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Design And Development Of IoT Based Low Cost Greenhouse Monitoring System

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ABSTRACT

With the increase in technology, there is much demand for the complete monitoring system of a greenhouses. For the healthy and good growth of plants, there are lot of things to be noticed within the greenhouse example like water level, certain temperature, humidity etc. To notice this all things the farmer will be not always around the greenhouse as they may be busy with other work. But farmers would like a automatic monitoring system, so that they can check the level of water, room temperature and humidity on their smartphone itself no matter how big distance is between them and greenhouse. The DHT 11 sensor is created to monitor temperature and humidity in the greenhouse whereas the soil moisture will monitor the moisture present in the soil. The application in the smart phonewill notify whether the temperature is good or bad and the levelof soil moisture to the farmer.

Keywords— Temperature, Humidity, Soil moisture,LED,ESP8266

1. INTRODUCTION

An embedded system is a combination of software and hardware to perform a dedicatedtask. A microcontroller not only accepts the data as input but also manipulates it interfaces the data with various devices, controls the data and gives the result. The IOT smart agriculture and automatic irrigation system with ESP8266 using node MCU microcontroller is a project which is used to designing a completely automated security. Since the conventional farming is profoundly climate dependent, there lies an immediate urge to create and sustain in environment for whole year production using the specific technology. IOT contains many devices and corresponds concentrated design and so as to detect and control their surroundings. Agriculture is one of the most affected sectors, since the growth of crops depends mainly on variables such as temperature, humidity, soil moisture, solar radiation. In long term, climate change could also affect the crop and production and activities. Thus based on their concerns, the ability to monitor environmental conditions of greenhouses is necessary, since it provides variable information to the farmer to better understand the growth of crops. Under the human monitoring, the greenhouse is structured with transparent sheets to maintain the every climatic conditions.

2. METHODOLOGY

This section explains how the project will be executed and also how each component helps in the development of this project The block diagram of the proposed system is given below.

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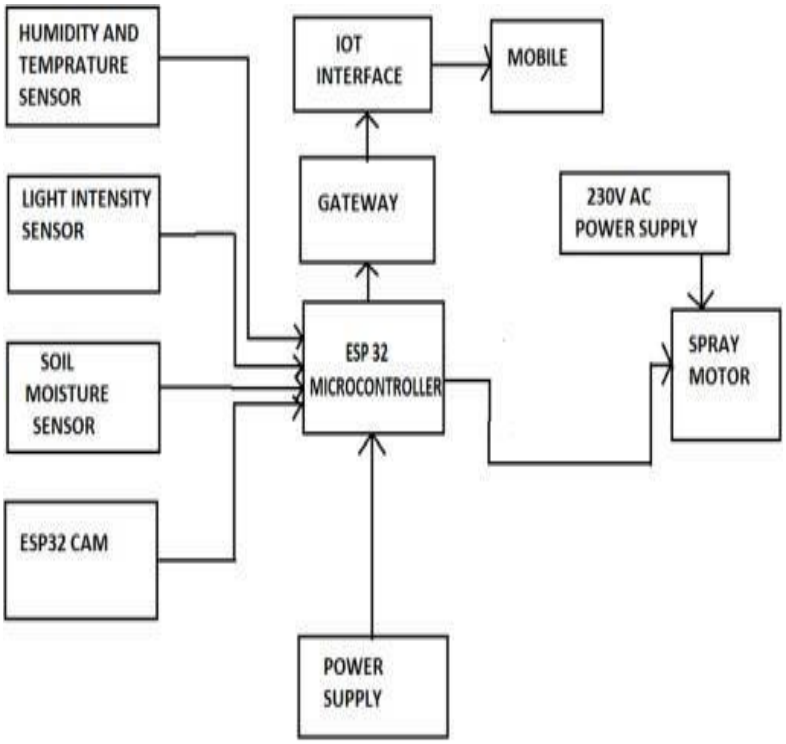

Fig.1 Block diagram

3. COMPONENTS

The main components of our project are :

- DHT11 Temperature and Humidity sensor
- Soil Moisture sensor
- ESP8266 Microcontroller
- LCD
- DC 3-6V micro submersible mini water pump

DHT11 Temperature and Humidity sensor

The DHT11 is a basic, ultra low cost digital temperature and humidity sensor. It uses a capacitive humidity sensorand a thermistor to measure the surrounding air. It splits out the digital signal on the data pin.

