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Automated Greenhouse Monitoring and Controlling System Using ESP8266

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Abstract- Designing a smart greenhouse-controlled atmosphere space for plant growth. By monitoring the climatic condition inside the greenhouse with a low-cost, more efficient programmable module and controlling the parameters in reference with their crop production goals to use a differentmethod including the ESP8266 board nodeMCU module. The water content of the parameters needs to be adjusted. soil, the amount of natural or artificial light available, the temperature, and humidity in the field. The design suggests to use a soil moisture sensor as well as an LDR to monitor. temperature and humidity sensor, and DHT22; all of these sensors collected the data are given to the Node MCU module, that subsequently processes all the Water pumps, motors, exhaust systems, and led lighting are used to control parameters. as per data calculations. The Node MCU module is supported by the HTTP protocol in connected to the Internet of Things (IoT) via telegram or a wireless network bot. Online mode transfer of the gathered environmental parameter data to smartphones irrespective of how far away, to the farmers to make the right overlook on their fields simply by implementing an IoT platform. The production of food and agriculture are two industries where Technology has advanced swiftly and is still paving the way for improvements and maximize plant growth for agricultural use. In a precise system, Change will undoubtedly come to the world of Android/IOS mobile applications.

Index Terms- Greenhouse, Node MCU ESP8266 Module, Monitoring, Controlling, IoT(Internet ofThings)

I. INTRODUCTION

Sensors the external conditions of the greenhouse, such as temperature, light, humidity, and soil moisture, are being monitored and controlled by sensors as part of an IOT and Arduino-based project. A temperature sensor measures and records the conditions within the greenhouse. The sensor's data is sent to the microcontroller. Connected to the microcontroller are a number of relays. One of the relays controls a fan. If the temperature goes over or below a certain point, the microcontroller would send signals to switch ON the Fan. A light sensor is used to determine how much sunlight is entering the greenhouse. The data from the sensors is sent to the microcontroller. In response to an increase in sunlight above a predetermined threshold, the microprocessor would activate a relay that would "shade" the area in question. Soil moisture sensors, which employ two probes embedded in the ground to measure soil moisture, and humidity sensors, which do the same for relative humidity, are very similar devices. As long as the soil's moisture content is above the setpoint or the humidity reading from the sensor is above the setpoint, the microprocessor would turn on the fan and let water to flow when the humidity dropped below a certain threshold. means of increasing soil moisture, or watering can. as an example, a DC motor stands in for the original line, and water flow has been diverted to suit our needs.

The IOT module receives data on the parameters at the same time (ESP8266). Regardless of any threshold mismatches identified, the data is delivered at regular intervals to the IOT. The ESP 8266 chip is used to establish TCP/IP connections with micro-controllers, send data, and link them to Wi-Fi networks. These sensors collect data, which is then transmitted to the IOT.For our purposes, the blower and water output have been replaced by a DC motor.

II. RESEARCH ELABORATIONS

(i) A greenhouse monitoring system based

In this setup, the current temperature is read by a sensor and fed into a microcontroller's input. The analogue input is calibrated and transformed to a digital input. After then, it will be seen. Light, moisture, and humidity sensors work the same way. First, the microcontroller sends the output data to the GSM modem through USART before sending them to the cloud via IoT. (Universal Synchronous and Asynchronous Receiver and Transmitter). To accommodate the differences in voltage between the microcontroller and GSM modem, level converters are employed. The output parameters are then periodically uploaded to a cloud storage system. Before the Node MCU module receives any sensor readings, they are transformed to digital signals. Manually setting the threshold value for these parameters is done through the IoTuser interface, which functions similarly to an Android app on a mobile device. The appropriate circumstances must exist for plants to flourish, crop yields to rise, and water and other resources to be utilised most efficiently. As a result of this innovation, more information may be acquired with less.

