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IoT Enabled Plant Monitoring System

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Abstract: As due to tremendous growth in the field of IOT, this technology has became easier to use & implement. In this paper we have proposed a simple solution based on plant monitoring system. Plant Monitoring System is a crucial task for the betterment growth of the plants. In this all the parameters which are required like soil moisture content, temperature, humidity are all the essential parameters which should be maintained and controlled to its utmost level.
Keywords: Internet of Things, Plant monitoring, Wireless connectivity

I. INTRODUCTION

India is a country where agriculture is really important. For plants to grow well and give a good harvest , they need the right conditions. Sometimes, the yield isn't as good as it could be because of things like the weather and other factors. Having a system to monitor and control these conditions could really help. Agriculture is crucial for the development of countries, and in India, a lot of people depend on farming for their livelihood.

A big part of the country's economy also comes from agriculture. But there are always problems in farming that hold back progress. One solution could be to use smart technology to improve traditional farming methods. So, the idea of this project is to use IOT technology with something called Node MCU to create a hydroponic system.

This system doesn't need soil; instead, it uses water to grow crops. It's automated, meaning it can take care of watering nutrients to the plants based on feedback from sensors. These sensors measure things like temperature, humidity, and other factors that affect plant growth.

II. LITERATURE SURVEY

1) We made a module to help monitor plants better using IOT. It's all about gathering information from the field. We use different sensors for this, like ones for monitoring soil, light, and temperature. The temperature sensor tells us how hot or cold it is, the soil monitor sensor checks how much water is in the soil, and the light sensor measures how bright it is in the field.
2) We're suggesting a new IOT device that sends real- time data about the environment to a database. It also takes pictures of plant leaves to help identify any diseases Using image processing and a fancy method called multiclass support vector machine. This process involves a few steps, like getting and cleaning up the images, finding the affected areas, picking out important features, and finally using a smart algorithm to figure out what's wrong. All the data from the sensors are collected by an Arduino, which then sends it all to a Raspberry Pi The Raspberry Pi splits up the data and sends it to a database using a special web address.
3) This paper talks about using computers or mobile apps to control farming systems. They've set up a system where different devices and sensors are connected to a main server through wireless communication. The server's job is to send and receive information from users using the internet. In auto mode, it makes decisions and controls everything automatically, while in manual mode, users can control things themselves using a computer or an app. It also talks about how IOT can be really helpful in rural farming and sector development.
4) ACHPA is a system that uses sensors to automatically control the environment in hydroponics. It keeps track of things like temperature, humidity, and soil moisture using sensors placed around the area. There's a central controller that makes sure everything stays just right for growing crops. It knows what the ideal ranges for these environmental factors are, and it adjusts things if they'renot quite right.
5) This system uses sensors to measure different things like flow rate, pH, and air quality. The flow rate sensor tells us how much water and nutrient solution we need in the hydroponic system to keep the pH level steady. The pH sensor checks the acidity of the solution, and the system makes sure it stays just right by comparing it with what's needed. There's also an air quality sensor to keep an eye on the surrounding air where the system is set up.

III. WORKING METHODOLOGY:

In the setup, we have Three sensors: a DHT11 for temperature and humidity, PIR Sensor for Motion Detection and a soil moisture sensor. There's also a relay circuit that controls a water pump. To sync everything up, we use a single bus data format between the DHT11 and the microcontroller (MCU). Each communication process takes about 4 milliseconds. The data from the sensors is split into integral and decimal parts, and it's sent in a 32- bit format, with the higher data bits sent first. Here's how the data is formatted: first, there's 8 bits for the integral humidity data, then 8 bits for the decimal humidity data, followed by 8 bits for the decimal temperature data, and finally, 8 bits for a checksum (which helps detect errors). If everything's transmitted correctly, the checksum shouldmatch the last 8 bits of the integral and decimal humidity and temperature data. All these sensors are connected to a Node-MCU (ESP8266), which acts as the microcontroller. The Node-MCU is powered by a 5V power supply. The valves and solenoid pumps are controlled by the Node- MCU to make sure everything works smoothly. All this data is sent to a Blynk app, which helps monitor and control the system remotely.

