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SMART IRRIGATION SYSTEM USING IOT

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ABSTRACT

Water is the important source in human life. Around 80% to 90% water is used in agriculture field. India is mainly an agricultural country. Agriculture is the most important profession for the most of the Indian families. As water supply is becoming scare in today's world there is an urgency of adopting smart ways of irrigation. This project report how irrigation can be handled smartly using IOT. The main theme of this IOT project is to evolve a device that can monitor the moisture content of the soil and turn on water pump automatically whenever the moisture drops below a threshold value, thereby we can provide the right amount of water to plant and reduce wastage of water and electricity. By using soil moisture sensor which senses the various parameters of the soil and based on soil moisture value land gets automatically irrigated by ON/OFF of the motor. These sensed framework and motor status will be displayed on user android application. This system can also prove to be helpful in agriculture, lawns and park.

Keywords: *IOT, soil moisture sensor, wireless (WIFI) water pump, automated.*

I. INTRODUCTION

Agriculture is considered as the basis of life for us as it is the main source of food and other raw materials. It plays vital role in the growth of country's economy. Growth in agriculture sector is necessary for the development of economic condition of the county. Unfortunately, many farmers still use the traditional methods of farming .In India most of the irrigation system are manually operated ones. These outdated techniques are replaced with automated techniques .This paper focuses primarily on reducing the wastage of water and minimizing the manual labor on field for irrigation. Recent advances in soil water monitoring combined with the growing popularity of wireless sensor networks make the commercial use of such systems applicable for agriculture and gardening .The system designed is programmed to irrigate at regular time intervals for predefined periods of time. In this technique, soil moisture sensors are placed root zone of plant and near the module and gateway unit handles the sensor information and transmit data to the controller which in turns operates the of control the flow of water through the valves. To give proper attention to the land located far away from the human settlement, supervisory automatic control system like multi –terminal control systems are used since in many processes, factor like soil ,salinity ,irrigation ,temperature, light intensity , etc. needs repeated tasks and have we are irrigating the load based on the soil humidity and at the same time the status of the irrigation is updated wirelessly to the based android app. The proposed system will allow farmers to continuously monitor the moisture level in the field, controlling the supply remotely over the internet. When moisture goes below a certain level. Sprinklers will be turned on automatically, thus achieving optimal irrigation using internet of things.

Agriculture is the major source of income for the largest population in India and is major giver to Indian economy. However, technological involvement and its availability have to be grown still and cultivated for agro sector in India. Although few advantages 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 supply employment to 70% of Indian population .IoT is changing the agriculture domain and qualify farmers to fight with the huge difficulties they face. The agriculture must overcome restricted availability of lands, expanding water deficiencies while meeting the expanding consumption needs of a world population. New innovative IoT applications are labeling these issues and increasing the quantity, quality, sustainability and cost effectiveness of agricultural production.

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Agriculture is the backbone of Indian Economy. In today's world, as we see quick growth in global population, agriculture becomes more important to meet the needs of the human race. However, agriculture needs irrigation and with every year we have more water use 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 guide 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 superior in water consumption because of population growth and increased food demand. There is an urgent need to create procedure 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 need rules. By using Internet technology and sensor network technology we can control water wastage and to maximize the technical technologies in irrigation methods. Hence it can greatly improve the usage of water and can increase water productivity.

The Internet of Things (IoT) is a technology where in a mobile device can be used to scanner the function of a device. The Internet of Things (IoT) is concerned with interconnecting communicating objects that are installed at different locations that are may 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 connect the Internet to exchange information.

It can also be used to modify the status of the device. The central processing unit will also contain communication device to receive data from the sensors and to be relayed to the user's device. This will be done taking a higher communication device such as a Wi-Fi module. The data processed by the central module is changed to meaningful data and relayed to the user. The user can view the data with the help of a handheld implement such as a mobile phone or a tablet. Nowadays water shortage is a big concern for farming. This project helps the farmers to irrigate the farmland in an well organised manner with automated irrigation system based on soil moisture.

