IOT BASED PLANT MONITORING SYSTEM

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ABSTRACT - The internet of things (IOT) has various use in Agriculture filed. Main moto is making IOT based Plant monitoring system is monitor plant growth system and control plant monitoring growth. In this system using DHT11 sensor, Touch sensor, soil moisture to monitor and collecting data. collect the data through the real time basic and send it through the cloud there is alert system if there anyone touches the plant then you have given an alert through an Alert Notification, On your mobile phone. there is one sensor dh11 to you know the real time temperature in what temperature is our environment if there is less soil moisture in soil, you again receive an alert message to Turn on the motor through your phone. This all about our project.

KEYWORDS: Plant monitoring, Soil monitor, Alert system, Automation monitoring Plant,

INTRODUCTION

In our fast-paced life, we ignore many things that we need to take care of, but ignoring of something living might result in the death of that, So are the plants, if we, because of any reason, forget to take care of the plant or even forget to water the plant, might result as the end of life of that plant. Plants need special care and thanks to today's advancement in technology, giving of that special care is possible. We can give that through Plant Monitoring system. The primary purpose of this effort is to create an embedded system that uses sensors to sense. ambient variables, an internet of Things processor, and plant monitoring and watering capabilities. The internet of Things (IoT) concept is presented in this work to connect gadgets via the internet and make it easier for consumers to obtain information. Accurate environmental perception data in the sector of agriculture can be obtained by the system, which can subsequently send it to users. The device keeps an eye on several variables, including temperature, humidity, soil moisture content, and light intensity. An intruder detection buzzer will activate for a brief period if an intruder is detected using the fixed infrared sensor. The motor in the field functions manually and automatically based on soil moisture sensor readings. The motor automatically changes between on and off stages during pumping. Results can be viewed through both the online app and monitor. Temperature, humidity, light, and carbon dioxide levels are all essential elements that influence plant growth productivity. As a result, continual monitoring of various environmental conditions provides the user with knowledge about ow each aspect influences growth and how to optimize plant growth. Precision agriculture has recently emerged as a trend in agriculture. Hence, the emphasis is commonly understood the environmental through the interpretation of a wide range of data. The system's main goal is to ensure that the plants receive the proper amount of water and light. If the soil contains sufficient moisture, the user will be notified. This would enable the user to easily provide daily resources to the plants and continuously check on the health of a plant from a distance. The adoption of new technology is necessary

since improving the agriculture sector has emerged as the largest challenge for nations like India. We have put into practice a cutting-edge approach that includes alarm generating, data integration to the cloud, physical parameter monitoring, and value prediction. We have made use of sensors for light intensity, soil moisture, and temperature and humidity. The data collected through that sensors put inside the agricultural field is stored in the cloud using Blynk.Console IOT cloud platform.

The disadvantage of the current system that the writers discovered through a review of the literature are listed below.

* Not designed for every type of farming.

* There was reduced safety and security.

* Reduced quantity of sensors employed.

* The processor/ controller had less memory.

FEATURES

i) TO MONITOR SOIL WATER LEVEL
ii) INTRUDER ALERT
iii) REAT TIME TRACKING OF TEMP & HUMIDITY
iv) MOBILE MOTORING

- *TO MONITOR SOIL WATER LEVEL*

This technology senses the moisture of the soil through sensors like soil moisture sensor which I am connecting with esp32 board. This provides a real time soil moisture level, and it takes the decision accordingly.

- *INTRUDER ALERT*

This technology has an Intruder alert system in which I am detecting whether someone has touched my plant, may be a human or an animal, for this I am using touch sensors which are available with esp32 board, I am sensing the conductivity and taking the decision.

- *REAT TIME TRACKING OF TEMPERATURE & HUMIDITY*

I am sensing the temperature and humidity level near the plant, for this I am using DHT11 sensor which send the real time humidity and temperature level.

- MOBILE MOTORING:

As I am sensing the temperature, humidity, soil moisture and touch, I am uploading these data to cloud and according to I am monitoring all this from the comfort of my home from my mobile phone.

Literature Review

The implementation of wireless sensor network technology in precision agriculture has significantly contributed to the development of plant monitoring systems. These systems are designed to provide real-time monitoring and automation of agricultural processes, leading to improved crop production and efficient resource management. This literature review aims to integrate and synthesize the findings from various research studies on plant monitoring systems based on WSM technologies. Additionally, it highlights knowledge gaps and suggests potential future research directions in the field.

