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IoT Based Humidity, Temperature Control, And Crop Management System

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Abstract – The system proposed in this paper is to control the humidity and temperature inside a greenhouse using sensors and IoT devices by controlling foggers and also keeping track of different activities related to the crop. Here humidity and temperature control at right time is the most important factor for the crop. We have designed this system to store live humidity and temperature values from a greenhouse to take the decision and have created a database for storing the activities like planting, fertilization, harvesting, etc... So, farmers can analyze the data related to crop and getting desired output reports of expenses and income from that crop. To minimize the manual activities and automize climate control, this system is more useful. This automatic system will control greenhouse foggers automatically throughout the day.

When we control humidity with foggers sprinkles of water also controls high temperatures. In case of low-temperature, additional heaters may be used to raise the temperature in a greenhouse, which is the future score of this project.

As these operations are operated on time and correctly, it is beneficial for crop health and its yield. Commercial companies have their own automatic climate control system but the cost of their systems are very high which is not affordable for normal farmer. Our system is designed for low cost and efficient way to perform same operations like commercial systems are doing.

Key Words: Automatic Climate control, Humidity control, Fogger control, crop management syetem, Crop, green house, polyhouse automation, Agriculture automation, nodmcu for IoT

1. INTRODUCTION:–

In control farming, the climate controlling is most important aspect for the better health and yield of crop. For that climate variables such as temperature, humidity needs to be controlled in some specific range to lower the stress of plants. By controlling humidity we can control temperature. Humidity and temperature controls are most important factor in this project and here we create a database which stores all the activities related to crop. So that along with better yield and farmers can manage different activities such as tilling, pruning, spraying, etc. keeping log of time, cost, income for or from that activity to summarize profitability of that crop.

The effect of temperature and humidity is very essential for the crop health. i.e. Crop diseases, small fruits and flowers, improper Color, and improper growth, etc.

Hence proper use of temperature and humidity sensor make operations and monitoring well maintained.

If these operations are performed automatically by machines, it will help farmers by reducing their work and efforts, it will also save farmers time and they can concentrate on another aspect of their work.

1.1 Project objective:-

1) Creating Automatic humidity and temperature control system.

2) Lowering the cost involves in such projects to make it affordable to more farmers.

3) Analyzing data from field and getting refined output values for further study.

4) Keeping records of crop related activities.

5) Keeping track on time, expenses and income.

2. LITERATURE SURVEY:-

The system proposed collects greenhouse environmental information such as temperature, humidity, etc. Crop diseases, especially, have deep relationship not only with indoor environmental factors but also with humidity lasting time on leaves and temperature of leaves. Accordingly, monitoring crop itself is as important as monitoring indoor environments. Using these collected greenhouse environmental data, indoor environments can be more effectively controlled, and monitoring crop itself can contribute to improve productivity and to prevent crops. In addition, it will be possible for farmers to do control plant growth through closely studying relationship between indoor environmental information and monitored information on crop itself. System components are: temperature sensor, humidity sensor, leaf temperature sensor, leaf humidity sensor.

The design of the greenhouse and the temperature and humidity control system have been investigated. We first got

information about the first greenhouses and types of existing greenhouses. Next, we found out the heating and cooling systems needed for greenhouses. We also found the relationships between the temperature and humidity of the greenhouse in several ways. In the next steps, by selecting a number of temperature and humidity sensors, we will the designed system in the greenhouse to turn on and off the sensors in the greenhouse, so that it controls the temperature and humidity inside the greenhouse.

The supervising system of flower house's environment, which is put into function by the popular series of AT89S52 single machine tablet, mainly measures and controls the major temperature and humidity of environment, which will be revealed by showing system. The paper gives an introduction of system's software, hardware design and the process of performing. The system is easily manured with great utility.at the same time.

We got information about ESP8266 how to use and how to code into it. Also, we learnt about how to combine sensors with the module and how it works parallelly

We learnt about the greenhouse basics. Also the plant requirements with the environment of surrounding taking temperature, humidity, moisture, fog, air, water, etc. also we figured out how the sensors will work take the temperature and humidity into consideration.

By watching this video, we got to know about why managing temperature and humidity is important for green house. Also, what are the challenges of managing temperature and humidity.

We learnt about the humidity and relative humidity. How we can manage the green house using this relative humidity taking hot and cold air and moisture into consideration.

By observing this content, we got to know that the temperature and humidity are the basic area than a farmer has to maintain for healthy yield.

By analyzing the above literature, we get to know that there are no. of system and no. of companies.

