OFF buttons. Also, this system is automatically activated when the soil moisture is low, the pump is switched ON based on the moisture and water content in the soil.



IV. WORK FLOW OF THE SYSTEM

It states the steps that the proposed system undergoes.

- Start the process
- Initialize power is supplied to GSM
- Check the moisture level(less than or more than- set the threshold value)
- If the level will be more than a fixed criterion, no need for irrigation.
- If Moisture level is less than the fixed criteria, start the irrigation.
- Initialization of pump and pipe
- After the process completed, it moves back to its original state.
- Stop the process.

V. SYSTEM WORKING PROTOTYPE

The Smart irrigation System is basically working upon the idea of water level management. We are using a Soil moisture Sensor which will read and collect the data from the sensor and send it to the Arduino board. Rain Sensor informs about raining status and according to that turns on/off the motor.

A pipe with rain gun irrigation mechanism is attached to the water pump; the other end of the pipe is in the plant. Whenever the moisture level from the plant drops down the threshold value, LED lights up indicating water pump to start till the moisture level matches the threshold value. The Rain Sensor senses the rain and immediately stops the water pump. Arduino UNO can be programmed to process the data and turn on/off the pump to supply water based on the moisture level. This device Uno Microcontroller can also be programmed to

send the user an update via email regard to the moisture level changes from a remote location.

VI. RESULTS

The optimum water moisture level for clay soil is 11-10%. The moisture level is different for different soil. The optimal level is programmed in the Arduino based on the soil type ,if the water level goes below threshold value the plant is watered .The automated control is implemented to avoid damage of crops due to surplus water. The already existing system uses simple water pumps to supply water to the crops as and when required by manual control. The proposed system uses automatic control by using continuous monitoring by checking moisture level after some defined time interval. Thus the continuous monitoring of the agriculture was designed and developed using various microcontrollers and sensors. In existing method, only discontinuous watering was obtained by the use of GSM which led to inefficient use of electricity and water. Hence by using this method, the water and electricity was used efficiently. Compared with the existing method it gives much better performance. So we can avoid these problem in a very efficient and innovative manner with the help of micro controller with the help of wireless technology of protocol through very sensitive sensors.

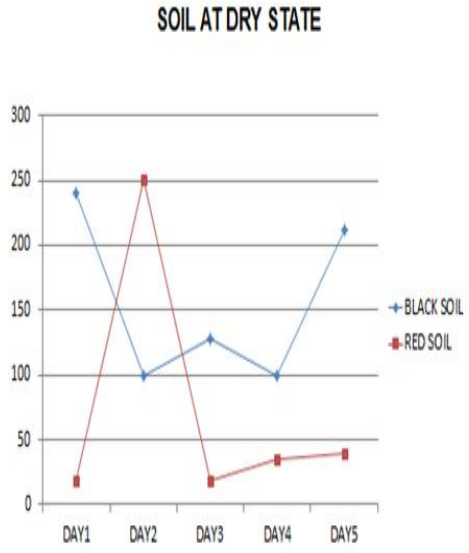
The moisture sensor is interfaced with the microcontroller. The input data signals from the moisture sensor are sent to the microcontroller and based on that it activates the DC Motor with the help of a motor driver. After the soil gets wet and reach predefined threshold value set in moisture sensor , the Motor gets switched off automatically. Simultaneously it is possible to send email to mobile . Thus, the smart water irrigation motor can be controlled by using a mobile and a GSM modem. The optimum level is programmed, if the level goes below the optimal level the motor is turn on to sprinkle.

Sensor in Air	**Sensor in Dry soil**	**Sensor in Humid soil**	**Sensor in Water**
0	**0<value<300**	**300<value<700**	**Value>700**
Ideal value=0	**Ideal value=35**	**Ideal value=578**	**Ideal value=934**

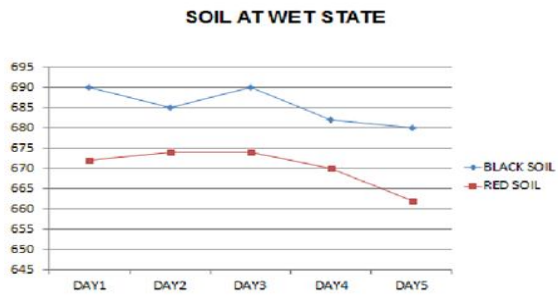
MOISTURE SENSOR READING:-

DRY STATE READING :

BLACK SOIL	**RED SOIL**
240	19
100	251
128	18
100	35
212	40



BLACK SOIL	RED SOIL
690	672
685	674
690	674
682	670
680	662



VII. CONCLUSION

The main objective of this smart irrigation system is to make it more innovative, user friendly, timesaving and more efficient than the existing system.

Automated irrigation system has a huge demand and future scope too.

It is time saving, led to removal of human error in adjusting available soil moisture levels and to maximize their net profits in accordance to factors like sales, quality and growth of their product.

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[7] Ms. Swapnali B.Pawar1, Prof. Priti Rajput2, Prof. Asif Shaikh3 Proposed The system can be used to control the water motor automatically.

[8] S Nalini Durga1, M Ramakrishna2design this paper presents irrigation monitoring and controlling system.

[9] Arif Gori1, Mangles Singh2,Ojas Thanawala3,Anupam Vishwakarma4,Prof. Ashfaque Shaikh5 has Proposed a System.