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IOT Based Smart Plant Monitoring System

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Abstract*: Smart agriculture uses the internet of things, usually for irrigation purposes. IoT is employed in this case to manage the water log on fields. The soil moisture sensor is used to keep track of the soil moisture in agricultural areas. The Cloud Service Brokerage issues a directive to the relay telling it to turn ON the suction motor when the moisture level reaches a specific level. The farmland's extra water is removed by the suction motor. With this proposal, we want to use IoT to analyze the availability of micronutrients and control the excess water log in farming. This semi-automated water management system can operate independently or be managed using a smartphone app. The weather at that particular place may be analyzed using the DHT sensor values, and it can be projected using a prediction algorithm for the following 10 days. IoT refers to the idea of linking all gadgets to the internet and enabling internet-based communication between them. The Internet of Things (IoT) is a vast network of interconnected gadgets that collectively gather and share information about their usage and the settings in which they function. IoT is an agricultural use of contemporary information and communication technologies. A system for agricultural monitoring is constructed using sensors*

Keywords: IOT, Humidity, Moisture, Monitoring, Temperature, Motion

I. INTRODUCTION

Researchers have begun offering solutions through "Smart IoT"—the Internet of Things embedded with deep learning techniques—to supply food for a burgeoning population in nations like India. With this development, e-farming has adopted a new paradigm in which all the farming-related sensors are linked to the distant server via wireless or remote protocols in a distributed setting. The farmers can keep an eye on these fields even when they are a long way away thanks to their intelligence. In a cloud environment, the data from various sensors is translated into a single, computable format so that the specified framework can deal with it. The data from various sensors now exist in many formats.

A plant's growth and health must be properly monitored in order to retain the plant's crucial role in the ecological cycle and its position at the top of the food chain pyramid. Consequently, automation and Internet of Things (IOT) technology are used to make plant monitoring systems smart. This topic emphasises a number of characteristics, including intelligent decision-making based on real-time data about soil moisture.

Planning water resources for a plantation (group of plants) is both practically and fiscally feasible using the computerised water system framework with IOT. We can show that the use of water for various plantations' (groups of plants') purposes can be reduced by using the automatic water system architecture. The system framework contains a suitable microwaves (wireless) chain of moisture content in the soil through soil moisture sensor, humidity and temperature sensor set in the plant's root zone, and level of water (ultrasonic) sensor set in tank to check the water level in tank. The sensors will collect the data, which will then be sent to a web server in the cloud.

The chapter's background emphases the study of IOT in the area of agriculture. This demonstrates how we can use IOT technology to make our planting reliable and smart with real-time updated data. The basics of IOT technology are covered in this chapter, which is very helpful for newcomers.

In the majority of fields, the Internet of Things (IoT) is crucial. The numerous benefits we may gain fromIoT have boost its utilization. The area that needs the most improvement is agriculture because it provides one of the basic requirements and employs a sizable portion of the population

II. LITERATURE REVIEW

Prathibha S R proposed an IoT based monitoring system in smart agriculture.[1] The monitoring system uses IoT sensors which are capable of transmitting data about the agricultural field. This monitors the temperature and humidity in the agricultural field through sensors using CC3200 single chip with a camera interfaced withit. The pictures of the field are captured by the camera sent to the farmer's mobile through MMS using Wi-Fi. This proposal is the modernization of agriculture by collaborating the conventional methods and the latest technologies like IoT and Wireless Sensor Network. This proposal believes that environmental monitoring isthe major factor that improves the yield of efficient crops.

Nikesh Gondchawar proposed a work on IoT based smart agriculture. The paper included the automation of irrigation in the farmland. The works of the farmer like spraying, weeding, etc., will be controlled by a Smart GPS based remote-controlled robot. It also includes smart control and intelligent decision making.The elements in this system are ZigBee modules, camera, actuators with microcontroller and raspberry pi. The robotis also used for moisture sensing, bird and animal scanning, keeping vigilance, etc., The system mainly focusses on smart irrigation and smart control using the data from the sensor set up in the agricultural field. The smart warehouse does temperature and humidity maintenance and theft detection in the warehouse.

Nelson Sales proposed work on Wireless Sensor and Actuator System for Smart Irrigation on the Cloud. This is a proposal for introducing Cloud Computing and adoption of Precision agriculture. In earlier times, the data were sent to the mobile through MMS or SMS. But this project includes the use of Cloud for controlling and monitoring the field to assess the plant needs. The technology deployed in this system is the Wireless Sensor and Actuator Network (WSAN) communication system. The operations like acquisition, collection and data analysis are performed by the nodes. [3] It also reduces the water consumption which provides monetary and environmental benefits. The main aim is to include cloud technology in smart agriculture.