The suggested system has been designed to overcome the unnecessary water flow into the agricultural lands. Temperature, humidity and moisture readings are continuously monitored by using temperature, moisture and humidity sensor and send these values to the assigned IP address. Android application continuously gather the data from that assigned IP address. Once the soil moisture values are pass the particular limit then the relay, which is connected to the arduino microcontroller controls the motor. The android application is a simple menu manage application, with 4 options. This includes motor status, temperature, moisture and humidity values. The motor status indicates the current level of the pump

II. LITERATURE SURVEY

Primary investigation is carried out under the following stages, such as Understanding the existing ,requirements, Understanding the approaches developing an abstract for the system.

In this paper, soil moisture sensor, humidity and temperature sensors placed in root zone of plant and transmit data to android application. Threshold value of soil moisture sensor that was arranged into a microcontroller to control water quantity. Temperature, humidity and soil moisture values are shown on the android application.

Remote Monitoring in Agricultural Greenhouse Using and Short Message Service (SMS) and wireless sensor. In this paper they are sending data via sms but proposed system sends the values to mobile application.[5]

But in this we did not aware about the soil moisture level so to overcome this drawback proposed system included with extra feature temperature value and soil moisture value which displayed on the farmer mobile application [6].

Microcontroller based Controlled Irrigation System for Plantation In this paper old generation with lesser memory microcontroller is used to power the system but proposed system made use of arduino board which is user friendly and it helps to tip the programs easily.[15]

A wireless application of drop irrigation automation carried by soil moisture sensors in this paper irrigation is carried out using soil moisture values but extend to this proposed system displays humidity and temperature values.[18]

By referring all above papers it is found that no such systems are existed with all non-segregated features but proposed system includes these all features such as displaying temperature, humidity and soil moisture values and also automatic switching on and off of motor by examine soil moisture values Archana and Priya (2016) proposed a paper in which the humidity and soil moisture sensors are put in the root zone of the plant.

SonaliD.Gainwar and Dinesh V. Rojatkar (2015) proposed a paper in which soil parameters such as pH, moisture,humidity and temperature are measured for getting high yield from soil. This system is fully automated which turns the motor pump OFF/ON as per the level of moisture in the soil. The present field status is not intimated to the farmer[2].

V. R. Balaji and M. Sudha (2016) proposed a paper in which the system derives power from sunlight though photo-voltaic cells.This system doesn't depend on electricity. The soil moisture sensor has been used based on the sensed values PIC microcontroller is used to ON/OFF the motor pump. Weather forecasting is not included in this system [3].

This paper aims at reducing the wastage of water and the labor that is used to carry out irrigation manually. The proposed system aims at detecting the moisture content of the soil using sensors that are placed directly into the soil. This sensors sense the water level of the soil and if the water level is not adequate then the user will be notified through a message that will be sent to the application which would be installed on the user's mobile phone. The Arduino board, a microcontroller, controls the digital connection and interaction between objects in the proposed system, enabling the objects to sense and act [2]. Also, with its powerful on-board processing, various sensors and other application specific devices can be integrated to it. In the system, sensors detect the water and moisture level and send readings to a fixed access point, such as a personal computer, which in turn can access irrigation modules installed in the field or the corporal module in the water tank, wirelessly over the internet. A wireless application of drip irrigation automation supported by soil moisture sensors Irrigation by help of freshwater resources in agricultural areas has a crucial importance. Traditional instrumentation based on separate and wired solutions, presents many trouble on measuring and control systems especially over the large geographical areas. If different kinds of sensors (i.e. humidity, and etc.) are involved in such irrigation in future works, it can be said that an internet based remote control of irrigation automation will be possible.

III. PROPOSED MODEL

Nowadays agricultural field is facing lot of problems due to absence of water resources. In order to help the farmers smart irrigation system has been used. In this system, various sensors such as soilmoisture, Ph, DHT11, PIR (intruder detecting system) and pressure sensors are connected to the input pins of arduino microcontroller. The sensed values from the sensors are displayed in LCD.

