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IoT Based Plant Monitoring and Watering System

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A B S T R A C T

The term "Internet of Things" (IoT) describes a network that links actual physical items that include electronics, sensors, software, and network capabilities. This makes it possible for manufacturers and devices to communicate data, improving efficiency, accuracy, and economic advantages while lowering the need for human involvement. The agriculture industry experiences enormous water wastage as a result of antiquated irrigation techniques. Researchers have therefore integrated IoT technology into irrigation systems, enabling remote control of water pumps and soil moisture monitoring.

Farmers can monitor soil moisture levels in their plantations and crops using IoT, which saves them time and energy compared to using conventional techniques. Automating agricultural operations enables more effective and dynamic management, increasing output with less human involvement.

The suggested automated irrigation system uses a microcontroller platform to automatically irrigate the land to maintain the ideal soil moisture content.

Farmers may check the condition of their sprinklers using a smartphone app with IoT capabilities, which provides real-time data from the linked sensors. Depending on the project's budget, more features may be explored. The system's productivity and efficiency might be increased with additional features, enabling farmers to fully utilise IoT technology in agriculture.

Keywords: IOT: Internet of Things.

1. Introduction

Agrarian India is a nation. Water is needed for the agricultural process. Water supplies have been diminishing more quickly in recent decades as a result of overuse. It is necessary to create an irrigation system that is functional and efficient while also being simple. In this period, agricultural cultivation management has to be improved. Along with the numerous instances of crop loss brought on by insufficient field conditions management. The goal of this system is to create an automated irrigation system that gives plants an appropriate quantity of water without wasting it. Nearly all facets of life, including job (work affairs), home, social interactions, health, religion, entertainment, and formal and informal education, can benefit from the IoT idea.

Therefore, we have proposed to use IOT to build a Home and Industry Monitoring System that can monitor various parameters in real time and send alerts across the globe to the user's smartphone.

In order to optimise plant development, a technology-based system called the plant monitoring and watering system makes use of sensors and microcontrollers. A microcontroller, in this case the NodeMCU 8266, is coupled to a number of sensors, including a soil moisture sensor, an ultrasonic sensor for gauging tank water level, and a DHT11 sensor.

The system is made to gather and examine information about the conditions under which plants are produced, including soil moisture content, temperature, humidity, and tank water levels. In order to maintain the appropriate growing circumstances for plants, the soil moisture sensor detects the quantity of moisture in the soil. The tank's water level is monitored by the ultrasonic sensor, which also makes sure the plants are getting enough water.The DHT11 sensor detects the environment's temperature and humidity, which is essential for preserving the proper growing circumstances for plants.

The microcontroller analyses the sensor data and modifies the watering schedule as necessary. If the soil moisture level is too low or the water level in the tank is low, notifications are also sent to the user via a mobile app. The system may be employed in a variety of locations, including indoor and outdoor gardens, greenhouses, and agricultural fields, and is very adaptable. The plant monitoring and watering system increases overall production while ensuring healthy plant development and minimising water waste.

In agrarian civilizations where the bulk of the people depends on agriculture for their living, water is a valuable resource. It is more crucial than ever to save water and utilise it effectively due to misuse and rising demands on water supplies. An innovative approach to solving this problem is provided by the plant monitoring and watering system in conjunction with iot technology.

In addition to helping farmers conserve water, this technique can boost production and lower crop loss. The system can maximise plant growth and development by giving plants the right amount of water. Additionally, this may result in healthier plants and more reliable agricultural harvests, which might boost farm income.

The plant watering and monitoring system can also be used in industries other than agriculture. It may be employed, for instance, in contexts such as home gardening or urban gardening, where plant health and water saving are also crucial considerations. The solution can give people a smooth and practical approach to monitor and take care of their plants by integrating IoT technologies.

In general, the plant monitoring and watering system is an innovative technical invention that has promise for enhancing agricultural practises, water conservation, and sustainable development. Innovative solutions like this will be essential in building a more sustainable future as the globe struggles with issues like water shortages and food security.

1.1. Proposed Methodology

Deploying the necessary sensors in the targeted places is the first step in the suggested process. This comprises sensors for detecting soil moisture, water tank levels using ultrasound, and temperature and humidity with DHT11 sensors. The NodeMCU 8266 microcontroller, in this example, will be linked to the sensors.

Data gathering: After the sensors are installed and linked to the microcontroller, they will start gathering information about the weather and water levels. The microcontroller will continually collect and examine the data, using it to compute choices regarding watering schedules and, if required, notifying users. IoT Integration: An IoT integration will be used to improve the system's functionality and usability. This will enable the user to receive warnings on their mobile devices and remotely examine the data that the sensors have gathered. On the basis of real-time data, the system would also be able to autonomously change watering schedules.

