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Smart Irrigation System using Internet of Things

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Abstract: *India is the second-largest irrigated country, but only one-third of the area is irrigated. It is due to uncertain rainfall and lack of water. Most of the areas need canals to be built for irrigation without being depending on the rainfall. The utilization of water is very important for irrigation. The implementation of IoT agriculture starts with intelligent irrigation for the majority of fields. Optimizing the water schedule and quantity of water helps us to save water, money, and have the best crop on the field. Sensor-based IoT technology gathers soil moisture, temperature, humidity data, and transmits this information to farm irrigation systems from sensors. A platform responds to these signals and the drip irrigation switches on as soon as there is insufficient water in the soil. Our Project is designed to overcome the problem of irrigation by reducing the usage of water while watering the plants. The proposed system uses sensors like a soil moisture sensor, temperature, and humidity sensor. The microcontroller is used to send data to Thing Speak. Thing Speak cloud is used to store the data. This system provides a feasible monitoring platform and automates the irrigation process. This leads to a transition from traditional farming to modern farming. Over 74 years since independence, India has made immense progress towards agriculture.*

Keywords: Internet of Things, Sensor, Microcontroller

INTRODUCTION

Agriculture is the major source of income for the largest population in India and is major contributor to Indian economy. However, technological involvement and its usability have to be grown still and cultivated for agro sector in India. Although few initiatives have also been taken by the Indian Government for providing online and mobile messaging services to farmers related to agricultural queries and agro vendor's information to farmers. Based on the survey it is observed that agriculture contributes 27% to GDP, and Provides employment to 70% of Indian population [1]. IoT is changing the agriculture domain and empowering farmers to fight with the huge difficulties they face. The agriculture must overcome expanding water deficiencies, restricted availability of lands, while meeting the expanding consumption needs of a world population. New innovative IoT applications are addressing these issues and increasing the quality, quantity, sustainability and cost effectiveness of agricultural production. Agriculture is the backbone of Indian Economy. In today's world, as we see rapid growth in global population, agriculture becomes more important to meet the needs of the human race**.** However, agriculture requires irrigation and with every year we have more water consumption than rainfall, it becomes critical for growers to find ways to conserve water while still achieving the highest yield. But in the present era, the farmers have been using irrigation technique through the manual control in which they irrigate the land at the regular interval. According to statistics, agriculture uses 85% of available freshwater resources worldwide, and this percentage will continue to be dominant in water consumption because of population growth and increased food demand. There is an urgent need to create strategies based on science and technology for sustainable use of water, including technical, agronomic, managerial and institutional improvements. Agricultural irrigation based on Internet technology is based on crop water requirement rules. By using Internet technology and sensor network technology we can control water wastage and to maximize the scientific technologies in irrigation methods. Hence it can greatly improve the utilization of water and can increase water productivity. The Internet of Things (IoT) is a technology where in a mobile device can be used to monitor the function of a device. The Internet of Things (IoT) is concerned with interconnecting communicating objects that are installed at different locations that are

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possibly distant from each other. Internet of Things (IoT) is a type of network technology, which senses the information from different sensors and makes anything to join the Internet to exchange information. It can also be used to modify the status of the device. The central processing unit will also include communication device to receive data from the sensors and to be relayed to the user's device. This will be done using a higher communication device such as a Wi-Fi module. The data processed by the central module is converted to meaningful data and relayed to the user. The user can view the data with the help of a handheld device such as a mobile phone or a tablet. Nowadays water scarcity is a big concern for farming. This project helps the farmers to irrigate the farmland in an efficient manner with automated irrigation system based on soil moisture. The proposed system has been designed to overcome the unnecessary water flow into the agricultural lands. Temperature, moisture and humidity readings are continuously monitored by using temperature, moisture and humidity sensor and send these values to the assigned IP address. Thing Speak cloud continuously collects the data from that assigned IP address. Once the soil moisture values are exceeded the particular limit then the relay, which is connected to the ESP8266 microcontroller controls the Automation of irrigation system using IoT.

II. PROBLEM STATEMENT/ OBJECTIVE

- To improve and stabilize the crop yields of smallholder farmers through the implementation of sustainable irrigation systems.
- To promote water management practices that optimizes the volume and timing of water distribution.
- To generate positive economic consequences for farmers and their families. Minimize year to year yield fluctuations, leading to higher and more stable farm income.
- To remove human efforts and time required for watering farm along with keeping all data in cloud.
- Smart irrigation technology maximize irrigation efficiency by reducing water waste, while maintaining plant health and quality.

1. Advanced tools and technology can be used to increase farm yield. The microcontroller from the node controls relay switching unit and watering subsystem accordingly.
2. Traditional Irrigation Methods used manual irrigation like Sprinklers, Drip or Trickle Irrigation and Flood Type Feeding Systems. The crops are watered directly in the soil and due to this, the crops undergo high stress and hence the yield is reduced.
3. Irrigation efficiency by reducing water waste, while maintaining plant health and quality.
4. This emerging global water crisis can be solved to a greater extent by deploying automatic irrigation system for crops growth.

Therefore the limitations of the traditional water irrigation system are stated as follows:

- Irrigation is done manually to manage crop growth.
- Water is wasted in large quantity.
- Wastage of time and money.
- Crops undergo high stress.