Nandurbar, Thool, and Thool (2014) presented a plant monitoring system based on a feedback control mechanism with a centralized control unit to regulate water flow onto the field in real time, considering instantaneous temperature and moisture values. This approach demonstrates the potential of WSM technology in enabling precise irrigation systems for agricultural fields. Anise, Abdul-Salaam, and Abdullah (2014) also emphasized the achievement of proper irrigation systems through the use of WSM technology, showcasing the energy-efficient and effective monitoring of farm fields in precision agriculture.

Mat, Kassim, Harun, and Yusoff (2016) developed a multi-parameter monitoring system using low-power ZigBee wireless communications technology for system automation and monitoring. The integration of IoT in Wireless Sensor Network was highlighted to enable the real-time measurement of temperature, humidity, and carbon dioxide levels inside the fields.

These findings emphasize the role of WSM in real-time monitoring of agricultural environmental information, such as temperature, humidity, and light intensity (Deve Kala Rathinam e al., 2019).

Furthermore, **Reynolds et al. (2019)** discussed the integration of an Internet of Things (IoT) in a WSM environment to manage and monitor the irrigation system either manually or automatically, catering to user requirements. This approach provides a scalable and open-source information management system for distributed plant phenotyping and IoT-based crop management. **Jiang et al. (2016)** highlighted the continuous monitoring of crops growth and leaf disease, enabling real- time advisory support for farmers. Similarly, Arshad et al. (2022) emphasized the implementation of a smart remote monitoring system for crops, ensuring that farmers/users are updated through the internet.

Despite the advancements in plant monitoring systems utilizing WSM technology, there are knowledge gaps that warrant further research. For instance, **Cheung, Lin, and Lin (2018) and Xiao and Guo (2010)** did not provide specific findings related to plant monitoring systems, indicating a lack of comprehensive studies in this area. Additionally, Ma and Chen (2018) did not contribute to the literature on plant monitoring systems, suggesting a need for more research on intelligent agriculture services platforms with wireless sensor networks.

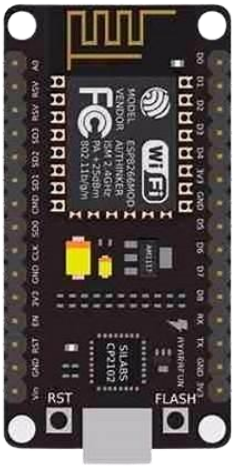
Further research directions in the field of plant monitoring systems could focus on addressing these knowledge gaps by conducting in-depth studies on the integration of WSM technology into precision agriculture. Moreover, there is a need to explore the development of advanced monitoring systems that can address specific challenges in different agricultural environments. Furthermore, research efforts should be directed towards enhancing the reliability, scalability, and cost-effectiveness of plant monitoring systems has shown promise in revolutionizing precision agriculture, and further research in this area can lead to significant advancements in sustainable crop production and resource management.

COMPONENTS

In this project I'm using ESP32, DHT11(TEMP, & HUMIDITY), SOIL MOISTURE SENSOR,12C 16X2 LCD DISPLAY, TUCH SENSOR.

ESP32: - In ESP 32 is a low power consumption device and it provides prebuilt wi-fi module and Bluetooth. ESP 32 is a Microcontroller.

In ESP32 there are total 36 pins.



- GPIO pins: - 0,2,4,12,13,14,15,16,17,18,19,21,22,23,25,26, 27,32,33 these pins general purpose for input /output pins.
- Pins number 1 is TX pin and pin number 3 is RX pin, in their pins used for programming and serial communication .and use for GPIO pins.
- Flash memory internal connected pin which are 6,7,8, 11, 16 and 17. If disable SPI flash then these pins are used as GPIO pins.
- Pins also connected (9&10) with internal Flash memory.
- Outputs PWM pins: - Pin 34, 35, 36 and 39 these pins are used only input pins. And these pins are used for Touch Sensors.

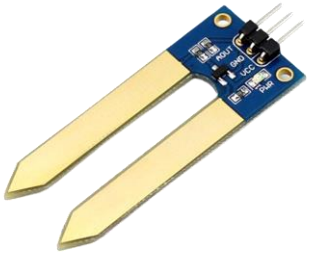
DHT11: - DHT 11 is a digital temperature and humidity sensor. There are three pins in DHT 11 sensor: -

i) VCC
ii) GND
iii) DATA

- VCC pin used for providing the power to the sensor.
- GND pin basically use for connecting ground of the circuit.
- DATA pin use for providing the data (value of temperature) and humidity.

SOIL MOISTURE SENSOR: - Soil moisture sensor has four pins: -

i) VCC
ii) GND
iii) DO
iv) A0



- VCC: - This is use for providing the power of the module.
- GND: - This is pin is connected to the ground to the circuit.
- DO: - DO is a digital output pins which give you higher or lower signal depending on moisture level of the soil.
- AO: - AO pins is an analog output pin which provide voltage proportional moisture level.

