# IoT BASED GREENHOUSE MONITORING AND CONTROLLING SYSTEM

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**Abstract**
The goal is to create a smart greenhouse with a regulated environment in which to grow plants. Utilizing a low-cost, high-efficiency programmable module to detect climatic behaviour within the greenhouse and adjust settings based on crop production needs, using a variety of methodologies and the board ESP8266 Node MCU module. The water content of the soil, the light intensity originating from natural or artificial sources, and the temperature and humidity of the field area are the parameters that need to be optimised. all of these sensors capture data and send it to the NodeMCU module, which processes it and controls all of the parameters via the water pump, motors, exhaust system, and lighting system based on the data computations. The HTTP protocol is used to link the NodeMCU module to a wireless internet connection or IoT platforms such as telegram bot. The acquired environmental parameters data was supplied to farmers' smartphones via internet mode, allowing them to keep a proper eye on their farms no matter how far away they were. In the sphere of agricultural and food production, technology has advanced at a breakneck pace and continues to do so. in the field of agriculture, to optimise and obtain maximum plant growth In the area of Android/IDS smartphone applications, an accurate system would undoubtedly bring about change.

**Keywords:** NODE MCU,Relay,GSM module, temperature and humidity sensor (LM35), Moisture sensors, smart phones, DC motors.

## 1. Introduction

A greenhouse is a closed structure that protects plants from environmental variables such as temperature conditions, pollution, and so on. It allows plants to grow in a sustainable and effective manner throughout the year.
Sunlight, water content in the soil, temperature, humidity, and other basic elements all influence plant growth. The automated water delivery system for urban residential areas, according to an article, can be utilised to effectively manage water resources. Because the required physical parameters are difficult to control manually inside a greenhouse, an automated system is required.Many smart irrigation systems have been proposed and constructed using technologies such as evapotranspiration (ET), thermal imaging, capacitive methods, neutron scattering technology, and gypsum blocks, to name a few.Capacitive \ssensors Instantaneous, on the other hand, are expensive and must be calibrated frequently with changes in temperature and soil type [Our suggested system in this paper collects three parameters from the sensors and activates the actuators if the real values are greater than the threshold values, as well as storing these values in a cloud database that can be accessed from anywhere, at any time, require chilly temperatures to grow. Cucumbers, melons, and other summer crops require moderate to hot climatic conditions to thrive. Moisture sensors, temperature and humidity sensors, an Arduino Uno, and water pipes to supply water from a tank controlled by DC motors make up the prototype we used.
Moisture sensors (YL 69) are placed near the roots, while a temperature and humidity sensor (LM35) is placed further away to detect temperature and humidity and evaluate the data. If the temperature and humidity levels are higher than the reference value, collingfan will turn on to keep them within the threshold levels.

## 2. Hardware Details

**Node MCU :** It is an open source firmware for which open source prototyping board designs are available. The name "Node MCU" combines "node" and "MCU" (micro controller unit). Strictly speaking, the term "Node MCU" refers to the firmware rather than the associated development kit.

Both the firmware and prototyping board designs are open source.

Fig:2.1 **NODE MCU**

**DHT11 SENSOR**:We use three sensors in the input section: a DHT11 sensor, a soil moisture sensor, and a light sensor. These sensors are electronic devices that take temperature readings using a DHT11 sensor, soil moisture readings using a soil moisture sensor, and light intensity readings using a light sensor. These sensors collect data and send it to the microcontroller

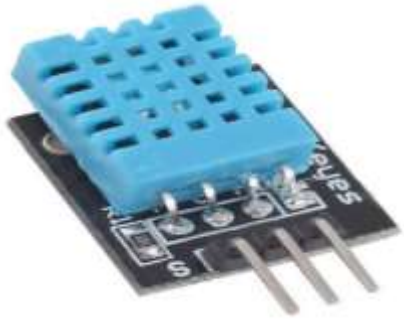

Fig 2.2. **DHT11–Temperature and Humidity Sensor**

**GSM modem:**IT is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone.

When a GSM modem is connected to a computer, this allows the computer to use the GSM modem to communicate over the mobile network. While these GSM modems are most frequently used to provide mobile internet connectivity, many of them can also be used for sending and receiving SMS and MMS messages.

