Smart Plant Monitoring System

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Abstract - ***The Internet of Things is one of the most widely used forms of communication. It can be used for many purposes. Proper irrigation is still a challenge in most regions. Water use does not affect the soil and plants. A maintenance or management system will help solve this problem. This project uses the Internet of Things to create a smart crop management system. This helps increase yields without affecting soil quality. Measurement characteristics such as temperature are an important feature of this system.***

Keywords - ***Internet of Things, Feasible Monitoring, Smart Monitoring, Without Affecting Soil Quality.***

1. INTRODUCTION

Agriculture in India generally forms the backbone of our country; people are addicted to it. The main problem of agriculture is water scarcity. Lack of water leads to wastewater. Proper irrigation is still a challenge in most regions. Water use does not affect the soil and plants. A maintenance or management system will help solve this problem. Global agriculture plays an important role in the development of agricultural countries. Approximately 68% of people in India earn their living from agriculture and 1/3 of the country's capital comes from agriculture. Agricultural problems have always hindered the country's progress. This problem can be solved by smart agriculture and improving existing agriculture. So the aim of this project is to use Node MCU to Using hydroponic systems using IoT technology. The main features of the project include aquaculture, which will eliminate the need for land. With this hydroponic automation system, water and nutrients can be provided to the crops in the region according to recommendations such as temperature, soil, electricity and physical energy.

2. LITERATURE SURVEY

[1] A. Pravin, T. Prem Jacob and P. Asha, Design to improve factory monitoring using IoT. They mainly focus on gathering information from the field. Sensor devices can be used to collect data. The thermometer will provide temperature data, soil moisture can be measured using a soil thermometer, and a light sensor will be used to measure the amount of light in the area.

Monirul Islam Pavel, Sadman Sakib Hasan, Syed Mohammad Kamruzzaman, and Saifur Rahman Sabuj proposed an IoT-enabled device that uses image processing to transfer environmental data, including tree images, into a time database, and many classes support vector technology to isolate. viruses. Figure 1 shows our proposed model. Imaging is used to identify and diagnose disease-related illnesses. In this workflow, the tasks are split into four stages: capturing and processing images, segmenting the affected regions, extracting features, and classifying them using various support vector machine algorithms. All sensor data is received by Arduino and stored in string format. Arduino then connects all the arrays to the Raspberry Pi 3 and stores all the data back into the arrays, separated by commas. For each sensor and sensor value received, we create a Uniform Resource Locator (URL) using the IP address of the data server and the database name.

[2] Nivesh Patil, Shubham Patil, Animesh Uttekar, A. R. Suryawanshi explain how to control the system using a computer or mobile application. In the system, each part of the product combines various devices and sensors and interacts with the central server through wireless communication modules. The role of the server is to send and receive data from the client using the network connection. There are two types of operating systems; in automatic mode the system determines and controls device settings; Discuss the development trends and opportunities of the Internet of Things in agriculture, rural areas and business development. Review the knowledge gained and share the steps to implement from developing suitable models for IoT hardware and solution models.

[3] Asif Siddiq, Annum Zehra, Muhammad Owais

Tariq, Salman Malik founded ACHPA, a regulatory environment in hydroacoustics. ACHPA uses sensors and central controllers placed at appropriate locations to control environmental parameters such as temperature, humidity and humidity to ensure environmental control of crops. There are many tasks that involve heavy weights that need to be fed to the controller first. To check the action, the average taken by the sensor is compared with previously used values..

[4] Divya D, Harsha Mohan Hiremath, Jyothi T U, and B S Shubhashree developed a system utilizing flow, pH, and air quality sensors to monitor changes during the preparation process. The flow meter measures the total volume of water and liquid required in the hydroponic system to maintain the pH level, which is monitored by the pH sensor. This system is specifically designed to regulate the pH value of the solution by comparing the desired value with the measured value.. The application charges a fee for managing the mining pool. Air quality sensors continuously monitor air quality around the facility.