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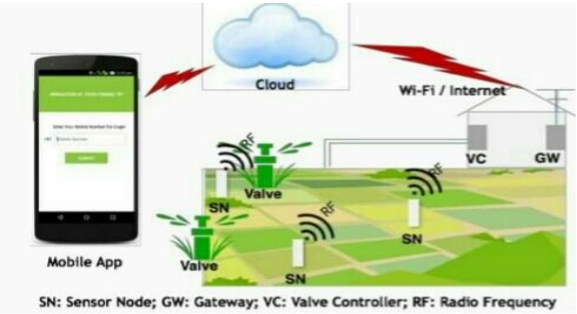

Figure:IOT based Smart Irrigation System

Arduino UNO

The Microcontroller used here is an Arduino UNO. The UNO is a Microcontroller board based on ATMEGA 328P. The ATMEGA 328P has 32kB of flash memory for keeping code. The board has 14 digital output and input pins, 6 analog inputs, 16 MHz quartz crystal, USB, an ICSP circuit and a reset button. The UNO can be arranged with the Arduino software.

Soil Moisture Sensor

Soil Moisture sensor is used to calculate the moisture content present in the soil. When the soil moisture value peruse by the sensor is above the set-up value, low level (0V) will be the digital output and if it is under the threshold level, high-rise level (5V) will be the digital output. The digital pin is used to straight read current soil moisture value to see if it is overhead threshold or not. The threshold voltage can be controlled with help of potentiometer.

Sensors

A sensor is a device, or subsystem, module whose purpose is to notice events or changes in its environment and send the information to other electronics, frequently a computer processor. In short sensors are the device which changes the physical parameter into the electric signal. A sensor's sensitivity indicates how much the sensor's output changes when the input quantity being calculated changes. The system which shown in fig.1 consists of

- Soil moisture sensor- used to measure the moisture content of the soil.
- Temperature sensor - used to detect the temperature of the soil.
- Ultrasonic sensor - used to measure the water level in the water tank

Figure3.3.1: Soil Moisture Sensor

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Figure33.2: DHT 11(Temperature Sensor)

WI-FI Module

The ESP8266 Wi-Fi module is a self - contained SOC (System on Chip) with integrated TCP/IP (Transmission Control Protocol/Internet Protocol) protocol stack that can give any microcontroller access to any Wi-Fi network. Each ESP8266 module comes arranged meaning, it can be simply bent up to Arduino device to receive Wi-Fi ability. This module has a powerful sufficient on-boarding process and high storage capacity that allows it to be integrated with the sensors and other application specific devices.

Proposed Algorithm

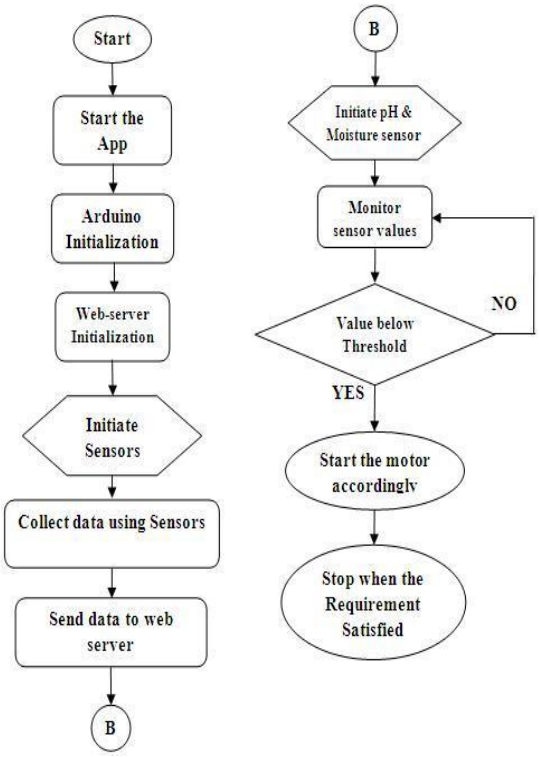

Figure**3.5.1. **Flow Chart

In this paper, we are using a Mesh topology in which sensor nodes are placed in the farm area. Sensors in our suggested topology are mobile where as the base station is stationary and it collects the data from sensor nodes and process them. This work proposes that how to deploy the sensed data to the base station in Wireless Sensor Networks. For this purpose firstly set the farm area [5]. pH sensor checks whether the soil is alkaline or acidic. Soil should have proper proportion of nutrients which is essential for the plant growth. Also, with help of pH we can determine for what type of plant the soil is feasible. In this project, we have added a pH sensor to check the acidity of the soil and give constant updates to the android application about the same. Sprinkler Algorithm The moisture