Nageswara Rao R proposed an IoT based Smart Crop-Field monitoring and automation irrigation system which is a Raspberry Pi-based automatic irrigation IoT system which supports to improvise the productivity.[The main aim is to grow crops using low-quality water and to focus on water availability to plants at the required time for which the farmers spend more time. The sensors send data to the base station in which the estimation of the quantity of water required is calculated. The information like soil temperature, humidity, temperature and the duration of sunshine per day are sent to the base station from 2 sensors. Based on this information, the proposed system calculates the quantity of water to be supplied to the field. Precision Agriculture with cloud helps to improvise the yield and also reduces the consumption of water.

Muthunoori Naresh proposed a Smart agriculture system using IoT technology which uses Wireless Sensor Networks in Precision Agriculture. The system screens and measures the water level.It also measures the compost and pesticide and sends it through the power utilization and information transmission. This is performed in hourly basis. With that information, the required amount of water and pesticide are supplied when required. For regions with steady and uniform atmospheric conditions, less continuous observation is enough.

They also include harvest web watching, bug acknowledgement into the field, alter improvement and cultivation. A soil moisture sensor is used to operate sensing the soil moisture. And a Wi-Fi module is used to connect the processor to the internet. The ARM processor is used in this system along with a water level sensor and a humidity sensors

III. PROPOSED SYSTEM

The system is combination of hardware and software components.

Hardware components:

- Sensors (Moisture, DHT11,PIR Motion)
- NodeMCU
- Relay
- Motor

Language Used:

- C++

Software components:

- Blynk App
- Android Studio
- Visual Studio Code
- Arduino IDE

3.1 Sensors:

3.1.1 Soil Moisture Sensor:

The moisture of the soil is found using a soil moisture sensor. The electronic board on the right and the probe with the two pads that measure soil moisture make up this sensor's two components. How does it function? According on the soil moisture level, the sensor's output voltage varies. whenever the soil is Wet: A drop in output voltage. Dry: A rise in output voltage

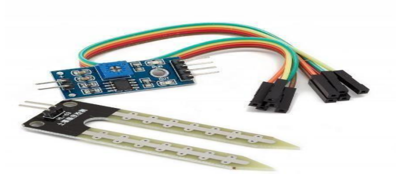

Fig 1. Soil Moisture Sensor

3.1.2 DHT 11 (Temperature and Humidity)

The DHT11 includes temperature and humidity sensors. Two electrodes with a moisture-holding substrate in between them are used to measure humidity. As a result, as the humidity varies, so does the resistance between these electrodes and the substrate's conductivity. The IC measures and processes the change in resistance, preparing it for reading by a microcontroller. DHT 11 On the other hand, a thermistor or an NTC temperature sensor are used to measure temperature using the DHT11 sensor. Because a thermistor is a variable resistor, its resistance changes as the temperature changes. These sensors are created through the sintering of semi-conductive materials (ceramic and polymers), which enable significant resistance variations with only modest temperature changes.

NTC stands for "Negative Temperature Coefficient," which denotes that resistance lowers as temperature rises.

Fig 2. DHT11 Sensor

3.1.3. PIR Motion sensor:

Size: Rectangular

Output: Digital pulse high (3V) when triggered (motion detected) digital low when idle (no motion detected). Pulse lengths are determined by resistors and capacitors on the PCB and differ from sensor to sensor.

Sensitivity range: up to 20 feet (6 meters) 110° x 70° detection range

Power supply: 5V-12V input voltage for most modules (they have a 3.3V regulator), but 5V is ideal in case the regulator has different specs

Fig 3. PIR Motion Sensor

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Microcontroller
Node MCU 8266:
Microcontroller: Tensilica 32-bit RISC CPU Xtensa LX106
Operating Voltage: 3.3V
Input Voltage: 7-12V
Digital I/O Pins (DIO): 16
Analog Input Pins (ADC): 1
UARTs: 1
SPIs: 1
I2Cs: 1
Flash Memory: 4 MB
SRAM: 64 KB

