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IoT BASED SMART FARMING USING ESP8266 MICROCONTROLLER

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Abstract: Internet of things (IoT) plays the role of a tool by empowering physical resources into smart entities through existing network infrastructure. It focuses on to provide smart and seamless services to the user end without any interruption. The IoT paradigm is aimed at formulating a complex information system with the combination of sensor data acquisition, efficient data exchange through networking, machine learning, artificial intelligence, big data and clouds. But collection of information and maintaining the confidentiality of an independent entity, and then running together with privacy and security provision in IoT is the main concerning issue. In this paper, we are developing a system which will automatically monitor the smart environment and generate Alerts/Alarms or take intelligent decisions using concept of IoT. IoT has given us a promising way to build powerful protection systems and applications by using wireless devices, Android and sensors. A main contribution of this work is that it summarizes uses of IoT in agriculture field with Artificial Intelligence to monitor and control the smart environment in the paddy field. In this IoT based smart environment system different parameters like temperature, humidity are measured and the data is then transferred to one android application using Google firebase cloud system. Further the system is capable of detecting the fall/ rise in temperature in the environment and if any such situation is detected, a push notification message will be sent to Blynk notification App. Accordingly controlling measures can be taken using the same App remotely. The whole system is controlled by a single board Node MCU ESP8266 wi-fi module. All data are transferred from node MCU which is connected to wi-fi and further to Google cloud firebase.

Index Terms **- Component, Internet of things, Node MCU, Wi-Fi**

I. INTRODUCTION

IoT is the network of physical objects or things embedded with electronics, software, sensors, and network connectivity, which enables these objects to collect and exchange data [1]. Use of advanced existing technologies such as cloud computing, smart vehicular system, protection protocols, analytics tools for IoT-generated data, communication protocols, etc is a new challenge for us. Combining IoT with Artificial Intelligence offer promising arrangements towards the robotization of different field. IoT is the latest up gradation in computer system and electronic engineering which results in enhancing the reliability of the smart environment in agriculture field. The IoT design comprised of remotely inserted sensors, hubs, actuators and a smaller scale regulator to perform and take clever choices. Here, the item, gadgets, machines, creatures, people are given a special recognizable proof label which empowers it to be distinguished from a distantly found territory and move information without requiring HCI (Human-Computer Interaction).

As technology is updating and it is also necessary to make the agriculture field also smart one. IoT plays a key role in designing a smart agriculture [2]. Internets of Things (IoT) sensors are used to provide necessary information about agriculture fields. The main advantage of IoT is to monitor the agriculture by using the wireless sensor networks. The sensors are used to sense the different environment parameters. IoT also shows the information by including date and time. The temperature level based on type of crops cultivated can also be adjusted.

The framework comprises temperature and humidity sensors interfaced with Node MCU also a controlling system with the use of a pump to supply water in site of installation whenever required. The sensor information is continually filtered to record esteem and check for changes in temperature, humidity and afterward this information is communicated on the web. The wi-fi module is utilized to accomplish web usefulness. The worker at that point shows this data on the web, to accomplish the ideal yield. Industry alert depend on manual mediation. Warning for any conditions in the installation site or environment is displayed on our android phone.

II. PROPOSED SYSTEM

The block diagram of the proposed work has been depicted in fig 1. This project is basically designed using NODE MCU ESP8266 microcontroller as it has wi-fi module which can be connected with our personal hotspot. The program is written in such a way that if the temperature rises above a critical value (here 32ºC) in the smart environment it will take necessary proportionate step.