sensor gives the water content level in the soil and sends it to the arduino. It will process this data by comparing it with the threshold value if it is less than the predefined threshold value then start the irrigation. **Reading<Threshold value Start the irrigation System** Photocell Algorithm Light is very important for the plants. Plants convert light energy into their own building material. The photocell sensor measures the level of availability of the lights to the plants. Arduino compares the level of light with the predefined threshold value if it is less than the threshold value then we can provide artificial lights for the plants so that the plants can get appropriate level of light. **Reading<Threshold value Start the artificial light**

IV. DESIGN

Design of a system explains humidity, temperature and soil moisture values using flow chart.

Flow Chart
A flowchart is a graphic representation of a logic sequence, work or organization chart, manufacturing procees or similar formalized structure. The flowchart is a means to visually present the flow of data through an information processing systems.

Soil Moisture Sensor
This below Figure 4.2 shows the procedure of exhibiting soil moisture value .

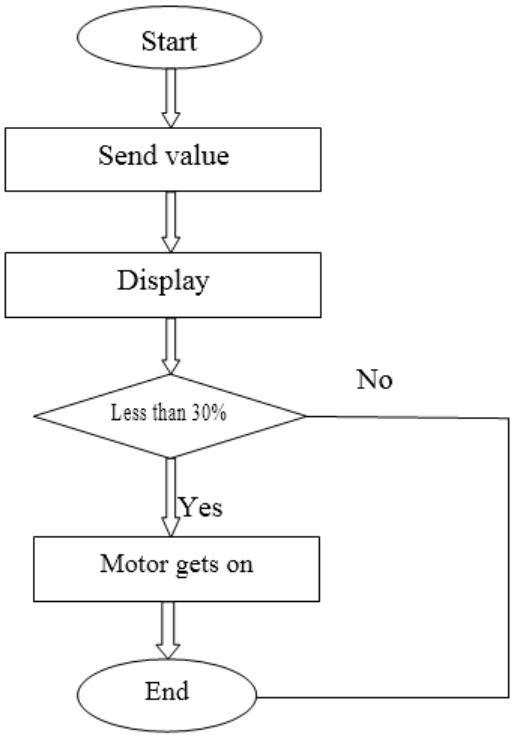

Figure:4.2:Flow chart of Soil moisture sensor

Soil moisture sensors calculate the water content in soil. Moisture in the soil is an important part in the atmospheric water cycle. Sensor module outputs a high level of resistance when the soil moisture is low. It has both analog and digital outputs. Digital output is simple to use, but it is not as exact as analog output based on moisture level motor gets turn on/off automatically.

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V. IMPLEMENTATION

The proposed agricultural system is planed to solve to find an optimal solution to the water crisis. The design tool IoT technology using an android device, a main controlling unit (MCU), sensors to measure various parameters and a water pump, which will be used to provide water to the farm.

Programming Techniques

This programming technique includes explanation about THINGSPEAK web server and it uses JSON format to convert stored data into human legible form.

Thingspeak

ThingSpeak allows the creation of sensor logging request, location tracking applications, and a social network of thingswith status updates". ThingSpeak was originally launched by ioBridge in 2010 as a service in bear of IoT applications. ThingSpeak has integrated support from the numerical computing software Matlab from Math works. Allowing ThingSpeak users to visualize and analyze uploaded data using Matlab without requiring the purchase of a Matlab license from Math works. ThingSpeak has a near relationship with Math works. In fact, all of the ThingSpeak documentation is incorporated into the Math works' Matlab documentation site and even enabling registered Math works user accounts as valid login credentials on the ThingSpeak website. The terms of favour and privacy policy of ThingSpeak.com are between the agreeing user and Math works.