3. WORKING METHODOLOGY

In the block diagram, it is evident that two sensors are employed: the DHT11 for temperature sensing and a relay circuit for controlling the pump. Single bus mode is utilized for synchronization between the DHT11 and MCU sensors. Communication occurs. approximately 4 milliseconds. The file has an integer part and a decimal part. All data sent is 32 bits and the sensor sends high bit data first. Data type: 8 The data consists of 8-bit humidity data, 8-bit decimal humidity data, 8-bit temperature data, and an optional 8-bit checksum. If the data is correctly input, the verification code should match the last 8 bits of the phrase "8-bit humidity data + 8-bit decimal humidity data + 8-bit temperature data + 8-bit checksum." All these sensors are connected to an open NodeMCU (ESP8266), which functions as a microcontroller. This microcontroller is also connected to a 5V power supply. Valves and pumps are controlled by the MCU nodes to ensure proper machine operation. All this information is transmitted to the Blynk application. The entire system is managed automatically using NodeMCU and IoT systems. Dispersants are utilized to mix nutrients with water. The nutrient-enriched water is delivered to the pipes via a submersible pump. Any water not absorbed by the crops is reused by adding nutrients based on sensor readings and returned to the system.

BLOCK DIAGRAM :

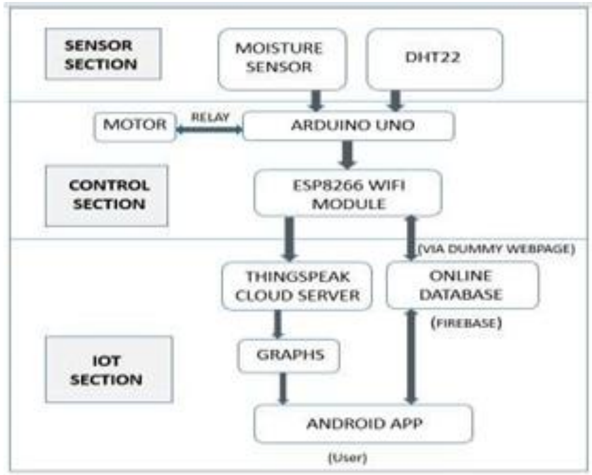

Fig 1: Block Diagram of the System

3.1 CIRCUIT DIAGRAM:

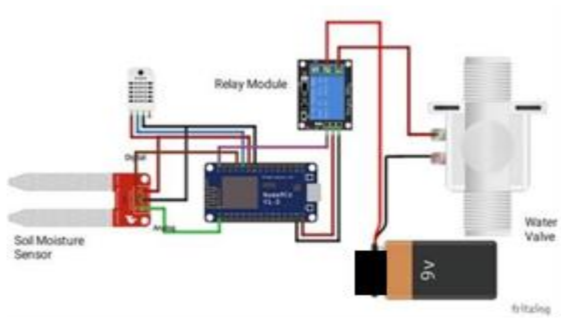

Fig 2: Circuit Diagram of the System

4. HARDWARE DESCRIPTION

4.1 Node-MCU ESP8266:

Node-MCU is an open-source firmware platform. that can be used in open source designs. The most commonly used device is a dual-in-line (DIP)-based graphics card that connects a USB controller to a small board containing the MCU and antenna.

Fig 3 : Node MCU

4.2 Soil Moisture Sensor:

Soil moisture sensors gauge the volumetric water content in the soil. Since measuring soil moisture directly with a gravimeter requires removing, drying and measuring the sample, soil moisture sensors do not use other properties of the soil (e.g. resistivity, dielectric constant) and measure volumetric moisture content directly. Interaction with neutrons gives water its name.

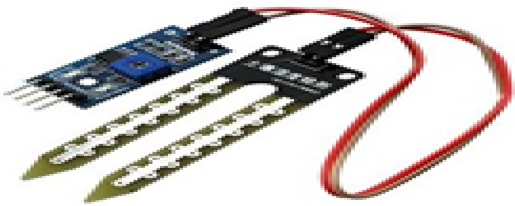

Fig 4: Soil moisture sensor

4.3 Relay Module:

A relay is an electrical device that utilizes electric current to open or close a circuit.. The channel relay module is not an ordinary connection, it is made of materials that are easy to replace and connect, please follow the signs indicating whether the module is using power and whether the relay is working.

Fig 5: Relay module

4.4 Solenoid Water valve:

A solenoid valve is a differential valve that uses a diaphragm and a solenoid valve to allow fluid to flow into the circuit. The solenoid “actuator” consists of an electric motor and a spring assembly that activates/deactivates the electronic device.