The whole system is automated using the Node MCU and IOT. There's also a dispenser that mixes nutrients withwater. This nutrient-filled water is then pumped through pipes using submersible pumps. Any water that the plantsdon't absorb gets recycled, and more nutrients are added based on the sensor readings before it's pumped back intothe pipes again.*The smart plant monitoring system uses special sensors to gather information about the plant's environment. These sensors measure things like how wetthe soil is, how warm or humid it is, and if there's any movement nearby (like a person walking by. All this collected information is sent to a small computer called a microcontroller, which figures out what to do based on thedata. For example, if the soil is too dry, it might decide to water the plant. If it detects someone nearby, it might activate a security feature. The system shows you all this information on a small screen called an LCD display. You can see details like temperature, humidity, soil moisture, and whether the water pump is running. If the soil is too dry and there's no one around, the microcontroller tells a relay module to turn on the water pump so the plant gets enough water. To power everything, there's usually a battery. The system tries to save energy by going into a low-power mode when it's not doing much, or when the plant doesn't need watering. This helps the battery last longer.

A. Block Diagram

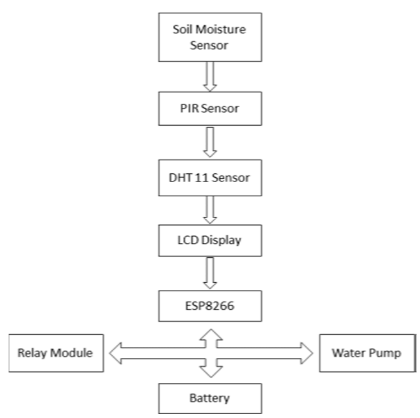


Fig 1: Block Diagram of theSystem

B. Circuit Diagram

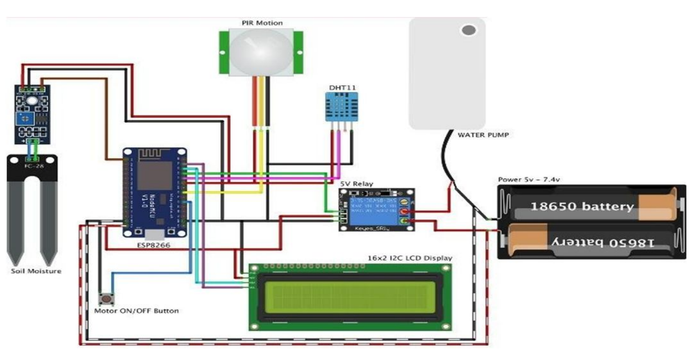


Fig 2: Circuit Diagram of theSystem

IV. RESULTS

Results showed that the system effectively watched over plants by keeping tabs on crucial factors like soil moisture, temperature, and humidity in real-time. This helped ensure plants received the right care at the right time. Sensor readings were accurate, giving reliable information about the plant's surroundings. This accuracy allowed users to make informed decisions about watering and adjusting environmental conditions. The system responded quickly to changes in the environment. For example, it promptly watered plants when soil moisture levels dropped too low. By maintaining ideal environmental conditions, the system protected plants from common problems like dehydration or overwatering, promoting healthy growth. The smartphone app made it easy for users to keep an eye on their plants from anywhere, making plant care more convenient and accessible. Discussions about future improvements focused on enhancing the system's capabilities, like adding more sensors for better monitoring or incorporating advanced features like predictive analytics.

Overall, the system demonstrated its potential to revolutionize plant care, offering simplicity, accuracy, and effectiveness in nurturing thriving plants.