VI. RESULTS

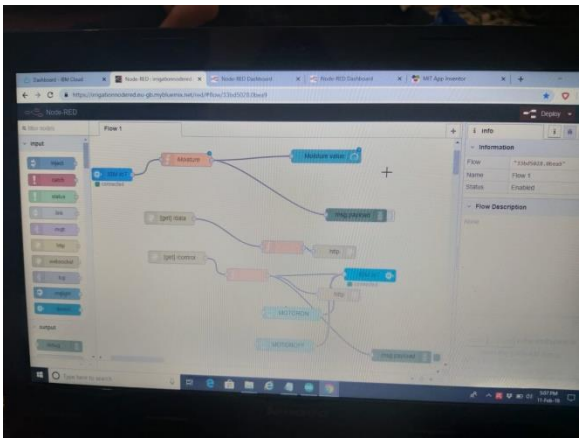

Figure6.1: node red

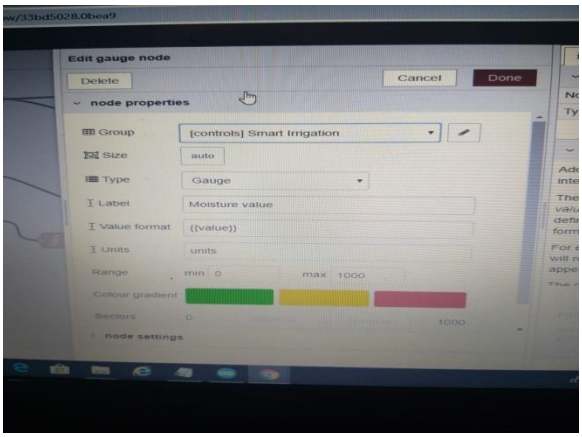

Figure6.2. : node red settings

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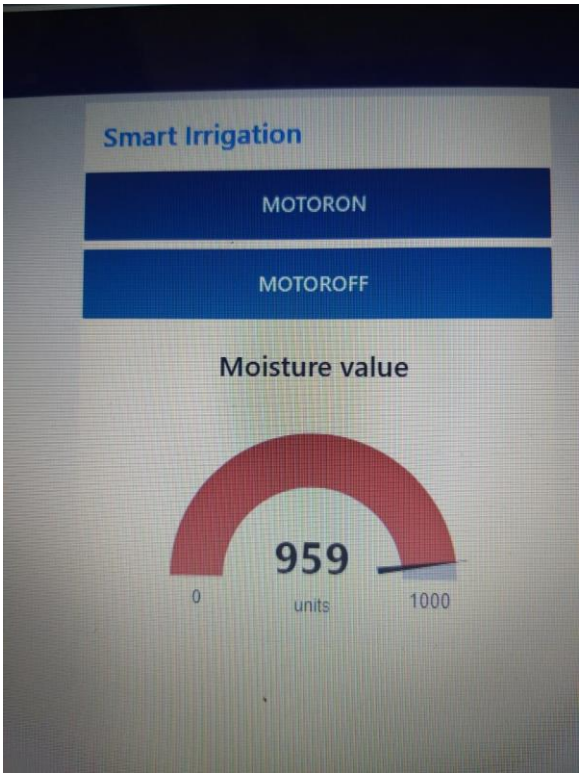