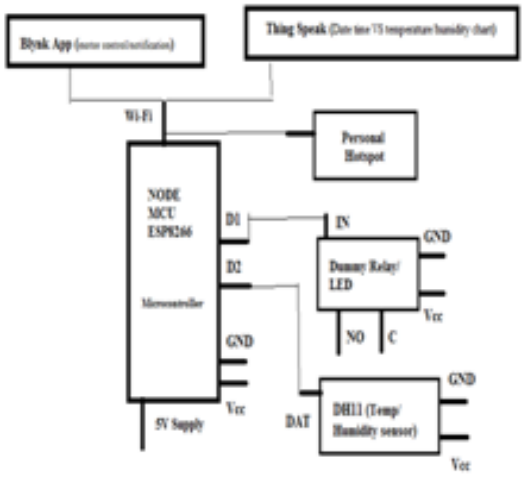

Figure 1: Block Diagram Of IoT based Smart Environment

The temperature and humidity sensor DHT1 is connected with the ESP8266 microcontroller to measure the temperature and humidity value of the surrounding and will feed it to the microcontroller. The data collected from the sensor will go to the IoT device or ESP8266 microcontroller, the IoT device will then process and transfer the data to ThingSpeak open-source software and Blynk server. The Blynk server will communicate the data to our mobile, Blynk Android application and ThingSpeak. The ThingSpeak the open source software is used to store and monitor the temperature and humidity value with date and time. The Blynk app is used to get notification also if the temperature is above the critical value. It will notify as "WARNING!". At that moment the relay module is ON and as a result the DC pump motor connected to it will start automatically sprinkle water at the site. The motor can be stopped through Blynk app or it gets automatically switched off as the temperature and humidity come down.

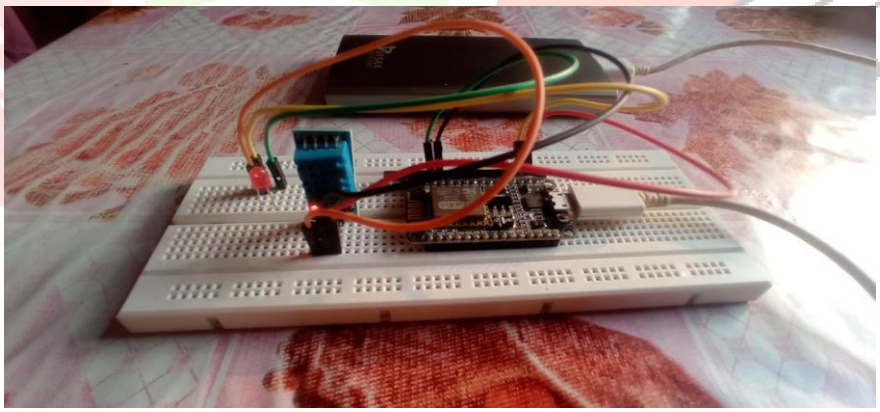

Figure 2: Circuit of NODEMCU ESP8266 with Humidity sensor and Relay

NODEMCU ESP8266 consists of 16 (D1- D15) digital pin USB power supply port and a Wi-Fi module[3][4]. D1 pin is connected to Relay and D2 pin is connected to DHT11 (temperature and humidity sensor). DHT11 sensor is on when the LED in the sensor turns on. The power supply is given by a Mi powerbank using a USB cable which gives a supply of about 5V[5][6]. When we start or switched on the system and the wifi module present in the circuit automatically connects to the server[7]. The DHT11 sensor turns on and it feeds digital data of temperature and humidity to the microcontroller. The microcontroller shares the data through internet to the ThingSpeak cloud and Blynk server which further ensembles the system to display data on our Android phone where the application is installed. The Blynk app gives us the notification rise in the temperature above 32ºC as shown in the figure 4 and the ThingSpeak software gives us the temperature vs time date chart also humidity vs time date chart on our phone as in figure 5. Further when the temperature is above 32ºC the if loop turns on the relay and the DC pump motor operates till the temperature is decreased to a value below 32ºC. The motor can be made off sending a message from the user side too.

