Solar Powered Automatic Irrigation System

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Abstract— The main objective of this paper is to provide auto irrigation system by sensing the soil moisture level. Moisture sensing is done by soil moisture sensor. Moisture level of the soil is below a certain level then the sensor sends the value to the microcontroller. According to the value that is sensed by the sensor, the water is supplied to the irrigation land automatically to the desired level in order to maintain the moisture content in the soil. It is the proposed solution for the present energy crisis for the Indian farmers. The project helps to reduce the wastage of water and minimize the manual labour on field for irrigation. Also helps to reduce the human intervention.

Keywords: Auto Irrigation System; Soil Sensor; Rain Sensor; Temperature and Humidity Sensor; Solar Power; Energy Crisis

I. INTRODUCTION

Agriculture is considered as the basis of life as it is the main source of food and other raw materials. It plays vital role in the growth of country's economy. Many farmers still use the traditional methods of farming. In India most of the irrigation systems are manually operated ones. These outdated techniques are replaced with automated techniques. The project focuses primarily on reducing the wastage of the water and minimizing the manual labor on field for irrigation. [1]

The proposed system will allow farmers to continuously monitor the moisture level in the field. When moisture goes below a certain level in the field, sprinklers would be turned on automatically, thus achieving optimal irrigation using Internet of Things (IOT). [2]

In the recent days, as per the newspaper, Bangalore has topped 2nd position in the world for the scarcity of water resources. The proposed system uses solar energy to produce the required electric energy using solar panel. The moisture level of the soil is sensed by the sensor inserted into the soil which gives signal to the microcontroller whether the lands need water or not. The signal from the sensor received through the output of the comparator and it is preceded with the instruction from the program stored in the microcontroller. When the soil is dry, motor ON and in the wet condition, motor OFF. This condition of the motor ON and OFF is displayed on a 16*2 LCD.

The system proposed contains the solar panel, which converts the sunlight into electrical power. This power is stored in the battery which can be transferred for the functioning of the entire module. The power from the battery is also used to power on the pump and also used to power the electronic circuits that transfer the power to the sensors. This power is stored in the battery which can be transferred for the functioning of the entire module. The power from the battery is also used to power on the pump and also used to power the electronic circuits that transfer the power to the sensors.

There are many plants which required minimum level of the moisture. If the required level of the water is not provided then the plant will die and results in low production. To irrigate the crop according to the moisture sensor. Due to the presence of sensor, crops will irrigate properly.

II. METHODOLOGY

The solar panel is used as a source of energy through which the battery is charged. Soil moisture sensors measure the water content in the soil which help farmers manage their irrigation system more efficiently. The soil sensor is interfaced to an Arduino UNO and ESP8266 Wi-Fi module which allows to collect number of different readings from the sensor. The microcontroller uses the rain sensor and the soil moisture sensor readings to determine if moor should be ON/OFF. The data collected is sent to the cloud which is then displayed in various forms, accessible on a public website. There are many benefits using cloud to store data, the reduction of initial costs for hosting a service. The data can be accessed anywhere as long as you can have any computer devices and Internet access.

Different types of crop will have different program stored in the microcontroller. Each type of crop will have different levels of humidity for their normal growth.

III. PROPOSED SYSTEM

It provides regular water supply whenever it is required and it reduces the human error for analyzing land soil condition and weather condition like moisture. When the moisture level is low and there is no rain. The motor turns ON, supplies the water to land from the tank. In this project IOT is used for communication and storing data.

The system is being constantly controlled by ATmega328 microcontroller. In the case, moisture level being low and no rainfall in the field a signal will be sent to the microcontroller by the sensors used. The microcontroller is used to check the program for different conditions.

The system that has been proposed uses solar panel to supply power for the system. Four sensing devices are used namely moisture sensor, rain sensor, temperature and humidity sensor and ultrasonic sensor.

The water in the soil is being measured by the soil moisture sensor. The water level in the tank is being measured by the ultrasonic sensor. The rain sensor is used to measure if it is raining in the field or not. The temperature and humidity in the field is measured by the temperature and humidity sensor. The sensed value is sent to microcontroller, the microcontroller is the decision maker of the system. Depending on the decision, if the water level in the field is low the motor is turned ON.

Thus, depending on the nature of the crop required amount of water is being supplied. The presence of soil moisture and relay unit will make the irrigation automated.

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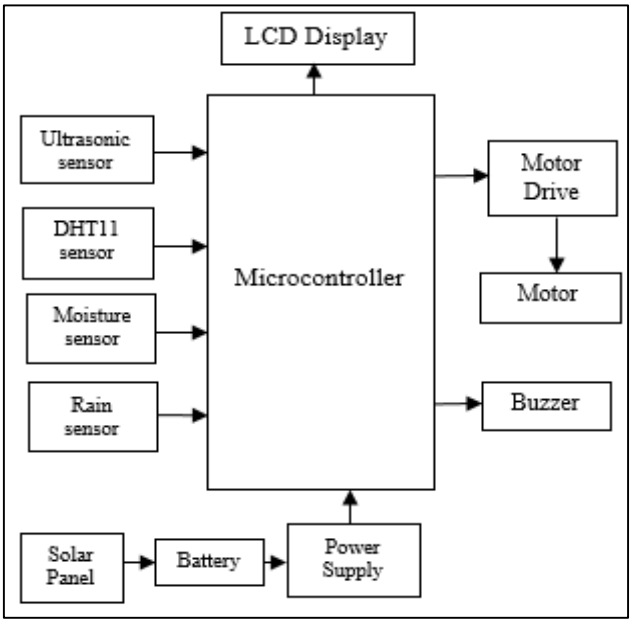

Fig. 1: Block Diagram of Solar Power Auto Irrigation System

The entire system uses solar energy. The solar panel gives a supply of 12V to the battery. The battery stores the energy and supplies it to the microcontroller and other devices. The microcontroller needs 5V supply and the motor needs 230 V supply. The electrical energy required for the process is conserved as solar energy is being used.