(ii)Automated Greenhouse Monitoring and Controlling System Using Esp8266

This greenhouse monitoring and control system uses a variety of sensors to regulate environmental factors like light level, soil moisture, air temperature, and humidity. Each component ensures proper operation by mechanizing. This IOT greenhouse monitoring system uses phone- or PC-based devices to continuously update the owner on the state of the greenhouse. The open-source web server "Thing talk" logs the parameters. Additionally, a Liquid crystal display (LCD) is used to show the current status of each device and the data it is receiving in real time. The system continuously tracks the various sensors' digitally recorded parameters. Sensing changes inside a greenhouse that may affect the rate of plant growth is a necessary step in monitoring and maintaining the environment there.

Monitoring System:

Within this system, we use all of the sensors to collect data from a variety of sources, including temperature and humidity sensors (DHT11 and DHT22), a soil moisture reader (SMR), and a light-detection and -timing (LDR) device. We then send signals to the system module Node MCU, which processes the data and uses the output to adjust the relevant variables.

Controlling System

Depending on the climatic requirements of the crop we hoped to grow in the greenhouse, we utilise a variety of technologies to regulate these variables.

1) A climate and humidity system—greenhouse ventilation is helpful for regulating temperature. We have a couple options for circulating air in the greenhouse. The two options are: (1) allowing air to circulate on its own, and (2) artificially circulating air with a fan. Using natural ventilation is a great method for lowering the greenhouse's ambient temperature.

We developed a unique method of irrigation to supply water to the field in the greenhouse, and this allowed us to control the soil moisture. When the soil moisture sensor determines that the soil's moisture level is too low. The pumps and motors will start up automatically until the required amount of water has been delivered.

It is possible to utilize the same system for regulating the photoperiod of plants and for maintaining and controlling the temperature within the greenhouse, which is achieved through the use of artificial lights.

III. ALGORITHM

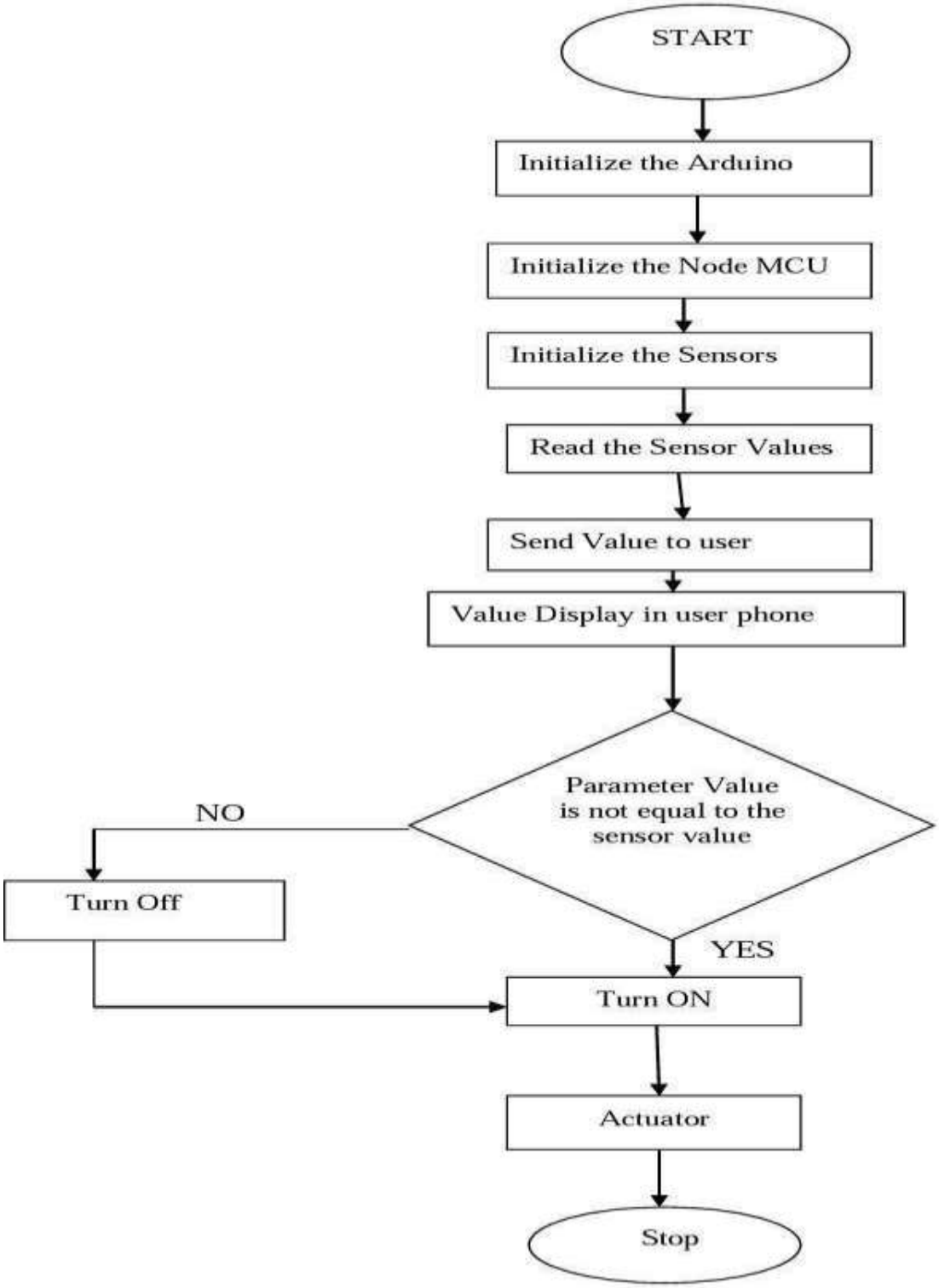
The step-by-step operation of developed model is explained using the following algorithm:

Step-1 – Start

Step 2 - Give connection to all the required components carefully. This project requires the following components: a. Temperature Sensor b. Light Sensor c. Humidity Sensor d. Soil Moisture Sensor e. Microcontroller - Arduino ESP 8266 f. Relays g. DC Motor
Step 3 - Initialize the Arduino
Step 4- Initialize the ESP8266
Step 5- Initialize the Sensor's
Step 6 - sensor's sensed data is stored in IoT(Thing speak).
Step 7- If the data is mis-matched with the required conditions for the green house
Step 8- If temperature is high the fan is ON, else OFF
Step 9- If soil moisture is less motor is ON, else OFF
Step 10 - This value sends to the relay
Step 11- Depending on value relay start/stop the devices automatically
Step 12- After the process completion, it moves to original state
Step 13- Stop.

IV. FLOW CHART

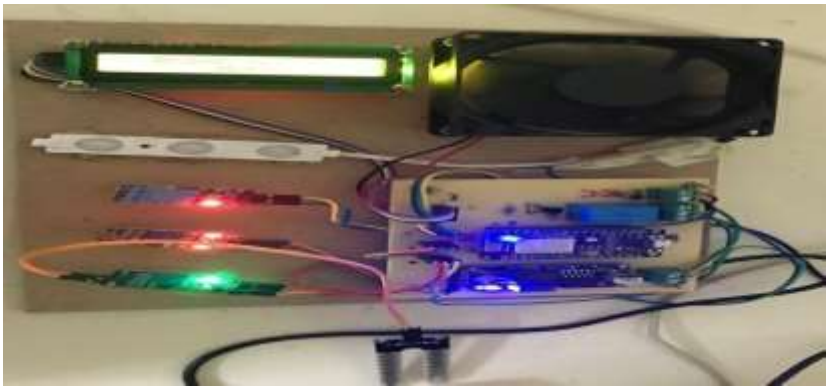
The detail description about the operation of the proposed model is explained using the below flow chart:



V. RESULTS AND FINDINGS

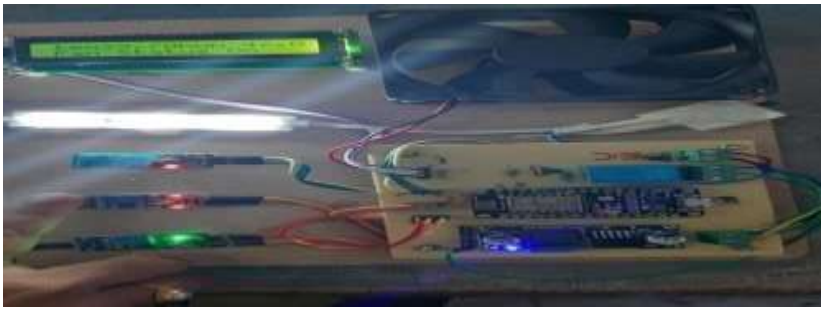
(i)PowerSupply Givento GreenhouseMonitoringSystem

When the power supply is given to the system it first displays the name of theproject "GREENHOUSE MONITORING " in the LCD display where all the sensorsaregiven supplytomeasurethehumidity,lightandsoilmoisture.



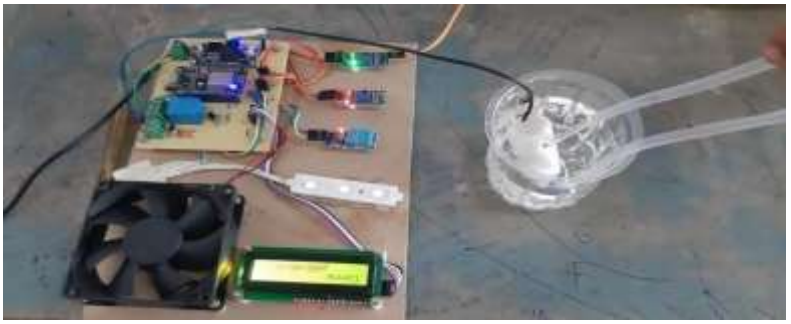
(ii)Displaytemperatureandhumidityofthegreenhouse

Here the temperature and humidity sensors are activated and measures the temperature in the green house and humidity in the air in greenhouse. By measuring the temperature in the Greenhouse and to control the temperature the fans are ON and display the status of the fan in LCD.



(iii)Themotoris ONtoprovidewatertothesoil

Here, a soil moisture sensor takes a reading of the soil's moisture level, and if the reading is low, a motor draws water from a reservoir and adds it to the soil.



(iv) A sensor placed in the soil to determine the amount of moisture present

Here, we use a soil moisture sensor to assess soil moisture. Soil moisture is essential for plant development because it nourishes plant roots.

OutputGraphs

(i) Graph of Light Sensor

The below graph represents the light sensor values; the values are consistent.

(ii) Graph of Soil Moisture Sensor

The graph represents the soil moisture values; the values increased rapidly and then decreased and then maintained a consistent value.

(iii) Graph of Humidity Sensor

The below graph represents the value of the humidity sensor; The values of humidity got increased linearly.

(iv) Graph of Temperature Sensor

The below graph represents the temperature values in the greenhouse; the values are inconsistent in the beginning and the end but in the middle the values got increased linearly.

VI. CONCLUSION

The ability to grow crops without the use of insecticides and pesticides, as well as to cultivate an environment conducive to plant growth, is a major benefit of the Smart Greenhouse over traditional agricultural methods. This technique is so simple that even someone with no farming experience may set it up in their own home (Rooftop greenhouse). Because the greenhouse's environment can be controlled, virtually any crop can be grown there. Because of this, we import plants like Hibiscus and grow them in India. Seventy-five to eighty percent of the water used by humans is produced by ourselves. It boosts yields and growth rates, and it generates organic byproducts. We may bypass the needless interference of middlemen by using IoT to establish a direct link between the farmer and the end user. This saves farmers time and energy and increases their returns on their agricultural endeavors.

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