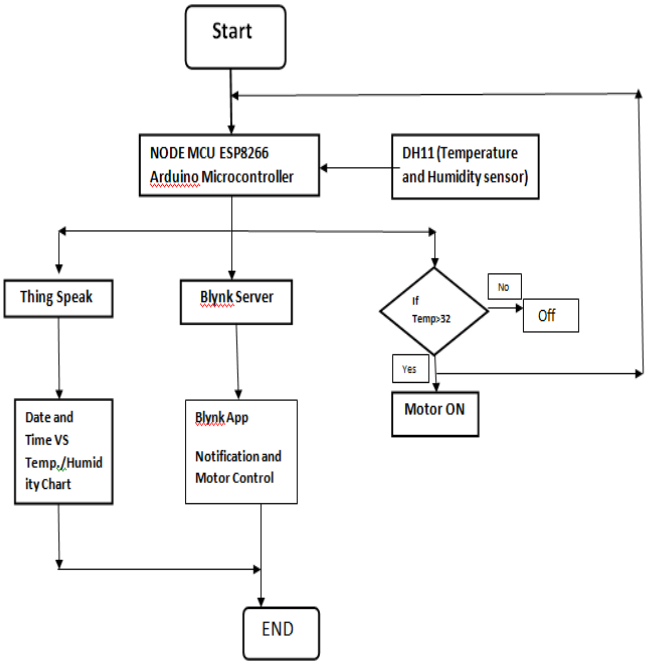

Figure3 : Flowchart of the smart environment protection system

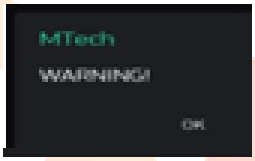

Figure 4: Notification in Blynk App in our Android phone

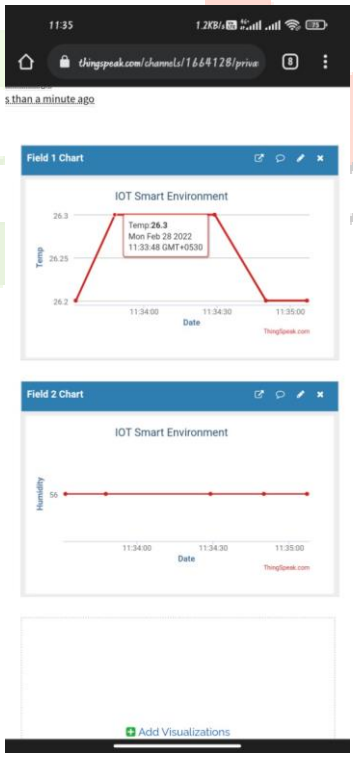

Figure 5: Field 1 chart is of Temperature wrt time and date & Field 2 chart is of Humidity wrt time and date

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The figure 6 gives an essential explanation of the set up. The block diagram also shows the connection of the circuit to establish the required result. The principle goal of our program is to get a hands-on through regarding coordinating various tasks with the web utilizing Wi-Fi module for control and monitoring. Which result in giving a perfect presentation in the topic of IoT.

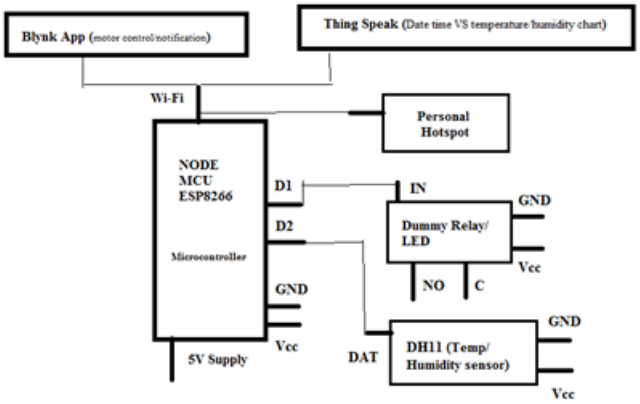

Figure 6: Block Diagram of our system

Figure 6: Block Diagram of relay and DC pump motor connection.

III. EXPERIMENTAL RESULTS AND DISCUSSION

This work is to explore the various environmental parameters in IoT platform. This system is design to monitor and control automatically the different aspects of remotely situated agricultural field. This system will help the cultivator to monitor the environment where the system is installed and to take immediate action whenever it is necessary. The notification of the alerting situation which is another vital part of the system. Here we have introduced Blynk App and ThingSpeak which when synced with the program that runs the system gives a smoothly functioning notification system. This was then implemented multiple times to make sure that there is no room for debugging. The final run was then done and the desired system output was achieved.

At normal condition:

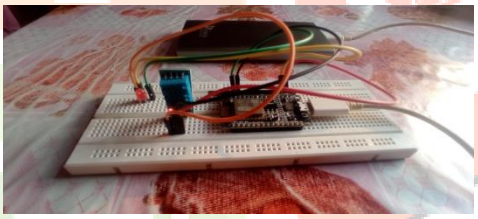

Figure 7: System in normal condition.