16X2 LCD DISPLAY: - In this LCD there are 16-pins which are connected to the ESP32 microcontroller.

- Pin 1 connected to the ground of the circuit.
- Pin 2 is connected to the 5V.
- Pin 3 is connected to the Potentiometer.
- Pin 4 RS is connected to the 0.
- Pin 5 is used for operation mode of LCD.
- Pin 6 is an Enable pin which is enable the LCD.

- Pin 7 to 14 these pins are used for sending the data and receiving the data. data should be 4-bit or 8-bit mode.
- Pin 15 is used for back light of the LCD. It's connected to the 5V power supply.
- Pin 16 is used for completing the circuit light LED of the LCD. And it's connected to the ground.

TOUCH SENSOR: - In this device you only know it is touched by a human or another object. In touch sensor has three pins:

i) GND
ii) VCC
iii) SIGNAL

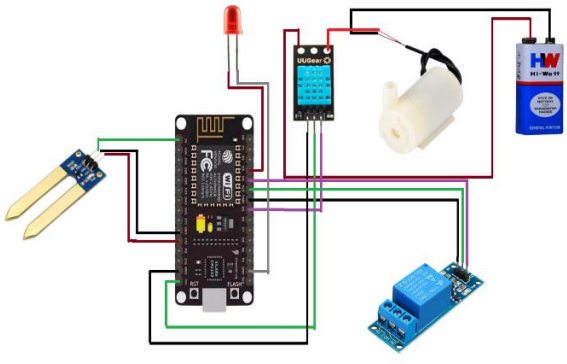
- GND: - This pin is connected to the ground voltage(0V).
- VCC: - This pin connected to the 5V or 3V of power supply voltage.
- SIGNAL: - signal pin should connect to the pin of ESP32 microcontroller.

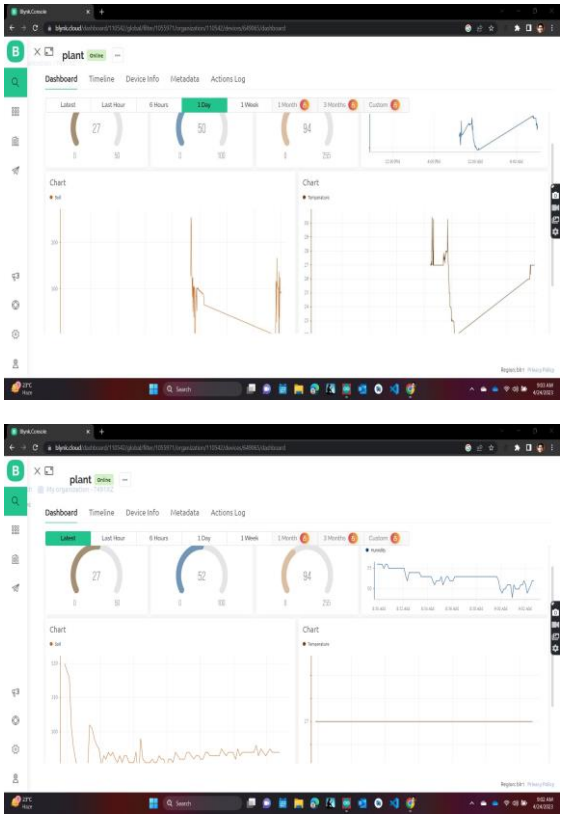
Relay: -

Relay is a low power controller to the high-power device.

Pump: - Pump is used for providing the water,

WORKING: - In plant monitoring system using for monitoring the plant you anywhere in the world, in that system you can know everything about plant. if they need of water, you always send an Alert message, Soil moisture is low so you turn on the motor through the mobile phone. anyone touching the plant then also provide you a Touch Alert through the phone. IF their temperature is low then you can also turn on the lights so plant wants proper temperature.





In both the above Picture see the real time plant monitor data.

In this image sowing how much soil moisture in Soil and show real time Temperature.

Results and Analysis: -

The developed model prototype is housed in a garden. Depending on the type of sensor needed, the same prototype can also be used for agricultural applications. Every sensor has a distinct identity that allows it to continuously monitor environmental changes.

CONCLUSION:

The sensors and microcontrollers are successfully connected to the cloud. The data was successfully stored and can be accessed remotely. All observations and experimental setup demonstrate that this is a comprehensive method for monitoring a plant's health. Users can retrieve data and identify deviations in temperature, humidity, soil moisture, and light intensity. Implementing this system will allow users such as farmers. To monitor and enhance agricultural yields and overall productivity.

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