Smart Irrigation System Using IoT

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***Abstract*- Irrigation is one of the traditional practice and involves higher percentage of laboursin daily agriculture sector. To water the plants automatically, sensors and Microcontrollers are available to determine when the plants needs water. Automation involves improving the speed of production, reduction of cost, effective use of resources. The main role of this project is to develop a Microcontroller system to irrigate the plant automatically and the information is been sent to the farmers.**

Keywords: **Smart irrigation, IoT, Soil moisture sensor, DC motor, water level sensor.**

I.INTRODUCTION

Agriculture provides the major contribution to our Indian economy and India holds second across the world in farm outputs. As of 2018, 50 % of Indian work force depends on agriculture and it contributes about 17 % - 18 % to our country's GDP.In India, most of the irrigation system is manually operated. Water scarcity is increasing rapidly and our country is in a situation to save each drop. Thus traditional method of irrigation can be replaced by automated irrigation by using the current technologies.In this technique, the soil moisture sensor is kept near the roots of the plants and this sensor senses the moisture and transmits the information to the microcontroller which controls the flow of water to the plants.

In the manual operation when the farmer fails to turn off the motor, it leads to wastage of electricity and water. To overcome these flaws, the motor can be turned ON and OFF automatically by the Smart Irrigation System. This motor operation mainly depends upon the atmosphere, soil condition and moisture condition. To determine the above parameters,various sensors like soil moisture sensor and temperature and humidity sensor is used. In addition for better cropping system,soil conditions are updated on regular basis by monitoring moisture level of the field area. This will improve the cultivation.

[1]In our traditional method of farming, more number of labours are involved to irrigate the plants. To reduce the intervention of farmers and to convert this process into an automated one, many sensors like soil moisture sensor and temperature sensors etc., are used and the output of these sensors is been connected to the microcontroller.[2] The technology is getting advanced day by day which inturn reduces the complications and the threats involved in the process. Embedded and micro controller systems provide solutions for many problems. This system automatically controls water system for irrigation land by using asensorbased Microcontroller system. This can be done by placing the sensors in the agricultural land to supervise the temperature of the soil and soil moisture sensor which passes the information to the Microcontroller. [3]This system supply the water flow automatically by using the soil moisture sensor. This paper makes the application of Sensor based Irrigation system through wireless sensor networks, which uses a renewable energy as a source. In this project wireless sensor networks are used to irrigate the plants. [4] The objective of this Smart Irrigation System is to develop an irrigation mechanism which is entirely an automated one which turns the motor ON and OFF automatically by detecting the moisture content of the agricultural land using the soil moisture sensor without the direct involvement of labour.[5] Automation irrigation system using an ESP8266 board using internet being remotely controlled operating system. This Smart Irrigation System project makes the motor ON and OFF and sends the message to the user. This system is traditional to farming methods. [6] IoT based smart Irrigation Management Systems can helps on irrigation management systems in achieving utilization of water resources in the farming landscape. This irrigation system helps in the efficient usage of water and irrigation to the land in a very precise manner.

II. PROBLEM STATEMENT

During day to day activities many people forget to water theirplantsand this becomes very challenging tasks to keep their plants healthy and alive. To avoid these problems and to improve the growth of the plants automated irrigation system is developed. Therefore, our project is to provide smart irrigation system to water the plants and to inform the user through the message. This project also helps the user about the water level present in the tank and it also gives the soil moisture content of the soil. This project also helps to determine the temperature and humidity of the environment

III. PROPOSED SYSTEM

Smart Irrigation system is developed by using the Microcontroller i.e., Arduino UNO and it plays a main role in this automated system. The sensors like soil moisture sensor, water level sensor and the temperature sensor are connected to

the microcontroller. Thus the output of these of these sensors are fed into the Arduino UNO.

On receiving the signal from those sensors, the Microcontroller gives the appropriate output that turns on the relay according to the soil and the atmospheric conditions and operates the water pump. This soil moisture sensor determines the soil condition and it is expressed in terms of voltage.

Then it compares the output voltage with the reference voltage. If the reference voltage is higher than the soil condition expressed in voltage, then the pump gets turned ON and the agricultural land is been irrigated automatically by the signal which is been provided by the relay. In the vice versa condition, the relay does not operate, the pump remains in the OFF condition.