Fig 6: Solenoid Water valve

4.5 DHT11 Temperature sensor:

The DHT11 is a straightforward, ultra-affordable digital temperature and humidity sensor. It employs a capacitive humidity sensor and a thermistor to measure the surrounding air and transmits a digital signal to the data pins, eliminating the need for analog input pins. While it is easy to use, it takes some time to retrieve information.

Fig 7: DHT11 sensor

5. SOFTWARE DESCRIPTION

5.1 Arduino IDE:

The Arduino Integrated Development Environment (IDE) includes text boxes for coding, text fields, various text elements, and tools with buttons for active use, among other features. It connects to Arduino and Genuino hardware to upload and interact with programs..

Fig 8: Arduino Logo

5.2 BLYNK App:

Blynk app is an open source Android application that can be used to create IoT applications in 5 minutes. Works with Arduino, ESP8266, ESP32, Raspberry Pi and more. Bluetooth and BLE are also supported.

Fig 9: Blynk App Logo

ALGORITHM:

1. START
2. Start up all devices, DHT11, humidity sensor, buzzer, node MCU and mobile application. Collect the sensors output.
3. View the price of the mobile app.

4. Check soil moisture value.
   a.If the value > starts, turn on the pump.
   b.If value < start go to step 4.
5. Check DHT11 value.
6. Use Wifi module to send notifications to users.
7. Go to step 3

5.3 FLOW CHART:

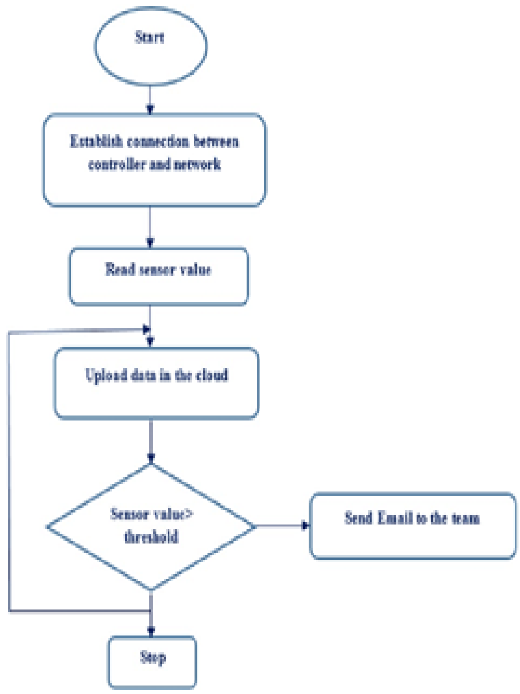

Fig 10: Flowchart of the System

6. RESULTS

The checkout system is fast, accurate and safe. Therefore, experimental results show that the preparation is easily accessible and protects plants from rot or drought.

6.1 Hardware Output:

The system hardware configuration includes Node-MCU as the controller. It works with 9V battery. Temperature and humidity sensors are connected to the microcontroller using jumper cables. Relay modules are used to control solenoid valves. A chip provides the control signal for the solenoid valve. After installation, the next step is to connect the device to the IoT app on your smartphone. The smartphone then sends a control signal to open and close the solenoid water valve. You may find all the settings simple, compact and very easy to use.

Fig 12: Hardware Design

6.2 Software Output:

Applications installed on Android smartphones display parameters such as humidity, temperature, and moisture levels. This aids in monitoring the facility's current status. A button for controlling the water solenoid valve is also displayed. When the humidity falls below 600 or the temperature exceeds the room temperature (e.g., 30 degrees Celsius), press the button to open the valve.

Fig 11: Results obtained through Mobile application.

Turn off by pressing the same button when the temperature and humidity return to normal.

7. CONCLUSION

The entire project is aimed at achieving two main objectives. The first goal is to assist farmers in enhancing their agricultural expertise, while also addressing critical environmental issues and disaster prevention measures, thereby safeguarding crops and natural ecosystems from harm. The second objective of our project is to leverage hydroponic equipment, harnessing the moisture, heat, and coolness around plant roots to cultivate plants in an optimal, sustainable environment, eliminating the need for traditional soil-based growth methods. By sending a message to farmers or users about the situation, it helps prevent planting delays and ensures that plants survive in a suitable environment.

8. REFERENCE

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