IV. HARDWARE AND SOFTWARE SIMULATION RESULTS

The proposed system contains the solar PV panel which converts light into electrical power. This energy is stored in the battery for the later use. The submersible pump helps to pump and store the water in the tank. These system uses ultrasonic sensor, soil moisture sensor and rain sensor.
Ultrasonic sensor is to detect the water level in the tank. Soil moisture sensor is used to sense the moisture of the soil and rain sensor to detect the rainfall, depending upon the values obtained from the moisture sensor, the microcontroller turns on the motor to irrigate the land.

The user is updated with the current status of weather condition and the crops with the help of IOT and cloud.

The system consists of the following hardware components:

1) Solar panel
2) Arduino UNO (ATmega328)
3) Ultrasonic Sensor
4) Soil Moisture Sensor
5) Rain water Sensor
6) DC motor.

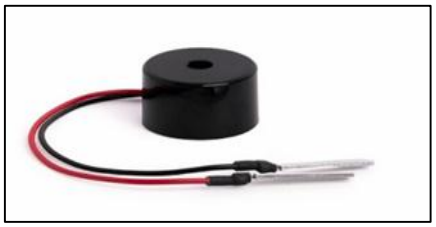

Fig. 2a: Soil Moisture Sensor

Fig. 2b: Rain Sensor

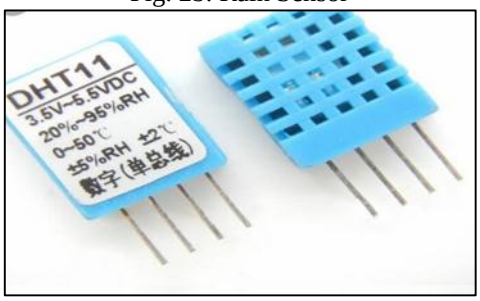

Fig. 2c: Temperature and Humidity Sensor

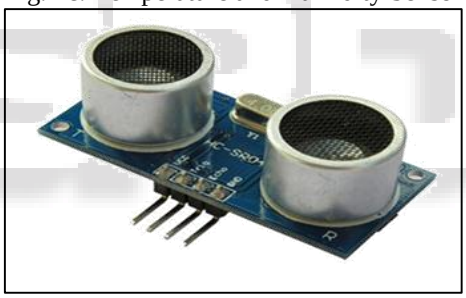

Fig. 2d: Ultrasonic Sensor

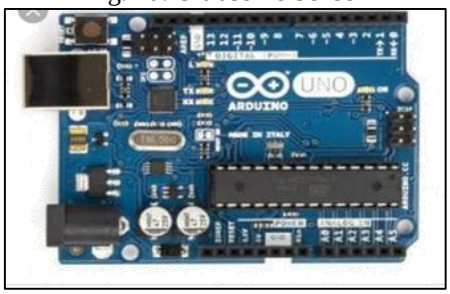

Fig. 2e: Arduino UNO

Fig. 2f: Hardware Setup

V. CONCLUSION

The smart irrigation system is implemented for better use of water resources for agricultural production. Since it is solar based, it helps in saving energy and fuel cost. The sensing device in the tank checks the level of water preventing over flow. There is also a sensing device to check the availability of rain during which there is no need of supplying water to crops.

The system can be used to switch ON/OFF the water sprinkler depending on the soil moisture level making irrigation process simple. Through this paper it can be concluded that there is considerable development in irrigation with IOT and automation and is a solution to problems faced in existing process of irrigation.

REFERENCES

[1] 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 Electrical and Electronics Engineering, Volume 2, Issue1, January 2014.
[2] M, Lincy Luciana, B. Ramya, and A. Srimati, "Automatic Drip Irrigation unit using PIC Controller", Proceedings of the International Journal of Latest Trends in Engineering and Technology, Vol.2, May 2013.
[3] H.T ingale and N.N. Kasat," Automated Irrigation System", Proceedings of the International Journal of Engineering Research and Development, Volume 4, Issue11, November 2012.
[4] K. Prathyusha, M. Chaitanya Suman, "Design of embedded systems for the automation of drip irrigation", International journal of application or innovation in engineering of management, vol1, Issue2, October 2012.
[5] Cuihong LiuWentao RenBenhuaZhang ChangyiLv, The application of soil temperature measurement by LM35 temperature sensors, International conference on Electronic and Mechanical Engineering and Information Technology (EMEIT), 2011.
[6] Andrew J. Skinner and Martin F. Lambert, "An Automatic Soil Pore- Water Salinity Sensor Based on a Wetting- Front Detector", IEEE Sensors journal, vol.11, no.1, January 2011.