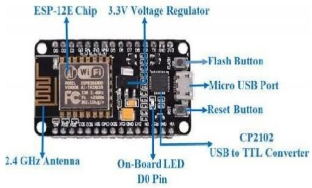


Fig 4. Node MCU 8266

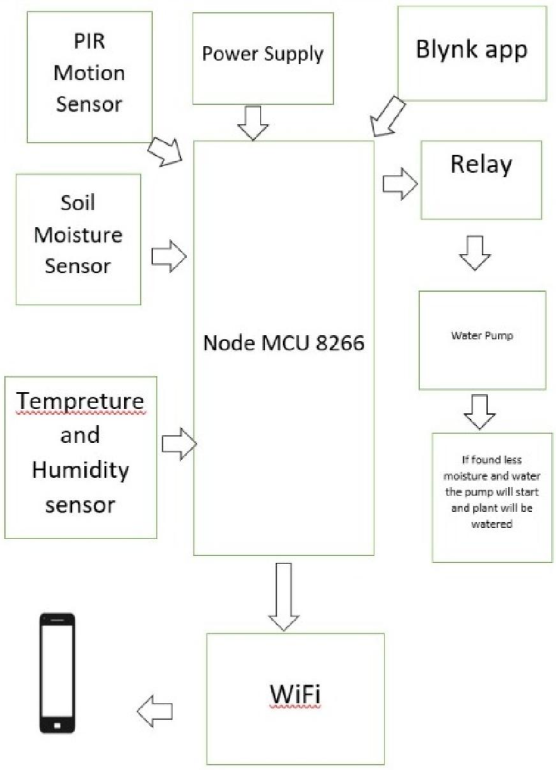
Water Pump:
DC voltage: 2.5-6V
Maximum lift: 40-110cm/15.75″-43.4″
Flow rate: 80-120L/H
Outer diameter of effluent: 7.5mm/0.3″

Fig 5. Water Pump

Relay Module
Supply voltage ranges from 3.75V to 6V.
2mA is the quiescent current.
When the relay is in operation, the current is about 70 mA.
A relay's maximum contact voltage is 250VAC/30VDC.
10A is the maximum current.

Fig 6. Relay

Flowchart



Schematic/ Circuit Diagram :

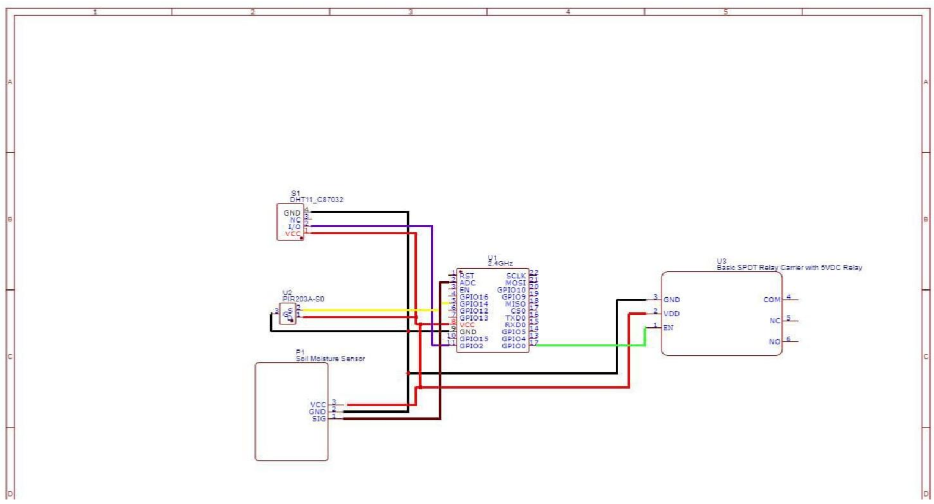


Fig 8. Circuit Diagram

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Working:

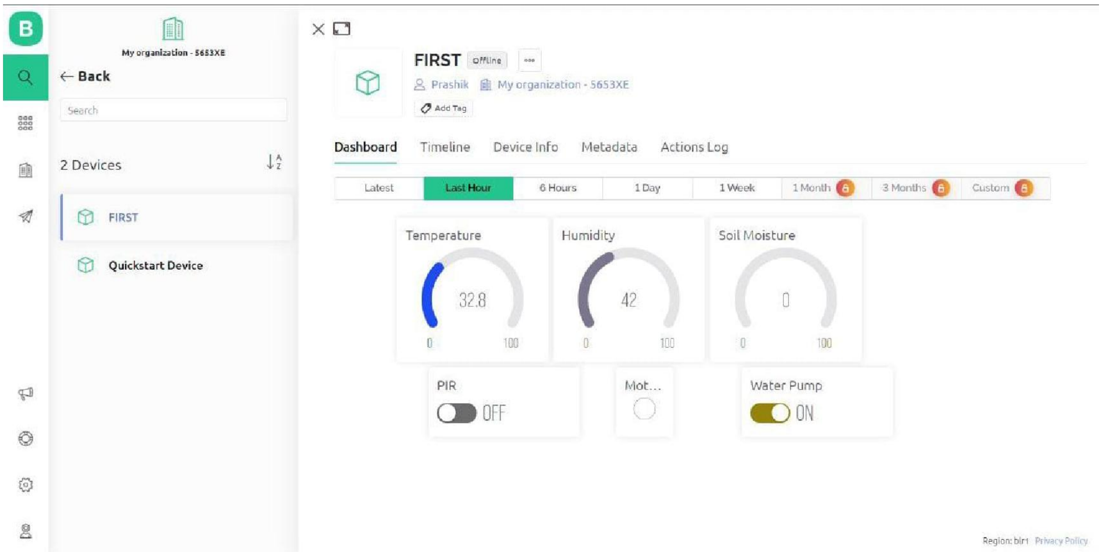

Fig 9. Blynk App Interface

System Setup:

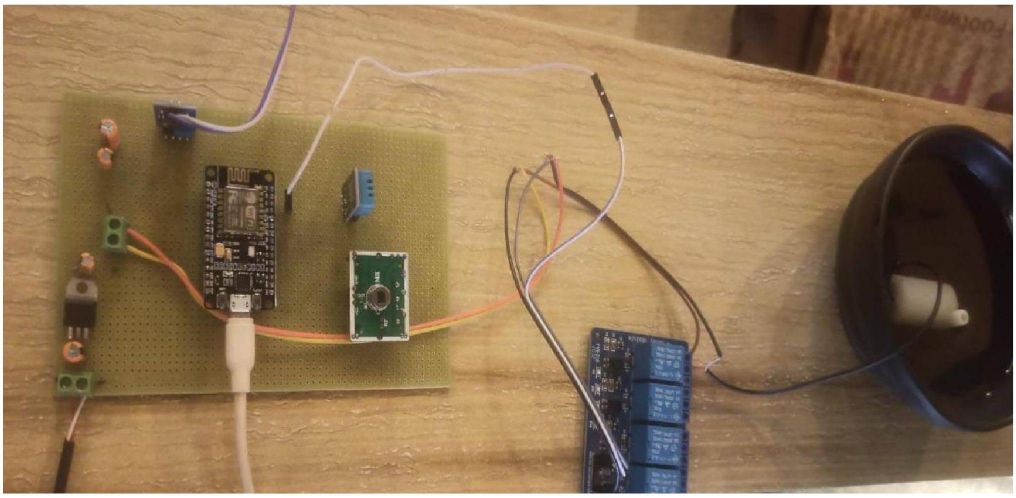

Fig 10. Realtime Setup

Advantages

- With the use of moisture sensors, it can optimise water levels based on soil moisture and weather predictions.
- Based on local weather data, it may determine when a farm/land needs to be watered.
- It will provide you more control over your landscape and irrigation needs.
- It will save you a lot of money on your water bills because it reduces water waste dramatically. Time is money.

Disadvantages

- The designing, developing, maintaining and enabling the large technology to IoT system is quite complicated.
- As the IoT systems are interconnected and communicate over networks. The system offers little control despite any security measures and it can be leading the various kinds of networks attacks.

Future Scope

- IoT-based management of water irrigation.
- Agriculture Agriculture is the main application. Keep an eye on the water and soil moisture level.

IV. CONCLUSION

A system to track temperature, humidity, motion, and soil moisture levels was developed, and this project offers a chance to examine the current systems, their benefits and shortcomings. One of the activities that uses the most water is agriculture. The proposed system can be utilised to automate irrigation by turning the motor on or off based on the health of the plants, or sensor values. which is one of the most time-effective farming activities and aids in preventing soil over- or under-irrigation, preventing crop damage. Through Front End Structure, the farm owner can keep an eye on the procedure online. By doing this task, it will be possible to save water and motor power for later use by reducing their waste. This experiment has shown that the use of automation and the Internet of Things may significantly advance farming.

V. ACKNOWLEDGMENT

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