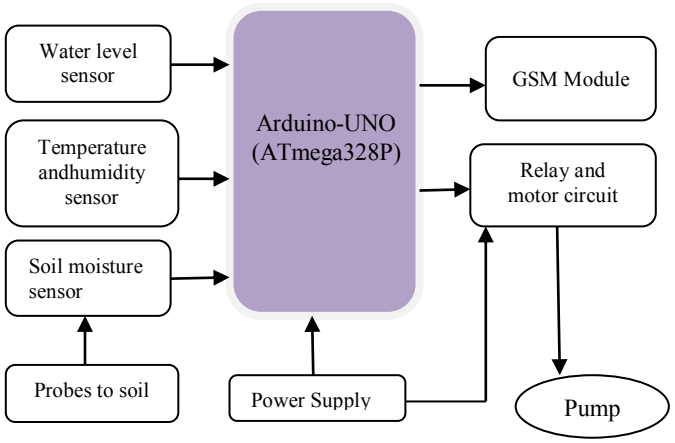

Fig.No:1 Block Diagram

On receiving the signal from the soil moisture sensor the Microcontroller gets analog signal which is converted into digital signal. The program is already done in the Microcontroller and the signal is given to the relay circuit. Based on the signal given to the relay circuit the motor gets turned ON or OFF.

Once the temperature is low the soil becomes wet, the voltage is higher than that of the reference voltage then low signal goes to the Microcontroller ["logic 0"] which makes the motor to turn OFF and it stops pumping the water. The voltage is obtained from the comparator which is present inside the sensor. When the sensor is placed in the field there will be conductivity. When there is good conduction that implies the presence of moisture content, as water is the good conductor of electricity.

Then, the signal is passed and the motor is turned OFF by necessary signals. And when there is no conduction has indicates the absence of water content hence the motor is turned ON by necessary signals generated by the Arduino.When the control signal is sent to turn on the motor, the relay switch is closed and the motor is connected to the circuit and the water is pumped to the plants. Similarly if the control signal is to turn OFF the motor, then the relay switch is opened and the motor is not given supply so the motor is turned OFF. Thus the necessary water is provided to the plants when they are in need, this is done according to the program burned in the Arduino. Here the frequent monitoring is not required.

GSM: Global System for Mobile Communication which is mainly used for mobile communication. With the help of GSM the information regarding the ON and OFF state of the pump can be sent to the user. To transfer the message to the user this GSM module uses the TDMA technique

Relay:The relay plays a major role in this irrigation system since it provides the necessary information for the pump whether the pump has to be turned or not. These relays acts as switches opens and closes whenever it is needed.

Pump:A pump is a component which consists of a motor which converts the electrical energy to mechanical energy.This rotational movement increases the pressure of the water in the tank or well. Since the pressure is high it takes the water from the well and it is used in the agricultural land.

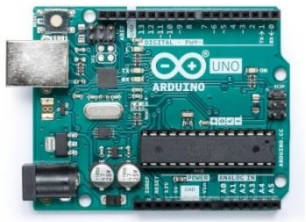

Fig.No:2 Arduino UNO

Fig No:2 describes Arduino UNO. Arduino plays a key role in this irrigation system. The output of all the sensors has been provided as the analog inputs to the Arduino. This Microcontroller converts analog inputs into digital outputs. These digital output signals are connected to relay. The output is again provided to GSM Module. These digital outputs are generated from the program which is alreadr burned in the Microcontroller.

Fig No: 3 describes the soil moisture sensor. Soil Moisture sensor senses the moisture level in the soil. This moisture level sensor acts based on the resistance. If the resistance value is low this shows the high moisture content in the soil. If resistance is high this shows the dryness of the soil. This signal is given to the Microcontroller and this makes the relay to be operated.

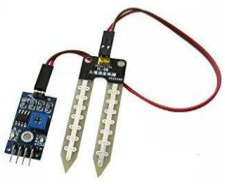

Fig.No:3 Soil Moisture Sensor

Fig No:3 measure the volumetric water content by using some other property of the soil, such as electrical resistance, dielectric constant, or interaction with neutrons, as a proxy for the moisture content. The relation between the measured property and soil moisture must be calibrated and may vary depending on environmental factors such as soil type, temperature, or electric conductivity.