A. Hardware Output

In this setup, we have a Node-MCU as the main controller, which acts like the brain of the system. It's powered by a regular 9V battery. We connect temperature and soil moisture sensors to the Node-MCU using jumper wires. These sensors help monitor the environment around the plant. Additionally, there's a relay module that controls a solenoid valve, which regulates water flow to the plant. The Node-MCU sends signals to the relay module to turn the water on or off based on the sensor readings. Once the hardware setup is done, we link the device with an IoT application installed on a smartphone. This app allows us to remotely control the system. From the app, we can send commands to turnthe water valve on or off as needed.

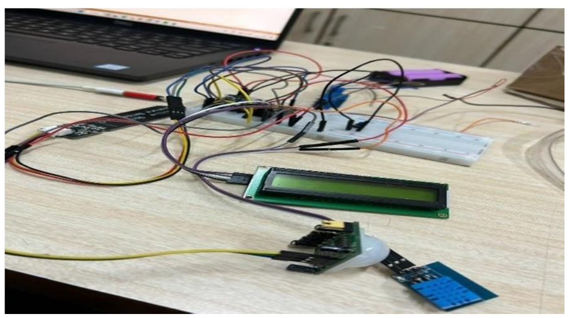


Fig 3: Hardware Design

B. Software Output

The smartphone app shows information like soil moisture, temperature, and humidity, so you can keep an eye on your plant's health. It also has a button that lets you control the water valve. Ifthe soil gets too dry (below 600 moisture level) or the temperature goes above 30 degrees Celsius, you can click the button to turn on the water valve and give your plant a drink. This way, you can take care of your plant's needs right from your phone, makingit easy to keep your plant healthy and happy.

Fig 4: Results from Mobile Application

V. LIMITATIONS

One big problem is that the system needs a good internet connection to work properly. If the internet is not reliable, the system won't be effective. Also, it needs a stable power source, which can be hard to find in places without electricity. Another issue is that the sensors need regular maintenance to give accurate readings. If they're not taken care of, the system might not work well. Also, there might not be enough sensors to cover large areas. Sending data over the internet can be risky because someone might access it without permission. So, strong security measures are needed to keep the data safe. Plus, setting up the system can be expensive, making it tough for small farmers to afford. Extreme weather can also damage the system's parts, and farmers used to traditional methods might find it hard to switch to this new technology.