In the figure 8 system is powered with 5v DC power supply using a power bank and USB cable in normal room temperature it gives results as shown below:

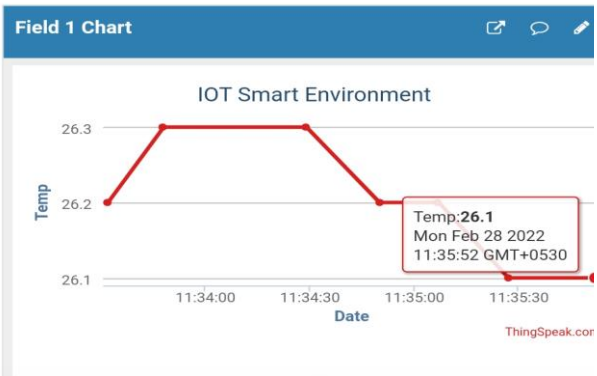

Figure 8: ThingSpeak result-Temperature Vs Date and Time Chart at normal condition.

Result: From the figure 8 we get the following information:

- Day: Monday.
- Date: 28/2/2022
- Time: 11:35:52 GMT+0530
- Temperature: 26.1°C

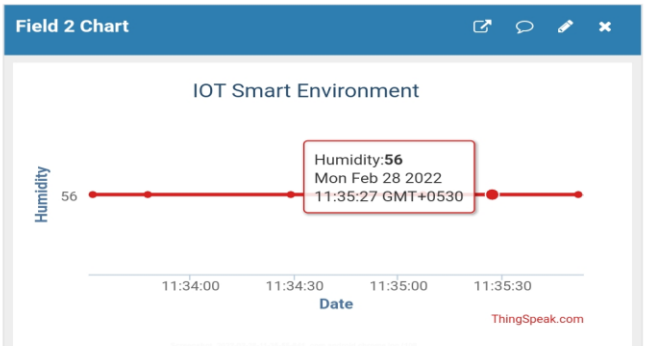

Figure 9: ThingSpeak result- Humidity Vs Date and Time Chart at normal condition.

Result: From the figure 9 we get the following information:

- Day: Monday
- Date: 28/2/2022
- Time: 11:35:27 GMT+0530
- Humidity: 56

At Temperature above 32ºC:

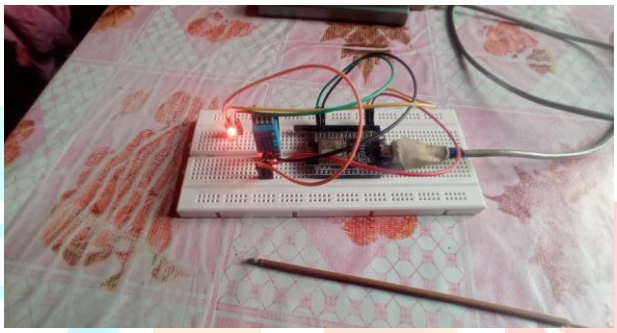

Figure 10: System in temperature above 32ºC.

For the temperature of the environment, 32ºC is considered as the alert limit temperature. At temperature above 32ºC it gives results as shown below:

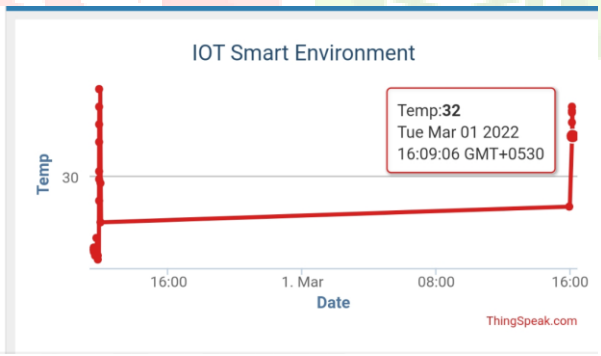

Figure 11: ThingSpeak result-Temperature VS Date and Time chart at above 32ºC.