Fig2.3. **GSM Module**

**Light Dependent Resistor**: An LDR or light dependent resistor is also known as photo resistor, photocell, photoconductor. It is a one type of resistor whose resistance varies depending on the amount of light falling on its surface. When the light falls on the resistor, then the resistance changes. These resistors are often used in many circuits where it is required to sense the presence of light These resistors have a variety of functions and resistance. For instance, when the LDR is in darkness, then it can be used to turn ON a light or to turn OFF a light when it is in the light.

Fig2.4. **Light Dependent Resistor**

**Relay Module**: A relay is an electrically operated switch. Relays were first used in long distance telegraph circuits as signal repeaters and they refresh the signal coming in from one circuit by transmitting it on another circuit. It consists of a set of input terminals for a single or multiple control signals, and a set of operating contact terminals. Relays are used where it is necessary to control a circuit by an independent low-power signal, or where several circuits must be controlled by one signal. Relays were used extensively in telephone exchanges and early computers to perform logical operations


Fig2.5 **Relay**

**DC MOTOR**: It is any of a class of rotary Electrical models that converts direct current (DC) electrical energy into mechanical energy. The most common types rely on the forces produced by induced magnetic fields due to flowing current in the coil. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current in part of the motor.

Fig 2.5 : **DC MOTOR**

## 3 Proposed Model Design and Results and Evolution Metrics

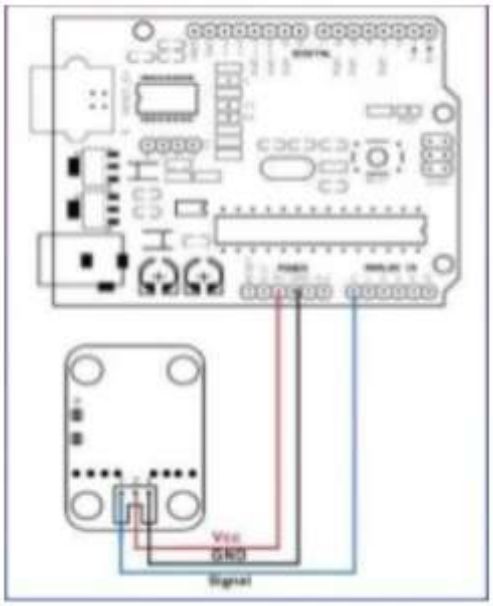

Figure 3.1- Block Diagram of Proposed model

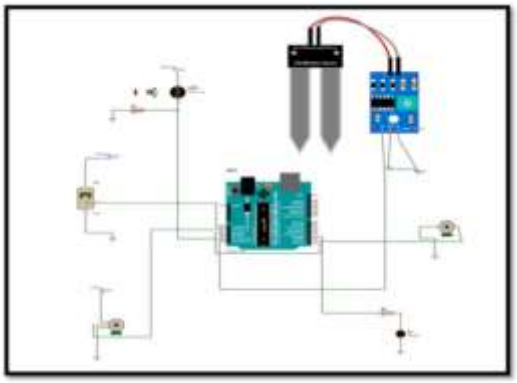

Figure:3.2- circuit diagram

Figure:3.3 Final output

### 3.4 Block Diagram :

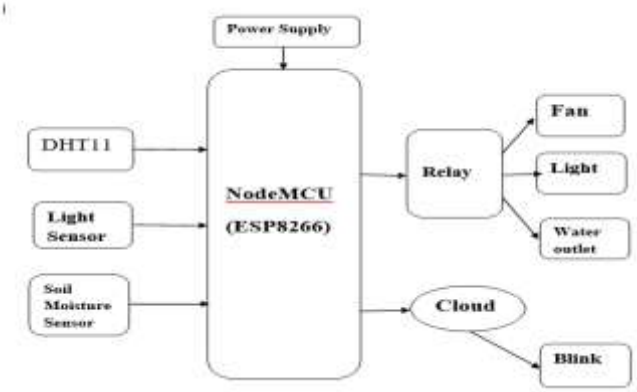


Figure:3.4 Block diagram

**Working:**

**Temperature Sensor**:

The temperature sensor measurements will be fed into the microcontroller on a regular basis. When the temperature rises above the threshold, the microcontroller activates the fan (DC Motor) to keep the temperature stable.The voltage across the diode terminals is the primary working mechanism of temperature sensors. When the voltage rises, the temperature rises as well, resulting in a voltage drop between the base and emitter transistor terminals of a diode. Temperature range: 20 to 80 degrees Celsius. Temperature sensors are used to check design assumptions, resulting in a safer and more cost-effective design and construction. The most precise temperature sensor is an RTD

