DEVELOPMENT OF AUTO IRRIGATION SYSTEM USING SOIL MOISTURE SENSOR AND RAIN SENSOR

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Structured Abstract-
Purpose: As continuous monitoring of crops by humans is not possible all the time. This project will help to irrigate crops without the help of human intervention.
Methodology: The sensors placed will detect the moisture content, environmental temperature and also detects the rainfall and the information is sent to a micro controller.
Objective: Monitor the soil moisture, environmental temperature and rainfall automatically supply water in the field.
Findings: The production is increased and water is not wasted.
Practical implications: It monitors the soil and environment of plants which helps in healthy growth of plants.
Social implications: As there will be no wastage in irrigation of crops. The food demand can be satisfied.
Originality/Value: For effective production and also reduces work for farmers.

Abstract:
It is an improved version of agricultural methods in irrigation practices. Farmers primarily depend on personal monitoring and their experience in irrigating the fields, and as a result, irrigation becomes largely inefficient and eccentric. India, therefore, requires a simple irrigation solution on which the farmers can depend indefinitely, which can habituate to the local climatic conditions, and accurately forecast the quantity of water required by the crops for judicious utilization of water resources, and additionally a better crop yield. To get this, we use soil moisture sensor, temperature and rain sensor to analyze the environmental conditions and this analysis is sent to microcontroller.
Key words: soil moisture sensor, temperature sensor, rain sensor, Microcontroller.

1. 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 environment temperature and detects the rainfall using wireless sensor networks. The sensed information is sent 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 based on the sensed information.

The most commonly used soil moisture sensor, temperature sensor dht11 is employed for sensing the data from the field. The most popularly used microcontroller Node MCU is used for processing the sensed information and regulating the water pipe.

Advantages of this proposed system

- Increased efficiency of food production
- Decreased in water wastage
- Decreased wastage of crops

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S.NO.	STUDY	YEAR	ANALYSIS
1.	GSM based Automated irrigation control system for efficient use of resources and crop planning by using an Android Mobile.	2014	The sensors data from agriculture field are fed to the Arduino processor which is linked to user android mobile via GSM module .In this system moisture sensor checks the moisture level and if moisture level is found low then Arduino switches on water pump.
2.	Irrigation management system using soil moisture sensor and Arduino.	2018	It helps the farmers to irrigate the farmland in an efficient manner with automated irrigation system based on soil moisture . The system uses an automatic control by using microcontroller devices . The power supply given to the system helps to drive the motor and LED to work and it is power to Arduino.
3.	Development of software for the Microcontroller Based Automated Drip irrigation system using soil moisture sensor.	2018	They develop one software for automated drip irrigation system using soil moisture sensor.

2. LITERATURE SURVEY

Based on our project, several works were studied and looked upon by us for references, motivation and suggestions which gave us insight into the current developments in the industry in a similar area. One of the papers studied presents the applying of metric capacity unit techniques to optimize irrigation water usage by predicting the longer-term soil wetness of a field in an associate IoT driven good irrigation framework [1]. Another study uses IoT to form devices employed in the system speak and connect on their own, with capabilities like admin mode for user interaction, onetime setup for irrigation schedule estimation, neural-based deciding for intelligent support and remote knowledge watching [2].

This analysis referred to, proposes a sensible irrigation system that helps farmers water their agricultural fields victimization the worldwide System for Mobile Communication [3]. This main focus is on the automated Irrigation System, followed by associate applicable downfall prediction rule which will facilitate the US verify that crops square measure favorable to grow in an exceedingly explicit space [4]. The objectives of this paper square measure to research the thought of a sensible irrigation system victimization IoT, to develop a system victimization associate Arduino Mega 2560 that processes the information from the soil detector that mechanically water the plant and to analyze the period condition of the soil of the plants via the smartphone that's connected to the net [5]. This project uses a straightforward system, employing a microcontroller to alter the irrigation and watering of little potted plants or crops with the smallest manual interventions [6]. This system consists of a solar-powered pump at the side of associate automatic water flow management employing a wetness detector [7].

A system to observe wetness levels within the soil was designed and also the project provided a chance to review the present systems, at the side of their options and downsides [8]. This paper covers the applying of Sensor-based Irrigation systems through wireless detector networks, that uses renewable energy as a supply [9]. This project has given a brandnew style of pump management for the event of a sensible irrigation system coupled with a mobile application [10]. This paper presents an associate ASCII text file technology-based good system to predict the irrigation necessities of field victimization the sensing of ground parameters like soil wetness, soil temperature, and environmental conditions at the side of the forecasting knowledge from the net [11]. This projected system is intended to extend the potency of water and power by star panels to form it eco-friendly. Additionally, this will be enforced on giant or little scales [12].

3.COMPONENTS USED IN THIS SYSTEM:

CAPACITIVE SOIL MOISTURE SENSOR:

This is an Analogcapacitive soil moisture sensor which measures soil moisture levels by capacitive sensing, that is, capacitance is varied on the basis of water content present in the soil. The capacitance is converted into voltage level basically from 1.2V to 3.0V maximum. The advantage of

Capacitive Soil Moisture Sensor is that they are made of a corrosion-resistantmaterial giving it a long service life.

DHT11 Humidity and Temperature sensor:

Temperature sensor senses the temperature from the various range of physical body. It is one of the main things 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 are 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.