Figure6.3.Soil Moisture Senser readings on website

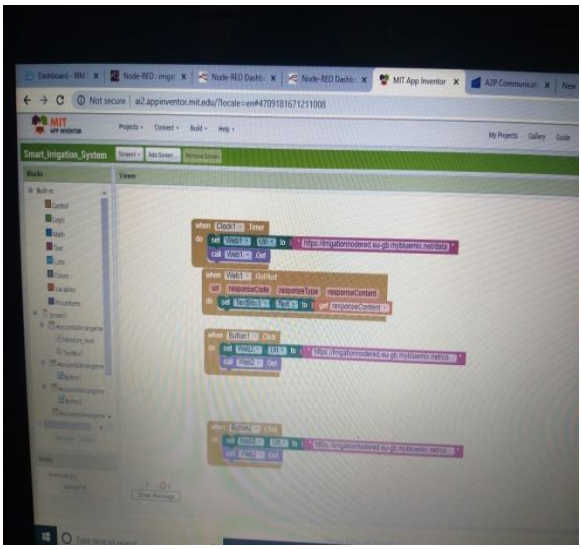

Figure6.4. for mobile application settings

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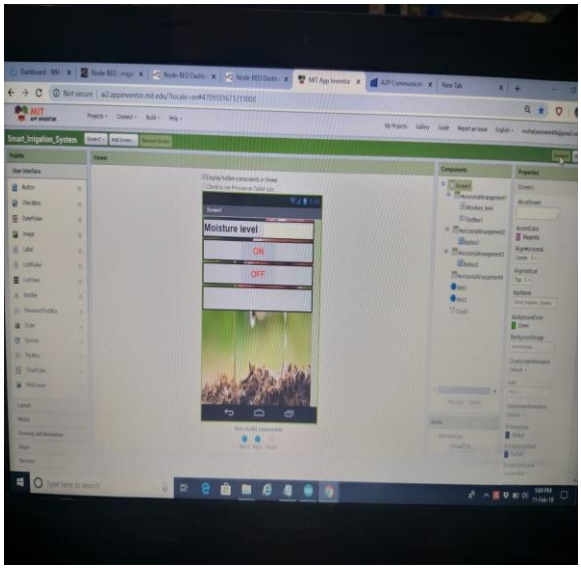

Figure6.5. Application on system

Figure6.6. model of Smart Irrigation System using IOT

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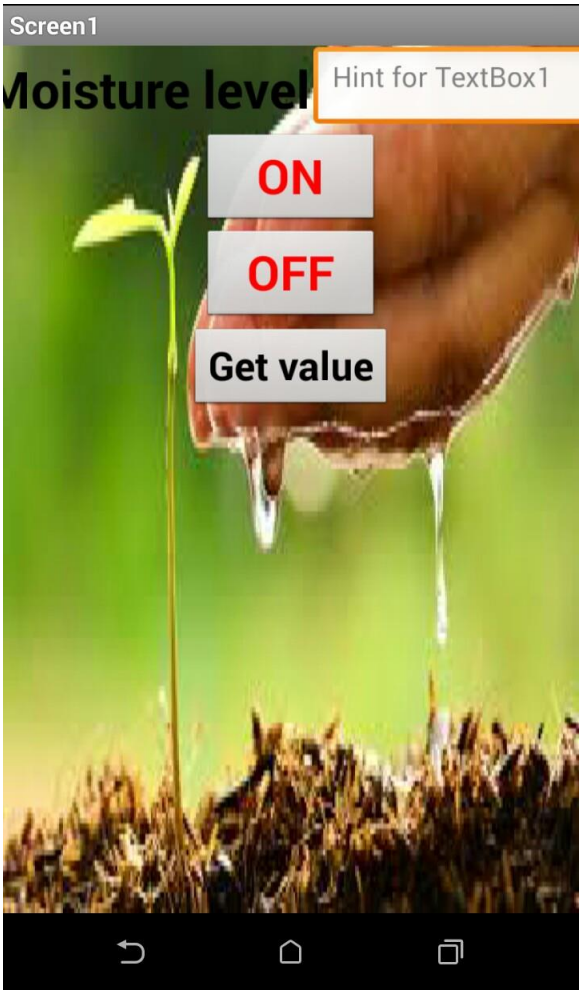

Figure6.7: app on mobile phone

VII. CONCLUSION

The smart irrigation system implemented is cost effective for optimizing water resources for agricultural production. The proposed system can be used to switch on/off the water sprinkler depending on the soil moisture levels thereby making the process simpler to use. Through this project it can be concluded that there can be considerable development in irrigation with those of IOT and automation. Thus this system is a solution to the problems faced in the existing process of irrigation.

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