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IOT-Based Monitoring and Control System for Greenhouses

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Abstract: *Plants are grown in greenhouses, which are controlled conditions. Because current greenhouse plants are self-restrictive, they cannot be regulated automatically; rather, they must be manually operated using a number of methods. The suggested system needs to be regularly checked and maintained, including temperature, wetness, soil humidity, light intensity, etc., to produce the best growth possible for plants. This study presents an Internet of Things- based management system for child care facilities (IOT). The system may keep an eye on such obvious parameters as temperature, humidity, soil saturation, proximity to a fire, light intensity, etc. Through the Node MCU esp8266, all environment parameter data is supplied to the nub. If a parameter exceeds the set limit, the connected actuator for that parameter is activated. If the Earth parameter is out of range, the microcontroller turns on the motor. On a PC and a mobile device, the user can display and monitor parameters.*

Keywords: IoT Technology, Temperature Control, Fuzzy Controllers, And Greenhouse Technology

I. INTRODUCTION

Plant growth is dependent on the ecosystem. The amount of moisture within the greenhouse is too much for the farmers to properly fathom. They can only understand and experience the situation in the green building manually. After all, experience is a big factor in their routine. If there is minimal water in the soil, the plants have water, but if the soil is too wet, the roof of the greenhouse is open all day. In greenhouse plant production, effective growth improvements must be achieved to achieve high production at lower costs, higher quality and lower environmental impact.

IOT can be used to control the greenhouse's cooling, ventilation, soil immersion, and other features. By focusing on environmental factors like temperature and humidity, this system may be adjusted. The environmental conditions of the greenhouse can be automatically monitored by a person.

Automation plays an essential role in performing tasks automatically, so the requirement for ON/OFF device functions is removed. Human error is not completely eliminated or suppressed by automation, but it is reduced at some points. All 's in the current environment must be operable or remote controlled. Here it is assumed that the owner of the greenhouse can monitor and control it from anywhere. The owner does not have to go through each one and constantly monitor the situation

The owner must maintain a firm position and at the same time observe and control the number of greenhouses. The WiFi module ESP8266 is important for transferring data to the network, because it eliminates the need for wires or cable links, which reduces costs. So we create an IOT based greenhouse system considering all the evidences in our mind.

II. METHODOLOGY

The greenhouse system includes the control area and the monitoring area. A DHT11 sensor, an LDR sensor, a moisture sensor on the floor, and a flame sensor in the control portion are used to monitor environmental factors. The ESP8266 is used to send environmental parameters from IOT cloud systems [4]. There is artificial lighting, a water pump, and a fan in the control area. The device's brain is the Arduino microcontroller. is seen in image 1. The project's common controller for connecting all of the sensors together is the Arduino. The greenhouse's inside temperature is measured using the temperature sensor. The microcontroller receives the sensor readings.

These relays each have the Buzzer attached to them. The microcontroller triggers the fan to turn on when the temperature exceeds the threshold. LDR sensor for gauging light output in greenhouses. The microcontroller

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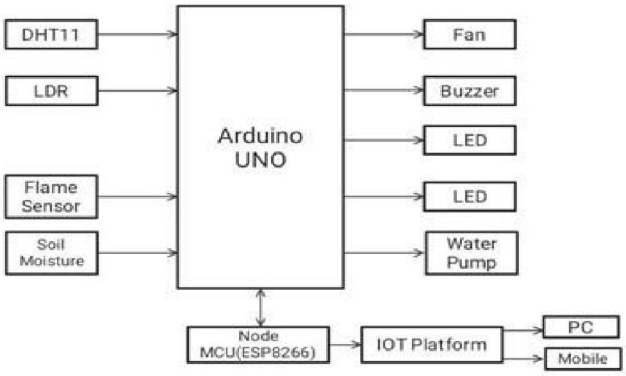
communicates messages using artificial light to increase the light's intensity if the amplitude is below the threshold value. The microcontroller may convey signals using artificial light to increase the light intensity when the amplitude is below the threshold value.