Node MCU ESP8266 (Micro controller):

When soil requires water, the micro controller instructs the motor pumps to supply water in the field. The microcontroller Node MCU is used for processing the sensed information and regulating the water pipe. The Node MCU is constructed with ESP8266 chip which is developed with Wi-Fi and Bluetooth. The Node MCU 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**.**

Water pump module:

The DC 3-6 V Mini Micro Submersible Water Pump is a low cost, small size Submersible Pump Motor. It operates from a 2.5 ~ 6V power supply. It can take up to 120 liters per hour with a very low current consumption of 220mA. Just connect the tube pipe to the motor outlet, submerge it in water, and power it.

Relay module:

A relay is an Electrically operatedswitch. Itconsistsof a set of input terminals for a single or multiple control signals, and a set of operating contact terminals. The switch may have any number of contacts in multiple contact forms, such as make contacts, break contacts, or combinations.

RAIN SENSOR:

A rain sensor or rain switch is a switching device activated by rainfall. There are two main applications for rain sensors. The first is a water conservation device connected to an automatic irrigation system that causes the system to shut down in the event of rainfall.

4. EXISTING METHODOLOGY

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 Node MCU for processing the sensed data from the sensor. The data manipulation is done by the centralized Server.

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 Node MCU 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 sent to the user. The communication between the microcontroller and the user is done with the help of GSM module.

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 sent to the microcontroller for further processing of the sensed data from the sensor.

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5. PROPOSED METHODOLOGY

Figure 1 shows the experimental set up of auto irrigation system. In the existing methodology, rain sensor is not placed so that we cannot know about the climaticconditions. As a result, there may be over watering to crops. To reduce this, we use rain sensor to

Figure -1: Experimental set up of auto irrigation system

detect the rainfall in advance so that we can reduce over watering as well as water wastage.

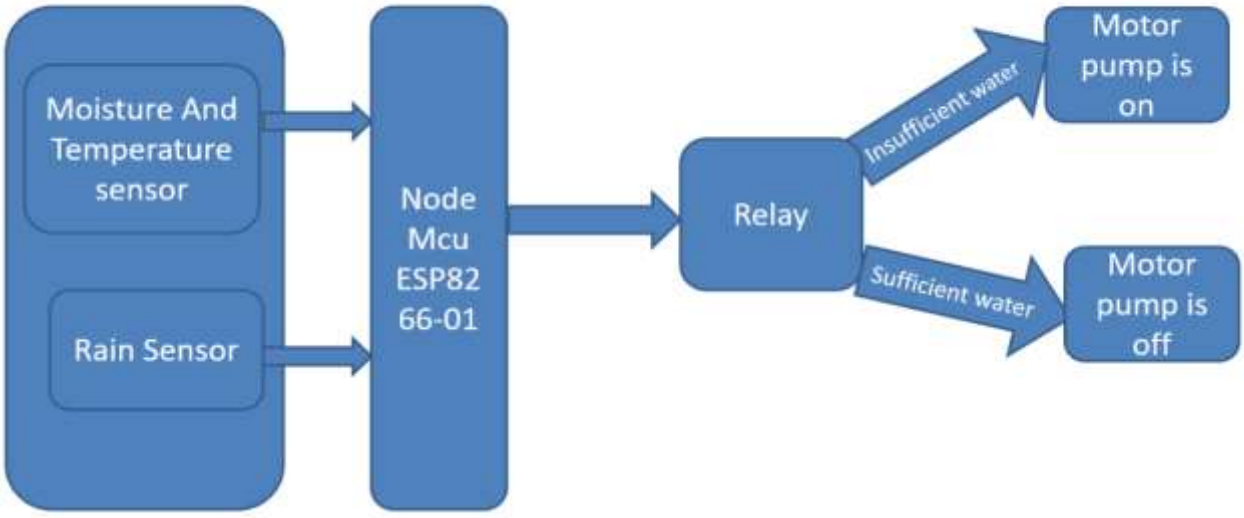

Figure 2: Block diagram of proposed system

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S.No	Parameter name	Ratings
1	Node MCU ESP8266	3.3v
2	Soil Moisture Sensor Module	3.3-5.5v
3	DHT11(Temperature Sensor)	3.5-5.5v
4	Rain Sensor	3.3-5v
5	Water pump Module	-
6	Relay module	-

Table 1: Components used in this system

6. CONCLUSION:

By completing this project, a smart irrigation system has been implemented using capacitive soil moisture sensor and rain sensor. It is an automated system and beneficial for mankind. This project proposes a design for smart irrigation system that implements ready-to-use, energy-efficient, and cost-effective devices.

1. The implemented system is integrated with multi-sensors such as soil moisture sensors, rain and temperature sensors.
2. This proposed system managed to reduce cost, minimize waste water, and reduce physical human interface.
3. The entire system is monitored and controlled by the microcomputer called Node MCU ESP8266.
4. The system is capable of automatic watering of plants depending upon certain parameters

From the point of view of working at remote place the developed micro controller-based irrigation system can work constantly for indefinite time period, even in certain abnormal circumstances. If the plants get water at the proper time, then it helps to increase the production from 25 to 30 %. This system can be used to irrigate very large areas as it only needs to divide the whole land into number of sectors and single microcontroller can control the whole process. It saves human energy, time, cost, etc.

7. Future Scope

This will conclude that the real time data successfully helpful because of low agricultural crops and wrong prediction of weather. The future of this system is wide, internet of things is just opening its arms, same system can be applicable to the variety of applications like data monitoring, sending and controlling of data at location. We can develop this project further by adding camera module to detect whether the plants are getting enough resources and whether they are growing without any resistances. Camera module clicks picture and send it through mail. Our project can be improvised by using a sensor to note the soil ph value such that usage of unnecessary Fertilizers can be reduced.

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