III. PROPOSED METHODOLOGY

1. All the sensors i.e. moisture sensor, humidity sensor, temperature sensor, is connected to the microcontroller i.e. to ESP8266 Wi-Fi module which will sent all data to Thing Speak Cloud.
2. 5 volts of power is supplied to the micro controller using battery resource.
3. From that microcontroller a relay gets the information about the moisture in the soil.
4. If the moisture percent is low then the motor gets automatically ON and the same data is sent to the Thing Speak Cloud.

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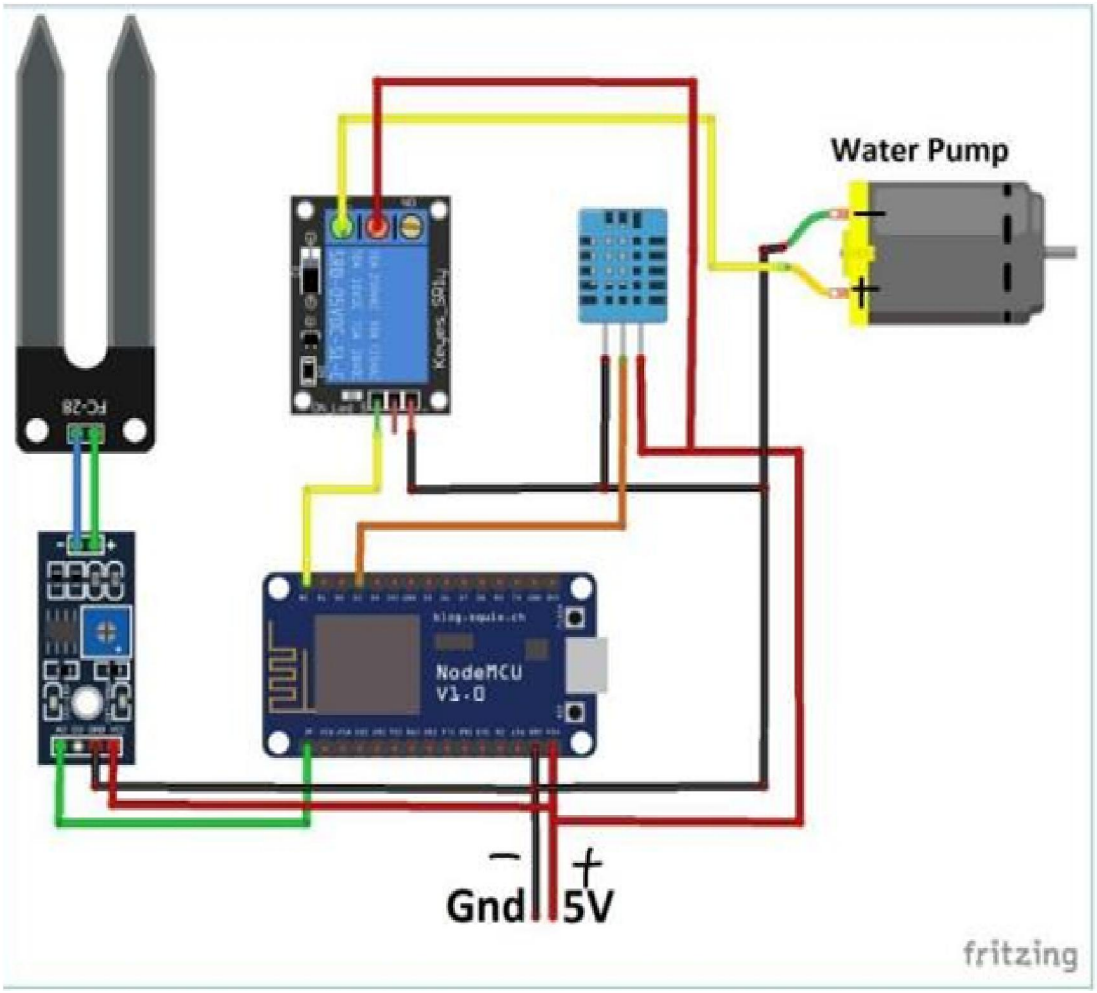
5. ESP 8266 Wi-Fi module based smart irrigation system which consist of some sensors which are connected to controller and sensed values from these sensors are send to the Thing Speak Cloud and motor pump acting according to this values.

IV.BLOCK DIAGRAM



V. CONCLUSION

The agriculture field is being monitored by Thing Speak API. The ESP8266 is the device at field end which receives the messages from Thing Speak API network and manipulates it and will perform the function mentioned in message. After it will send the messages to Thing Speak API network and in turn it will be published to the Client (user end). The ESP8266 is the best device for IoT projects. Since it is small, compact, lightweight, easily programmable, and easily installable and have enough GPIO pins to use them.

By studying this concept project, we are going to provide an automatic irrigation system which is going to save time, money & power of the farmer. Hence stopping and minimizing the manual intervention.

We conclude that by using automated technology of irrigation the human intervention is minimized.

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This project will definitely be going to save water wastage happening due conventional irrigation system and also maintain crop health by using sensors and various components**.**

the smart irrigation system is feasible and cost effective for optimizing the water resources for agricultural production. This type of irrigation system allows cultivation in places with water scarcity thereby improving sustainability.

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