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Smart Irrigation System Using IOT

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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 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 paper 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 Blynk and Thing Speak, Blynk application is used to monitor the data, and 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 75 years since independence, India has made immense progress towards agriculture.*

Keywords: IoT, Irrigation, Water, Sensors, Thing Speak, etc.

I. 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].

Need of automatic irrigation:

- Simple an easy to install and configure.
- Saving energy and resources, so that it can be utilized in proper way and amount.
- Farmers would be able to smear to right amount of water at the right time by automatic irrigation.
- Avoiding irrigation at the wrong time of day, reduce runoff from overwatering saturated soils which will improve crop performance.
- Automated irrigation system uses vales to turn motor ON and OFF. Motors can be automated easily by using controllers and no need of labor to turn motor ON an OFF.
- It is precise method for irrigation and a valuable tool for accurate soil moisture control in highly specialized greenhouse vegetable production.
- It is time saving, the human error elimination in adjusting available soil moisture levels.

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This project uses IOT technology in agriculture, gathering crops growth environmental parameters in a fixed place to help farmers find problems in time. Agriculture experts give guidelines with specific information to increase the farmer's income and help them in the prevention and control of crop diseases and pests. Through the custom development of mobile phone apps, it has been implemented with agriculture technology promotion and expert online FAQ.

The system development composes three parts: The server, Android client and PC client to achieve scalability, high reliability, security, compatibility of technical requirement. The Smart irrigation System has wide scope to automate the complete irrigation system. Here we are built IoT based Irrigation System using ESP8266 (Node MCU) Module and DHT11 Sensor. It will not only automatically irrigate the water based on the moisture level in the soil but also send the Data to Thing Speak Server to keep track of the land condition.

A. Main Objective

1. The main objective of this project is to provide an automatic irrigation system thereby saving time, money & power of the farmer. The traditional farm-land irrigation techniques require manual intervention.
2. With the automated technology of irrigation, the human intervention can be minimized
3. This project will save water wastes happening due to traditional irrigation system using sensors and various components.

B. Motivation

For continuously increasing demand and decrease in supply of food necessities, it's important to rapid improvement in production of food technology. Agriculture is only the source to provide this. This is the important factor in human societies to growing and dynamic demand in food production. Agriculture plays the important role in the economy and development, like India.

Due to lack of water and scarcity of land water result the decreasing volume of water on earth, the farmer use irrigation. Irrigation may be defined as the science of artificial application of water to the land or soil that means depending on the soil type, plant is to be provided with water

II. LITERATURE SURVEY

In irrigation field, soil moisture sensor, temperature sensors are placed in the root of the plant and a microcontroller handles the sensor information and transmits the data. One algorithm was developed to measure threshold values of temperature sensor and soil moisture sensor that was programmed into a microcontroller to control water quantity. The main objective of this project is to determine how a person can use the automatic irrigation system of his own moderately economical facilities in a few hours to connect some electronic components and other materials. . An automatic irrigation system based on sensor-based systems has been designed and implemented as one of the most widely used and advantageous automatic systems [2]

This will help people in their daily activities, thus saving them time and hard work. This system uses sensor technology with the microcontroller, relay, DC motor and battery. Behave as an intelligent switching system that detects the soil moisture level and irrigates the plant if necessary [3]. A record of the soil moisture, temperature and water level is maintained in a database for backup. This will help us to harvest various kinds of crop according to the various weather conditions and we can have a full control over the crop's growth [4].

To ensure the exact amount of moisture in the sand and to fulfil the requirement of the water to the soil we will need to first find out the amount of water or moisture in the soil. To do this we have soil moisture sensors that has been used by the researchers in the previous studies. Managing soil moisture properly through irrigation is the key to increase crop yield and conserving water. Each soil moisture sensor has a specific amount of range up to which it can sense the moisture in the soil or agricultural land [5].