Fig.2. Temperature and Humidity sensor

Soil moisture sensor

Soil moisture sensors measure the volumetric watercontent in soil. It consists of two parts: The main Sensor and the Control Board. Sensor part of the Soil Moisture Sensor consists of a

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couple of conductive probes that can be used to measure the volumetric content of water in soil.

Fig.3. Soil moisture sensor

ESP8266 Microcontroller

The Node MCU (Node Micro Controller Unit) is an open source software and hardware development environment that is built around a very inexpensive System-on-a-Chip (SoC) called the ESP8266.

Fig.4. ESP8266 Microcontroller

Liquid Crystal Display

LCD (Liquid Crystal Display) is a type of flat panel display which uses liquid crystals in its primary form of operation. LEDs have a large and varying set of use cases for consumers and businesses, as they can be commonly found in smartphones, televisions, computer monitors and instrument panels.

Fig.5. Liquid Crystal Display

DC 3-6V Micro submersible mini water pump

DC 3-6 V Mini Micro Submersible Water Pump is a low cost, small size Submersible Pump Motor. It operates from a 2.5 ~ 6V power supply. It can take up to 120 liters per hour with a very low current" consumption of 220mA. Just connect the tube pipe to the motor outlet, submerge it in water, and power it.

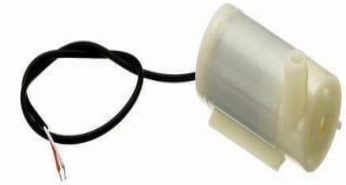

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Fig.6. DC 3-6V Micro submersible mini water pump

Voltage Regulator

A voltage regulator (also called a 'regulator') with only three terminals appears to be a simple device, but it is in fact a very complex integrated circuit. It converts a varying input voltage into a constant 'regulated' output voltage.

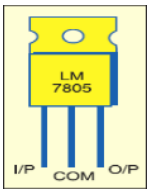

Fig.7. Voltage Regulator

4. WORKING OPERATION

Connect the soil moisture sensor to A0 of node MCU and DHT11 to D4 pin. The motor connects to relay. To control the relay, we use the D5 pin and node MCU. Connect the LED display to the 12C pin of node MCU. You can power the motor and relay using the 5V pin of node MCU. The DHT11 sensor, capacitive soil moisture sensor and LED display requires a 3.3V supply only. Just connect the tube pipe to the motor outlet submerge it in water and power it. We use DHT11 to measure temperature and humidity. Soil moisture sensor senses the moisture content in the soil. Whenever the sensor detects a low quantity of moisture in the soil, the motor turns ON automatically and hence will automatically irrigate the field. Once the soil becomes wet, the motor turns OFF. You can also monitor all this happening remotely via Thing speak server online from any part of the world.

5. FUTURE SCOPE

The greenhouse can be controlled by IOT which involves refrigeration, ventilation, immersion of the soil, etc. This System can be managed by concentrating on environmental criterion such as temperature and humidity. A individual can automatically monitor the environmental parameters of the greenhouse. Each sensor continually measures a specific condition like temperature or humidity in a specific location and reports those measurements to the system. In greenhouse monitoring and control system, such automation requires climate control software based on models that predict the actual plan reactions to the ongoing changes in the greenhouse climate.

6.CONCLUSION

The smart greenhouse can be further upgraded in many ways and can be used in wide agricultural applications. It can be placed and operated in any of the environmental conditions to grow any kind of vegetation. Non- conventional energy sources such as solar panels, wind mills are used to supply power to the automatic greenhouse equipment and Peltier effect for cooling purpose. Soil-less farming can be performed to further improve the nutritional value. Integration of farming with IoT can make it much more efficient and profitable activity.The concept itself entails a regular greenhouse that is equipped with sensors that optimize plant growth by regulating heat, humidity, and light.This allows the crops that are being grown to reach the harvesting stage faster whilst

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retaining as many nutrients as possible.IoT smart farming solutions is a system that is built for monitoring the crop field with the help of sensors (light, humidity, temperature, soil moisture, crop health, etc.) and automating the irrigation system.The farmers can monitor the field conditions from anywhere.

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