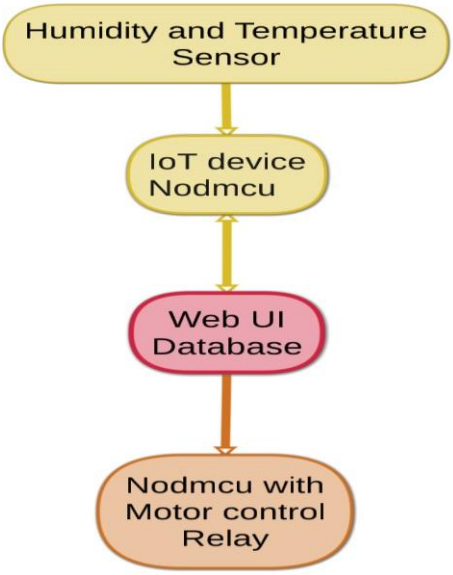
3. PROPOSED SYSTEM:-

The IoT based humidity control and crop management system is a mixture of hardware and software additives. The hardware part includes Humidity and Temperature sensor HT11, nodmcu and relay circuit.
Nodmcu is the main heart of this system which collects physical information like humidity and temperature from HT11 sensor. Nodmcu sends this data to webserver and webserver stores it in database for further processing. Based on Humidity and Temperature vales nodmcu takes decision to switch on relay or switch off relay which operates fogger motors. To control different values we will have web UI for each user. Who can monitor and manage foggers activity and crop related activities.

4. METHODOLOGY:-

While designing this system we have collected some sample data from green house which contains humidity and temperature values and trigger point at which the fogger are getting switched on manually. We have collected random data samples from 2-3 green houses which have different crops. As per crop the values of humidity and temperature changes the trigger time at which we have to switch on or off the foggers to maintain humidity and ultimately temperature of green house.
We have also collected some random sample values of humidity which needs to be maintain for crop from agriculture scientist which are working for government and private agriculture firm. From them we have got different trigger values of humidity. This will help us to finalize average values of humidity for each crop which we will add in our research base. This research base will be added in web UI so farmers will select its crop and trigger values will get updated for his crop.

5. SYSTEM DESIGN AND IMPLEMENTATION



Let's we discuss about above block diagram. It consist of four main parts:

5.1 Humidity and Temperature Sensor : -

Here we connect humidity and temperature sensor to the Node-MCU which is an IoT device. Humidity and temperature sensor collect the live values of humidity and temperature and it will send these values to the nodmcu for further processing at server. Sensor plays an main role of collecting physical values of the surrounding atmosphere in green house or controlled farming. More precise humidity temperature sensor will give accurate reading which increases initial hardware cost.

5.2 IoT device Nodemcu : -

Nodmcu is heart or brain of this system. It acts as decision maker and processor on data either received from humidity and temperature sensor or processed values from server. As per the programming Nodmcu sends each humidity and temperature values each minutes to the server with sites unique name so that data can be processed as per site unique id just like unique identifier in IoT devices which will differentiate data from other sites or other installed devices hosted on same server. Even username changes or by adding new user for same site we can still process data based on sites unique id for fogger controls.

5.3 Web UI and database:-

Web UI is offered to user to better manage and control this system. As its integrated control and crop management system, there will be web form where farmer can keep the log of activities, expenses, income. So that he will able to track activities he has done related to that crop. He can Track back profit and loss with this system. From Web UI farmer can set his desired values of humidity and temperature to switch on or switch off foggers. He can switch on or switch off motor from same UI.

5.4 Nodmcu with motor control relay:-

Using server-side scripting we are calculating average humidity and temperature of recent time frame eg.15min of average. To check humidity and temperature values with preset values another node MCU will perform periodic checks and it will switch on / off fogger motors via Relay Module. Current relay module us capable of controlling one motor set and fogger control and for future scope we reduce high humidity by switching exhaust fan on/off.

6. HARDWARE USED:-

This project is aided with many hardware components.

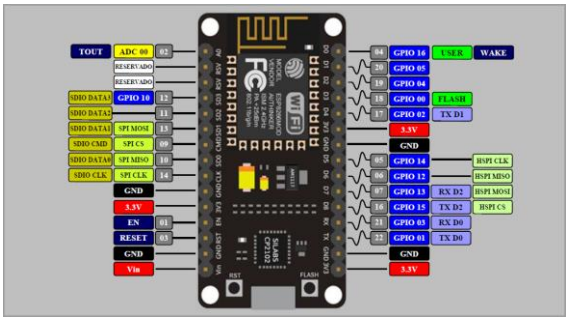


Fig I. Node MCU –ESP8266

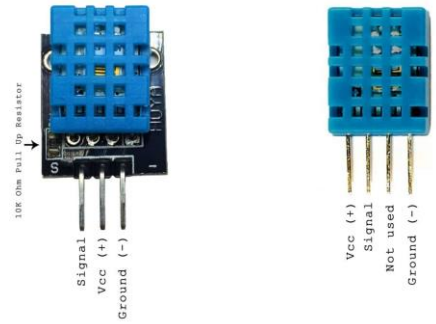


Fig II. DHT11 – Temperature and Humidity sensor

Fig III. 16*2 LCD Display with i2c convertor

Fig IV. 4 Channel relay

6.1 Node MCU-ESP8266: -

NodeMCU is an open-source firmware and development kit that helps to build IoT products. It includes firmware that runs on the ESP8266 wi-fi SoC (System on chip) from Expressif System, and hardware which is based on ESP-12 module. However, as a chip the ESP8266 is also hard to access and use. It uses many open source projects, such as Lua-cjson and spiffs.