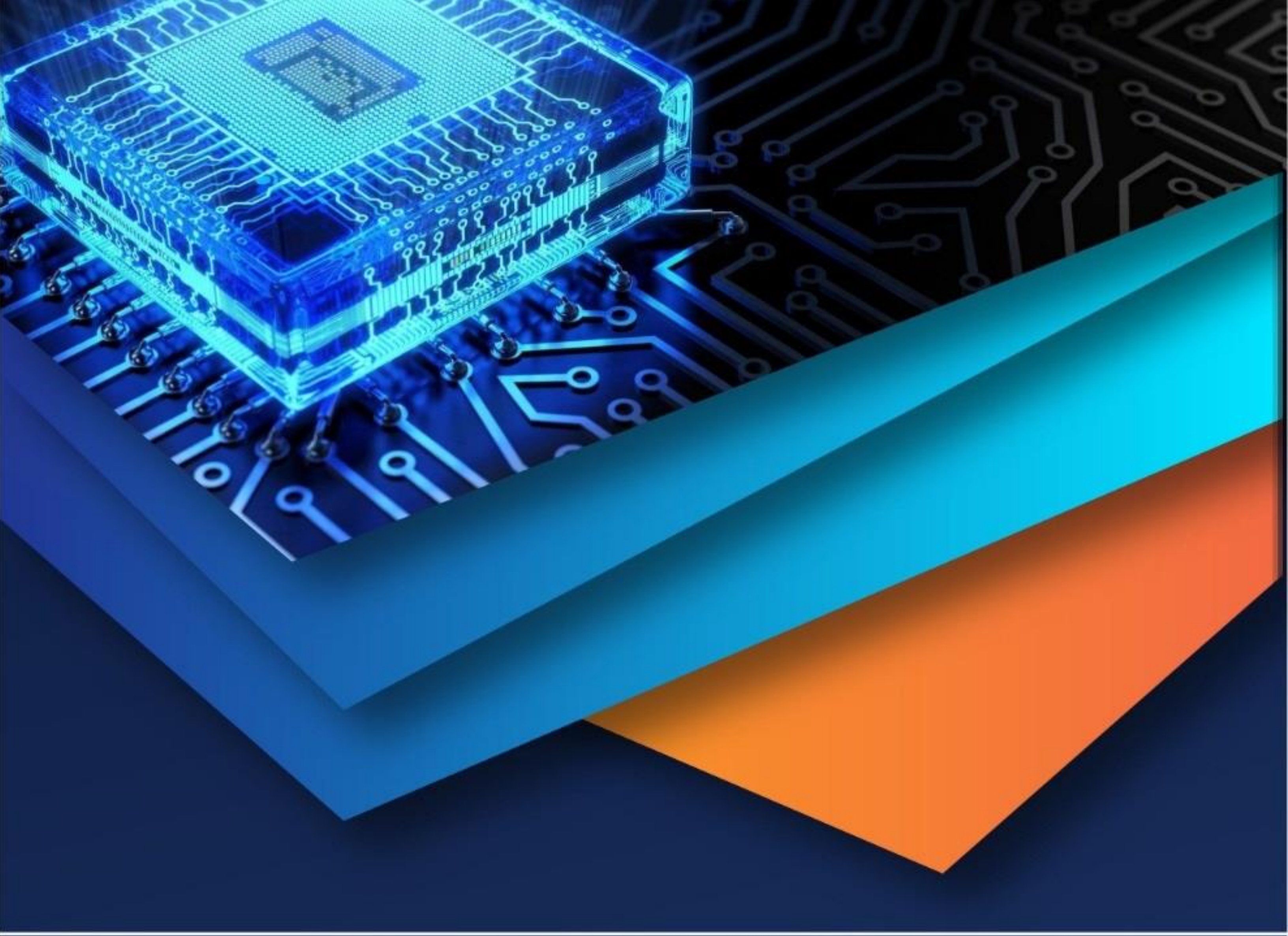
Overall, dealing with these problems needs careful thinking about technology, the environment, and how people farm, to make sure smart plant monitoring systems can be useful and adopted by everyone.

VI. CONCLUSION

In conclusion, the IoT-enabled smart plant monitoring system offers a convenient and effective way to care for plants. By using technology to monitor factors like soil moisture, temperature, and humidity, the system ensures plants receive optimal care and protection from environmental issues. With features like smartphone integration and real-time alerts, users can easily manage their plants and prevent problems like overwatering or dehydration. Overall, this system simplifies plant care and helps plants thrive in healthy conditions.

REFERENCES

[1] https://robocraze.com/blogs/post/smart-plant-monitoring-system
[2] https://www.ijraset.com/research-paper/iot-based-smart-plant-monitoring-system
[3] https://ieeexplore.ieee.org/document/10048792/a uthors#authors
[4] https://ieeexplore.ieee.org/document/9791690
[5] https://www.youtube.com/watch?v=PTJ9sAk2c2I
[6] https://link.springer.com/chapter/10.1007/978- 981-99-8343-8_9
[7] https://circuitdigest.com/microcontroller- projects/smart-plant-monitoring-system-using-esp8266
[8] https://www.jetir.org/papers/JETIR2306458.pdf
[9] https://www.researchgate.net/post/What_is_the_pu rpose_of_smart_plant_monitoring_system_and_what_are_the_applications_of_IoT_in_environmental_monitoring
[10] https://ijarsct.co.in/Paper10234.pdf
[11] https://www.viralsciencecreativity.com/post/iot- smart-plant-monitoring-system



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