# IoT BASED CONSERVATORY MONITORING SYSTEM USING ESP8266

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## ABSTRACT:

The goal of this paper is to make an Internet of Things (IoT) system for greenhouse monitoring to increase agricultural production. Using automated sensors and tools together essential data, the greenhouses deals a structured atmosphere for plant growing for this linking of many sensors to a Blynk mobile application, With the help of sensors can monitor, control temperature, humidity, soil moisture, and lighting in real time environment through the integration of IoT technology. Blynk confirms ideal growing settings by facilitating communication between mechanical sensors and devices. Climate measured greenhouses afford higher crop yields through automation and better-quality control. In this product Wi-Fi used for wireless communication, it will help to enables smooth data sharing amongst the greenhouse's sensors. Farmers can improve overall production and enhance crop growing processes by automating temperature regulation and other environmental essentials.

**Keywords:** Soil moisture; Smart agriculture; Real-time monitoring

## INTRODUCTION:

Modern agriculture be determined by more and more on technical progresses. The Internet of Things (IoT) is one of them that viewpoints out as a disruptive force because it delivers creative ways to develop productivity and sustainability. This paper offerings a ground breaking initiative expected at creating an Internet of Things (IoT) based greenhouse monitoring and control system. Because they create an environment that is favorable to plant growth, greenhouses are important instruments in the regulated growing of crops. Integration of sensors and automation devices, which permit real-time data collecting and analysis, is revolutionizing traditional greenhouse management performs.

Through the use of IoT technology, its converts traditional greenhouses into intellectual, climate-controlled spaces by connecting a wide range of sensors to a microcontroller enabled by Blynk. Important variables are tracked, including temperature, humidity, lighting, and soil moisture. Moreover, Blynk's smooth construction makes it possible for sensors and the microcontroller to work together competently, allowing for accurate environmental parameter monitoring and control. Through the use of Wi-Fi, the system improves data transmission speeds and allows for quick responses to changing circumstances in the greenhouse. This creative method gives producers the tools they need to maximize crop growth techniques while also automating important greenhouse maintenance tasks. This effort represents a major step towards a more resilient and productive agricultural ecosystem by increasing the potential for sustainable agriculture techniques to flourish. By leveraging IoT technologies to monitor key environmental factors in real-time, this initiative not only enhances crop yield but also reduces resource wastage. Such advancements pave the way for a greener and more efficient agricultural landscape, fostering a sustainable future for generations to come. This creative strategy makes use of state-of-the-art technology to provide farmers with sophisticated instruments for improving crop development techniques and automating crucial greenhouse upkeep tasks. This effort is a major step toward building a more resilient and high-yielding agricultural environment because it seamlessly incorporates cutting-edge solutions into agricultural practices. The potential for sustainable agriculture approaches to flourish is increased with the application of these advancements.

 

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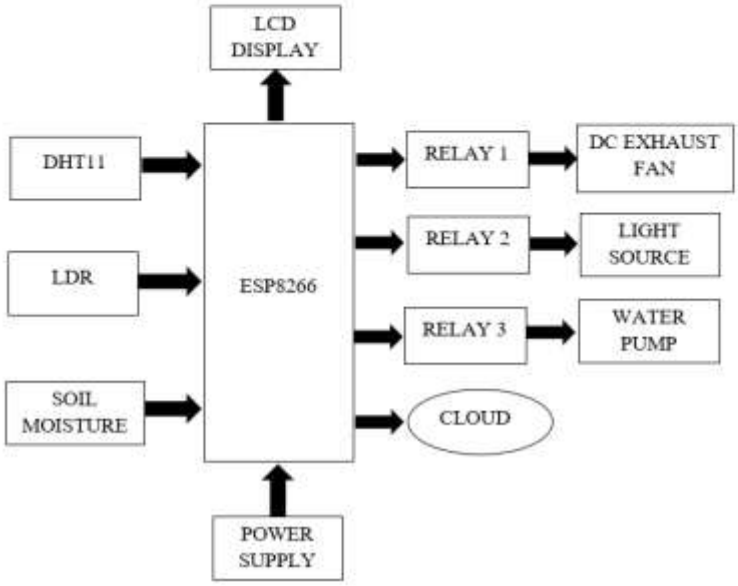


**Figure 1: Block diagram**

Figure 1 shows the functional block diagram of proposed system. The proposed system will feature an expanded array of sensors, providing comprehensive coverage of environmental parameters critical to greenhouse cultivation. Through integration with the Blynk platform, the existing system enables remote monitoring and control of greenhouse conditions via a mobile app or web interface. The system offers real-time data visualization through the LCD display, providing growers with immediate feedback on temperature, humidity, and other monitored parameters