The moisture sensor measures moisture, and the soil moisture sensor measures moisture in the soil. If the measured humidity value by the sensor exceeds the threshold value, water is moved using a water pump. Insufficient soil moisture will cause the microcontroller to open the water outlet to increase moisture and activate the buzzer to decrease moisture. The IOT module would receive simultaneous transmission of the data for these parameters (ESP8266). No matter whether a threshold mismatch is noticed, the information provided to the IOT will still be sent on a regular basis. Data transmission over TCP/IP networks is accomplished using a microcontroller connection device known as the ESP8266. The information discovered by these sensors is subsequently sent to the IOT. then forward it to your laptop and smartphone.

III. OBJECTIVES

- Ease of use and ease of maintenance
- Improved physical object connectivity in a large network.
- Trace log history of parameters
- Build a small greenhouse with automatic monitoring and control system.
- Maintain greenhouse environmental conditions at desired temperatures, light, humidity and humidity levels.
- Its main purpose is to save water, increase productivity and reduce the environmental impact on plant growth.
- The website allows users to monitor the air conditions of greenhouse plants and manage the greenhouse remotely.

IV. COMPONENTS

4.1 Arduino Uno

Figure 2. Arduino UNO

Open source Arduino is a tool that relies on foundation and design. The motor that activates the LED light broadcast over the internet, it is triggered by the Arduino board after it sees inputs from the light sensor, a finger tap or a twitter message from the Multiple commands can be sent to the microcontroller to monitor the board. You use the Arduino programming language and applications for your purposes (IDE). Arduino was the designer of countless features of the

, including both standard and advanced and logic tools. It includes 6 analog input pins, a 16 MHz crystal oscillator, 1 optical input or output pins, a power connector, a and an ICSP header. The operating voltage is 5V and 7 to 12V is the recommended input voltage for the as shown in Figure 2.

4.2 Wi Fi(ESP8266)

Figure 3. Nod MCU (ESP8266)

Open source IoT framework NodeMCU. This generates firmware for ESP-12 compatible devices and ESP8266 Wi-Fi SOC from Espressif Systems. Widely used technology spells "NodeMCU" as firmware rather than modification. The firmware uses the Lua script . This was set up and the was built using the Espressive Non-OS SDK for the ESP8266 . Figure 3.

4.3 DHT11 Sensor

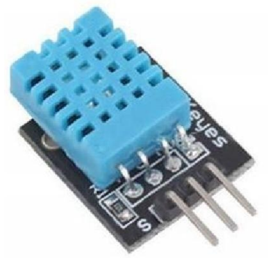


Figure 4: DHT11

A DHT11 temperature and humidity sensor was used to measure both temperature and humidity. It combines complex temperature and humidity sensors with a balanced digital signal output. The five-star symbol attests to 's progressive perception technology, temperature and stickiness, ensures effective consistency and superior overall design performance. Figure shows how this sensor combines a resistive immersion quality evaluation cell, an NTC-rated component, and a basic 8-bit microcontroller to provide the with maximum cost-effectiveness and durability with - par quality and fast response. A thermistor is a variable resistor. Temperature variations in the affect the resistance of the thermistor. The humidity sensor component has two electrodes with a moisture-resistant substrate. The increased resistance of the electrodes causes changes in humidity. This resistance change is calculated in . The operating voltages are 3.3 V and 5 V. The following equation can be used to calculate the output voltage temperature: Temperature equals (Vout x 100)(5 0 C)- 1 (1) The equation gives the relative humidity value of the output voltage. RH is equal to ((Vout(Vsupply)-1) - 0.16; (0.0062%) -1 (2)

4.4. Soil Moisture Sensor

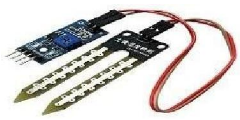


Figure 5: Soil moisture sensor

The soil moisture sensor connector has a property of , which indicates dielectric permittivity. The dielectric permittivity reported by the sensor probably contains all the water in the world. The amount of water in material, such as dirt, is measured by a soil cleaning machine and a soil moisture sensor of volumetric or gravimetric function.

Figure 5 illustrates how volumetric water content with sensors can be routinely viewed with soil-filled precision sensors.