**Soil Moisture Sensor**:

Readings from the soil moisture sensor will be fed into the microcontroller. The soil moisture content threshold is modified. When the reading falls below the threshold, microprocessor adjusts the servo motor's angle to activate the Water Pump.Range: 0 to 45 percent volumetric water content in soil (with different calibration, 0 to 100 percent VWC is possible). Capacitance is used by the Soil Moisture Sensor to determine the dielectric permittivity of the surrounding material. Dielectric permittivity in soil is a function of water content.The sensor generates a voltage that is proportional to the dielectric permittivity, and thus the soil's water content. The water content of the sensor is averaged along its whole length. With respect to the flat surface of the sensor, there is a 2 cm zone of influence, however it has little or no sensitivity at the extreme borders. The electromagnetic field lines through a cross-section of the sensor indicating the 2 cm zone of influence.

**Light Dependent Resistor:**

Light-Required The microcontroller will receive constant resistor readings as input.
Some cropsnecessitate a certain amount of light.Crops' ability to grow properly is harmed if they do not receive the required quantity of sunshine. The microcontroller will turn on the Light Bulb whenever the light intensity decreases in order to maintain the light intensity. The Cadmium Sulphide (CdS) film, which flows through the sides and looks like a snake, is depicted below. Metal films are linked to the terminal leads on the top and bottom. It is constructed in such a way that the maximum feasible contact area with the two metal films is achieved. To allow open access to external light, the structure is enclosed in a translucent plastic or resin shell. Cadmium sulphide (CdS), which is utilised as a photoconductor and contains no or extremely few electrons when not illuminated, is the main component for the production of LDR, as stated above. It is meant to have a strong resilience in the absence of light. The mega ohms range. When light strikes the sensor, electrons are liberated, and the material's conductivity increases. The photons absorbed by the semiconductor provide the energy required for band electrons to jump into the conduction band when the light intensity surpasses a particular frequency. As a result, the free electrons or holes conduct electricity, substantially lowering the resistance (to 1 Kilo ohm).

**GSM module:**

The project's fourth application is to use the GSM module to convey this data to a mobile device. The first application involves using a temperature sensor (LM-35) and a fan to maintain the temperature of that location (Motor).A GSM Module is essentially a GSM Modem (such as the SIM 900) attached to a PCB with various sorts of outputs, such as TTL Output (for Arduino, 8051, and other microcontrollers) and RS232 Output (to communicate directly with a computer) (personal computer). The board will also contain pins or provisions for connecting a microphone and speaker, as well as for disconnecting +5V the or other power and ground connections. The type of provisions varies depending on the module.

## 4.1 Conclusion:

Our proposed system monitors temperature and humidity, as well as soil moisture, and takes appropriate action based on the findings. Human engagement is not required by the systems. It also comes with a database that may be used for future research and reports. This technology is well suited for deployment in regions like the North Pole and countries with harsh winters, where humans live but plants are unable to thrive. Due to its efficient use of time and automatic controlling ability, if this method is utilised in those nations, one person may manage numerous Greenhouses to grow a large number of plants. That person's only responsibility will be to keep an eye on the greenhouses' condition and to repair anything that cannot be fixed

## 4.2Acknowledgement :

The major goal of this study is to keep track of the plants' condition in any situation. The information of the plant will be in the form of analogr if we consider the four parameters of the plant as the input. To convert this, the ARM7 board has an in-built analogue to digital convertor (ADC) where the data

 

will be converted and presented on the LCD screen at any time. The driver circuit will automatically switch the corresponding automation control if the sensing value reaches the threshold level. This entire procedure will take place within the confines of the factory. The previous explanation is fine within the confines of the plant, but checking and monitoring plant status from any location is only possible through IOT. Using an IOT app, we can check and monitor plant condition from any location at any time. In the case of nurseries that care for medicinal and herbal plants, it will yield the finest results. Because it is our responsibility to grow our future generation and pass on these medicinal and herbal plants to them.

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