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III. PROPOSED WORKING

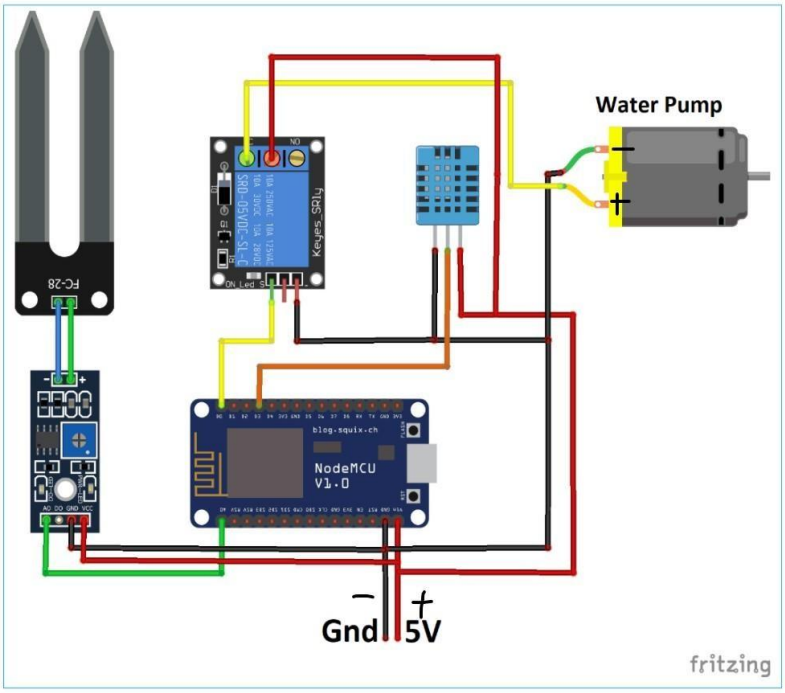

Figure 1: System Setup with Components

Sensor Data Acquisition:
The sensor is interface with Arduino Uno such as DHT11 Temperature, Humidity, Soil moisture and Rain detection sensor is used.

Wireless Data Transmission:
The data acquired from sensors are transmitted to the web server using wireless transmission (WIFI module ESP8266).

Data Processing and Decision Making:
The data processing is the task of checking various sensors data received from the field with the already fixed threshold values. The motor will be switched ON automatically if the soil moisture value falls below the threshold and vice- versa. The farmer can even switch ON the Motor from mobile using mobile application.

Automation and Irrigation System:
The irrigation system automated once the control received from the web application or mobile application. The relays are used to pass control form web application to the electrical switches using Arduino microcontroller. The circuits with low power signal can be controlled using relay.

Thing Speak Cloud:
The web application will be designed to monitor the field and crops from anywhere using internet connection. To control the Arduino processing IDE is used, the webpage can be communicated using the processing IDE.

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IV. HARDWARE

As per objective and need of this project main information required is moisture level available in that particular soil with temperature and humidity in that environment, with this two information our system will act accordingly. So as per requirements we need following hardware components for project

A. Soil Moisture Sensor

Soil moisture sensor helps in providing the exact moisture content in the soil. The sensor has both analog and digital output. The digital output is fixed and the analog output threshold can be varied. It works on the principal of open and short circuits. If the moisture content is below 40% then automatically motor will get started. If the moisture is more than that motor will stop automatically. Soil moisture is basically the content of water present in the soil. This can be measured using a soil moisture conducting probes that act as a probe.

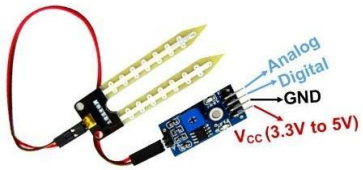

Figure 2: Soil Moisture Sensor

B. Temperature and Humidity Sensor

The DHT11 is a basic, ultra-low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin (no analog input pins needed). Initially Once the board is activated, instantly it will start showing the exact temperature and humidity in that particular place. Hence this sensor helps in detecting the temperature and humidity.

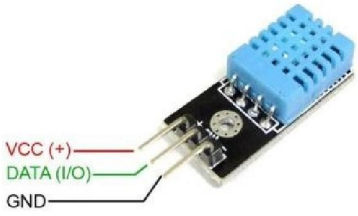

Figure 3: Temperature & Humidity Sensor (DHT 11)

C. Communication Wi-Fi Module

The ESP8266 Wi-Fi Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. ESP 8266 will gather data from Soil Moisture Sensor and DHT 11 Sensor and send it to Thing Speak Cloud.

Figure 4: Wi-Fi Module (ESP 8266)

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D. Relay Module

Relay is one kind of electro-mechanical component that functions as a switch. The electromagnet is activated by a separate low-power signal from a micro controller. The relay coil is energized by DC so that contact switches can be opened or closed. A single channel 5V relay module generally includes a coil, and two contacts like normally open (NO) and normally closed (NC).

Figure 5: 5v DC Relay Switch

F. Water Pump

A submersible pump (or sub pump, electric submersible pump) (figure3.8) is a device which has a hermetically sealed motor close-coupled to the pump body. The whole assembly is submerged in the fluid to be pumped. The main advantage of this type of pump is that it prevents pump cavitations, a problem associated with a high elevation difference between pump and the fluid surface. Small DC Submersible water pumps push fluid to the surface as opposed to jet pumps having to pull fluids.

Figure 6: Water Pump

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.

Thus, 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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