Fig No:4 detects the levels of water in the tank. Water level sensor is placed in the tank to determine the water level. The reference value is given to the sensor as the minimum required level. If the water level goes below the reference level it gives the information about the water level to the user.

Fig.No:4 Water Level Sensor

Fig No:5 describes the temperature and humidity sensor. If the water level is above the specified value or below the specified value, the sensor will indicates to mobile. The photoelectric water level sensor operates using optical principles. It is used in modern applications because of its advantages like good sensitivity and absence of mechanical parts. The corrosion resistance probe is mounted easily and it withstands very high temperature and pressure.

Fig No:4is a low cost sensor which measures both temperature and moisture by detecting changes that happens in the atmosphere. It operates on 3.3V to 5.5V. The humidity measuring ranges from 20 % to 90 %. The temperature measuring range is from 0˚C to 50˚C.The temperature and humidity sensor has three pins. It has communication port, power ground and power supply pins.

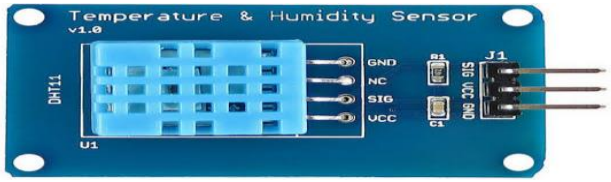

Fig.No:5Temperature and Humidity Sensor

IV. CASE STUDY

The Survey has been done on the number of soil moisture sensors that are required for the lane for the process of irrigation system. This mainly depends on the type of moisture sensor that we use. Based on the recent technologies, the moisture is measured at every 6 inches to 48 inches depth are sometimes just at 12,24 and 36 inches. The number of sensors used may vary depending upon the manufacturing companies. the soil moisture sensor consists of two probes such that each probe is nearly 3 inchwide and 4 inch long. A progressive farmer a village adopted a fully automated irrigation system in sugarcane farming. His farm is in Karur district and he resides in the Chennai and manages the farm operations by prescheduled comments in the mobile phone. The entire unit is operated with 24 hours power back-up. For example, let us consider abanana plant, the total requirement of water throughout their lifecycle is nearly is about 900-1200mm and this can be satisfied either by rainfall or automated irrigation process. In general, the irrigation of the banana plantations every 3-4 days during summer season and at 7-8 days interval during winter season is recommended.Thus the irrigation depends upon the type of soil, crops and the atmospheric conditions.

V.RESULT AND DISCUSSION

Smart irrigation system is implemented in agricultural lands. The moisture sensor is kept in the soil and it gives the analog signal to the arduino and the analog signals from the water level sensor and temperature and humidity sensor is given to the arduino. Theanalog signals are converted into digital signals and the motor gets turned ON.
The message signals are given to the user as a message and the user knows whether the motor gets turned ON or OFF

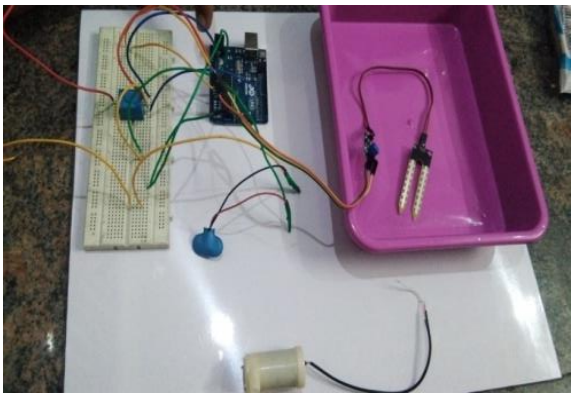

Fig.No:6Experimental setup

VI.CONCLUSION

The smart irrigation system can be widely used so as to reduce the wastage of water and to provide the healthy plants and agriculture. In our project the motor can be turned ON and OFF automatically by using relay which controls this

operation. The plants get the required amount of water from the water tank or water storage that is connected to the motor. Proper monitoring of water level to the plants is done by this project. Itprovides correct amount of watertoplants whenever it is necessary. The health and growth of the plants can be maintained. Menwork and labour cost is reduced as the farmersare not required to continuously check for the irrigation process. The water wastage has been reduced which has many economic benefits hence this project gives benefit in economic side too. In order to avoid water issues in agriculture Smart Irrigation will be the best solution.

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