6.2 DHT11 – Temperature and Humidity sensor: -

The DHT11 is commonly used Temperature and humidity sensor. The sensor comes with a dedicated NTC to measure temperature and an 8-bit microcontroller to output the values of temperature and humidity as a serial data. The sensor is also factory calibrated and hence easy to interface with other microcontrollers. This sensor is used to sense temperature and humidity present in the atmosphere.

6.3 16*2 LCD Display with i2c convertor: -

I2C_LCD display screen is an easy to use display module. It can make display easier. It is able to display 16*2 characters on 2 lines.

6.4 4 Channel relay: -

The 4-Channel relay module contains 5V relays and the associated switching and isolating components, which makes interfacing with sensor easy with minimum components and connections. There are two terminal blocks with six terminals each and each block is shared by two relays. The terminals are screw type which makes connection to mains wiring easy and changeable. The 4-channel relay module can be used to switch multiple loads at the same time since there are four relay on the same module.

7. RESULT AND DISCUSSION:-

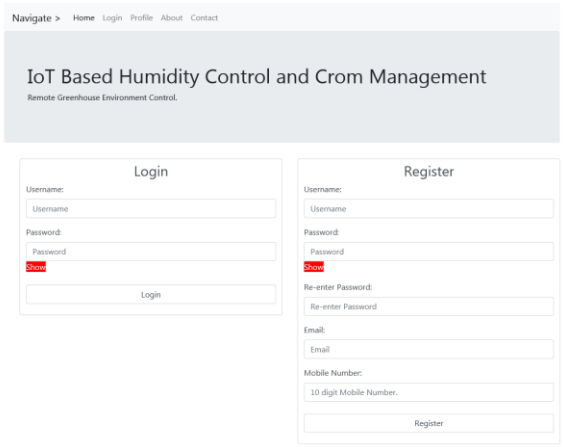


Fig. 7.1 Login and Registration.

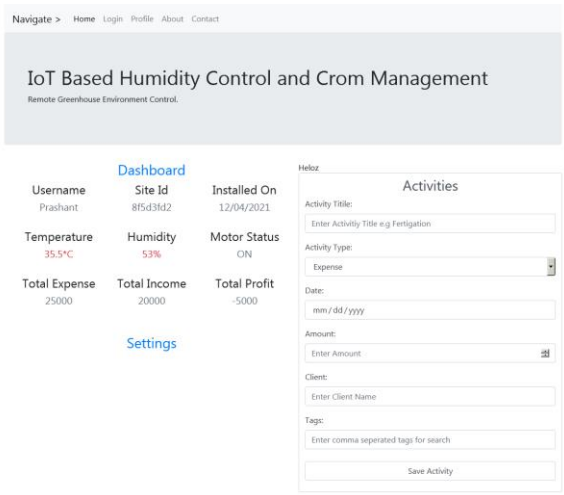
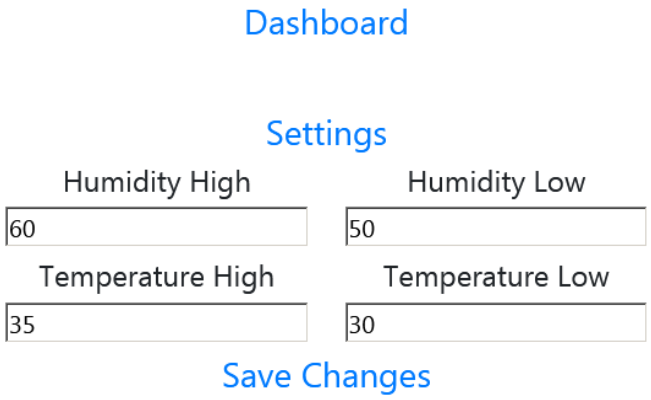


Fig. 7.2 Profile Dashboard and Activity form.



7.2.1 Dashboard Settings Section.

8. ACKNOWLEDGEMENT:-

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9. FUTURE SCOPE:-

- As we can add weather analysis for farmers to get information on the site itself using external weather API's
- Graphical view of each crop History cab be shown.
- Connection of More than one module by adding additional sql statements to to the server side scripting.
- Adding more humidity reduction Equipment to reduce over humidity as per the crop requirements.

10. CONCLUSION:-

From this entire project we have concluded that we can create better low cost environment control system for green houses which will be beneficial for farmers for maintaining

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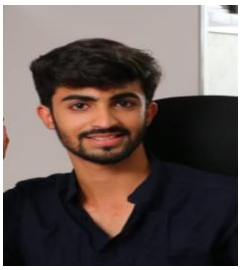

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