Adaptability: Depending on the water demands and environmental factors of various plant kinds, the system may be adapted to meet those needs. This may be accomplished by altering the watering schedule or configuring the sensors' thresholds.

1.2. HardWare:

1 ESP8266 :

The microcontroller board NodeMCU 8266 is based on the ESP8266 chip, which has integrated Wi-Fi capabilities. A 3.3V DC power source powers it, and the Arduino IDE may be used to code it. A 32-bit CPU, an 80 MHz clock rate, and 4MB of flash memory are all features of the NodeMCU board.

It includes 1 analogue input pin and 11 digital input/output pins. A USB connector is also available on the NodeMCU board for programming and debugging.

Fig 3 es826

2 Soil Moisture Sensor :

Sensor for Soil Moisture: The soil moisture sensor is used to gauge the soil's moisture content. The moisture content is determined by measuring the resistance between two probes that are put into the soil.

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Fig 4: Soil Moisture Sensor

3 DHT11 sensor :

DHT11 Sensor: The DHT11 sensor is used to gauge the humidity and temperature of the surrounding air. For detecting humidity and temperature, it has a thermistor and a capacitive humidity sensor. The sensor has a digital output that is attached to a digital input pin on the NodeMCU board and is powered by the board's 3.3V power source.

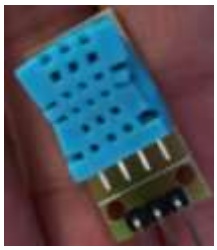

Fig.5 DHT11 Sensor

4 Water Pump :

Water Pump: The plants are watered by the water pump. A relay attached to a digital output pin on the NodeMCU board controls it, and it is supplied by a 12V DC power source.

Fig,6 Water Pump

5. *Relay Module :*

Relay Module: The relay module is used to switch the water pump on and off. It is powered by the NodeMCU board's 5V power supply and is controlled by a digital output pin on the board.

Fig.7 Relay Module

6. *BreadBoard :*

For projects using microcontroller boards like NodeMcu 8266, a breadboard is a solderless construction base used for constructing an electronic circuit and wiring.

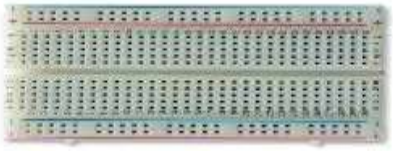

Fig.8

7. Ultra Sonic Sensor:

An ultrasonic sensor is a device that measures the presence or distance of an item using high-frequency sound waves. It operates by sending out a high-frequency sound wave and timing how long it takes for the wave to return after striking an item. The distance to an object may be calculated using the speed of sound and the time it takes for the sound wave to return.

Fig 9

2. Actual Output:

The soil, tank, and air sensors set around the plants are continually collected and analysed by the plant monitoring and watering system. The soil moisture sensor calculates the soil's moisture content, and the ultrasonic sensor determines the tank's water level. The DHT11 sensor monitors the ambient temperature and humidity. The microprocessor modifies the watering schedule for the plants based on the data from these sensors to make sure they get the proper quantity of water at the right time.

The system's real output is twofold: first, it maintains the best circumstances for the plants to grow in, ensuring their healthy growth and optimum yield. Second, based on real-time data and analysis, the technology reduces water waste by only watering the plants as needed.

Additionally, the system notifies the user through a mobile app if the water level in the tank is becoming low or the soil moisture level is too low, prompting the user to take action to protect the plants. Additionally, the user has more freedom and control over the plant's development by remotely monitoring the sensor data and changing the watering schedule.

Overall, the system aids in maximising the plant's development and output while minimising water waste and giving the user real-time input on the condition and requirements of the plant.

3. Conclusion

In conclusion, the IoT-based plant monitoring and watering system employing NodeMCU 8266, soil moisture sensor, ultrasonic sensor for detecting tank water level, and DHT11 sensor offers an automated and effective solution for giving plants the right amounts of water while minimising waste. To alter the watering schedule as necessary, the system gathers and analyses data on the soil moisture content, temperature, humidity, and tank water levels. Real-time monitoring and remote access to the system through a mobile app are made possible by the adoption of IoT technology, giving customers ease and flexibility. The technology can result in higher crop yields and more environmentally friendly farming methods by enhancing plant development and decreasing water waste. Overall, this research offers a workable solution and shows the promise of IoT technology in agriculture

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