Result: From the figure 11 we get the following information:

- Day: Tuesday
- Date: 01/03/2022
- Time: 16:09:06 GMT+0530
- Temperature: 32ºC

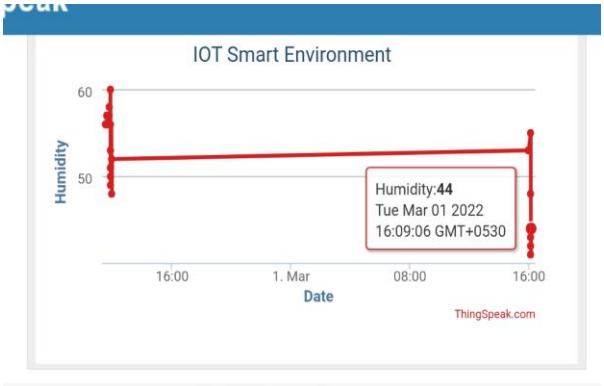

Figure 12: ThingSpeak result- Humidity Vs Date and Time chart at temperature above 32ºC.

Result: From the figure 12 we get the following information:

- Day: Tuesday
- Date: 01/03/2022
- Time: 16:09:06 GMT+0530
- Humidity:44

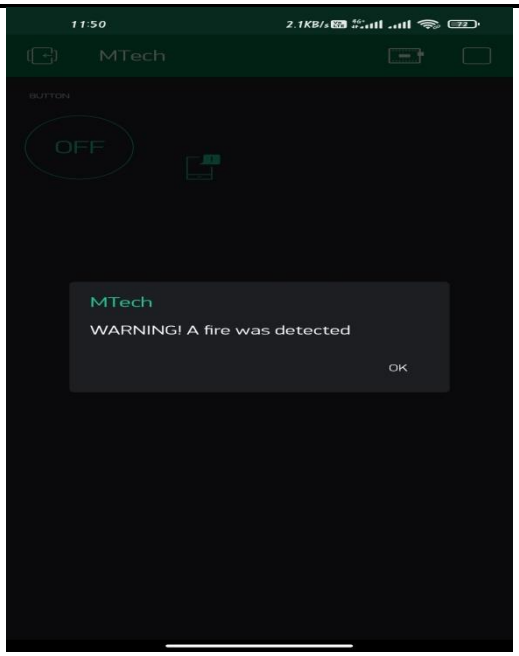

Figure 13: Blynk App notification of Fire at temperature above 32ºC

As we can see in the figure 10 only the LED on the sensor DHT11 is turned ON it indicate the fact that the environment has a temperature below 32ºC, the temperature and humidity value is send to the microcontroller from the sensor DHT11. The ESP microcontroller with wifi module share this info with ThingSpeak Cloud through internet, for which we can see the result in our Android phone as shown in the figure 8 for temperature and figure 9 for humidity.

Further in the figure 10 we can see that LED on the sensor DHT11 also the LED connected to the D1 pin of the microcontroller is also turned ON it indicate the fact that the environment has a temperature above 32ºC, the temperature and humidity value is send to the microcontroller from the sensor DHT11. The ESP microcontroller shares this info with ThingSpeak Cloud and also to Blynk server through internet, for which we can see the result in our Android phone as shown in the figure 11 for temperature, figure 12 for humidity and figure 13 for fire alert notification on Blynk app.

From the above experiment we can conclude that we have effectively executed the coding for the prototype to work as required and ensured that the model was working properly with no mistake. We have made the WSN-IOT arrangement in synchronization with the Cloud stage i.e. Blynk App and ThingSpeak.

IV CONCLUSION:

The wireless sensor networks are connected with the internet with the help of the IoT gatewayand also ensure the monitoring of temperature and humidity related to the paddy field continuously. Based on the monitoring of the smart environment, the system is capable of taking intelligent decisions.

The limitations performed by the system are-

1. Critical controlling actions could not be taken eventhough a smart sensor network has been designed.
2. Only a limited number of Sensors are used.

This work is based on IoT can be further expanded by providing additional facility to the industry, homes, school, colleges etc with the help of Android app for achieving better control and monitoring purpose. Further, smoke and gas sensors can be interfaced with the system to ensure the monitoring of other parameters related to the corps ripening.

V. REFERENCES

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