4.5 LDR Sensor

Figure 6: LDR sensor

The solar frequency is estimated by the LDR sensor module. Both the digital output pin and the analog output pin are included. As the light intensity increases, the resistance of the LDR decreases. Figure 6 shows that the resistance of the LDR increases as the light intensity decreases. The sensor has a potentiometer for the to adjust the LDR sensitivity. LDR strength is often as follows: 5000 days dark = 20000000Ω

4.6 Arduino IDE

The official Arduino.cc program for the Integrated Arduino or Arduino Framework for Growth , known as the Arduino IDE, includes a script editor, message box, text console, simple toolbar and menus. It connects to the developed software and the exchanges data with the Arduino/Genuino hardware. Writing the code on the board and uploading it is a quick process using the free Arduino app (IDE). It works on Windows, Linux and Mac. The environment is written in Java and relies on other tools and open source processing, Figure 7.

V. FLOWCHART

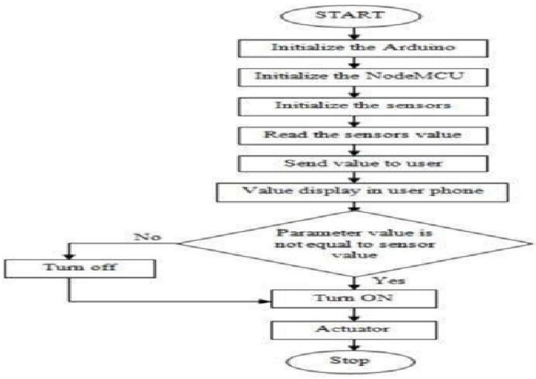


Figure 7: Flow Chart

The device flowchart outlines the design methodology, the initializes the microcontroller, NodeMCU and each sensor, and the reads the physical data from the environment. When reading data, the microcontroller can provide read sensors. When the values of the sensor reach the threshold actuator, the second actuator engages when the data from the microcontroller is transmitted to the smart user. Figure 8.

VI. RESULT AND DISCUSSION

Figure 9: Output at Desktop

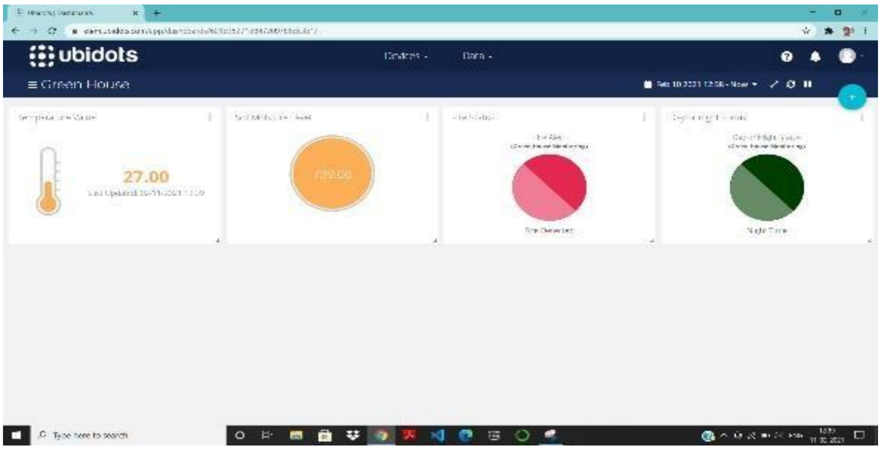


Figure 10: Output at Phone

This system is designed to track and monitor environmental factors. The final product focused on the effective automatic control of the greenhouse environment. The automatic control mechanism works entirely by coding. Portable devices such as mobile devices are used to monitor temperature, humidity, soil moisture and content. Figures 9 and 10 show the system and laptop, respectively.

VII. FUTURE IMPLEMENTATIONS AND ADVANTAGES

The proposed system consists of two Wi-Fi modules; in a later iteration, a common server would be used to store and manage system parameters. The installation of chemical sensors is another important innovation of the. Soil ph and chemical composition can be determined with chemical sensors. The proposed system has the following advantages: Wi-Fi, graphical user interface, and comprehensive control and monitoring. Easy to implement, records parameters to cloud servers, automatic and user-defined modes, and reduction of pesticide and water use.

VIII. CONCLUSION

The Greenhouse Arduino based power and control system is excellent. The main sensors used in this experiment are DHT11 sensor, soil moisture sensor, LDR sensor and these provide complete estimation of temperature, humidity, glue concentration and light intensity. This approach is popular in childcare facilities that monitor environmental factors with a convenient smartphone application. Send phone and desktop a NodeMCU esp8266 is used. With this technique, physical activity is reduced by. This machine can be used in nurseries, home centres and vegetable fields

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