**NODEMCU ESP8266 :**

The ESP8266 is a low-cost System-on-a-Chip (SoC) that serves as the basis for the Node MCU (Node Micro Controller Unit), an open-source hardware and software development atmosphere. With its RAM, CPU, networking (Wi-Fi), and even a contemporary SDK and operating system, the ESP8266, created and formed by Systems, has all the needed components of a computer. For Internet of Things (IoT) projects of all kinds, this kinds it a great option. Though, as a chip, the ESP8266 is also hard to use and access. It must solder wires, with the suitable analog voltage, to its pins for the simplest tasks such as running it on or distribution a keystroke to the computer on the chip. It also have to program it in low-level machine instructions that can be construed by the chip hardware. This level of incorporation is not a difficult using the ESP8266 as a stable controller chip in mass-produced electronics.

**SENSOR SYSTEM OVERVIEW :**

Sensing unit gathers the environmental parameters from field. It collects four different parameters like temperature, humidity, soil moisture and light intensity. The sensing unit comprise of three sensors namely digital humidity and temperature sensor, soil moisture sensor, light intensity sensor.

**Temperature and humidity sensor :**

Temperature and humidity play a vital role in growth of any crop. There is a direct relationship between humidity and moisture, and soil moisture is another crucial element that affects plant growth. While insufficient moisture would hinder plant growth, excessive moisture can result in pest assaults. To speed up growth and boost productivity, the ideal moisture content should be preserved. The humidity and temperature are measured in this setup using a DHT11 sensor module. To generate the digital output, it is composed of an 8-bit microprocessor, an NTC temperature sensor, and a capacitive humidity sensor. Every two seconds, the module generates the temperature and humidity. It can measure temperatures up to 125 degrees Celsius with an accuracy of +/-0.5 degrees.

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**Soil Moisture Sensor:**

Soil moisture is another important factor for any agricultural crop. Another crucial element for each agricultural product is soil moisture. The temperature of the surrounding air has a direct impact on soil moisture, which in turn impacts soil texture. Crops cultivated in extremely high or extremely low soil moisture will suffer and yield poorly. With an accuracy rate of ±4%, volumetric water content is detected using a soil moisture sensor. The capacitance principle is used to measure the dielectric permittivity as a function of water level. The robot uses this sensor to track the amount of moisture lost to evaporation and plant uptake over time.

**Light Intensity Sensor :**

Light is the key component in plant growth and photosynthesis. Light intensity sensor is used to measure the intensity of the light from sun falling on the field. These sensors record variations in light intensity throughout the day using light-dependent resistors (LDRs), allowing growers to modify growing techniques as necessary. These sensors interface with farm management software or Internet of Things devices to collect data and make informed decisions for optimizing crop yield and quality. Farmers are able to precisely manage light through the use of LDR-based light intensity sensors, which enable continuous monitoring and provide ideal conditions for photosynthesis. This proactive approach promotes resource efficiency and sustainability in agricultural operations in addition to increasing crop output.

## DISTANT DATA COLLECTION :

A data storage unit and a mobile data sharing unit make up the two main elements of the distant data collection unit. This entails investigating the mobile data sharing unit after looking at the characteristics and functionalities of the data storage unit. We hope that this detailed explanation will provide readers a clear grasp of the parts and functionalities of our remote data collection system.

**Cloud :**

Data is securely transferred from the sensing unit to the Blynk cloud server by the remote data storage unit. This enables real-time monitoring and control by facilitating the smooth integration of agricultural information within the Blynk cloud environment. Farmers may effectively manage their agricultural processes by utilizing Blynk's sophisticated tools for real-time tracking. Flexibility is given top priority in the system's design, which makes it simple to integrate with Blynk's features and quickly adjust to changing agricultural data needs. We are dedicated to providing flexible and scalable agricultural data management solutions. In the event that further advanced features become necessary in the future, migration to other cloud-based systems that are compatible with Blynk can be accomplished with ease.

## EXPERIMENT RESULTS :

Promising outcomes came from the experiment designed to assess the effectiveness of the Internet of Things-based greenhouse monitoring system. Temperature, humidity, soil moisture, and light intensity are among the environmental factors that are critical for plant growth and health that the system effectively recorded in real time. By analysing the data gathered, important insights into the dynamic circumstances of the greenhouse environment were discovered, which made it possible to precisely manage environmental factors and make well-informed decisions. Furthermore, the system's remote monitoring capability allowed for ongoing observation and prompt action, which enhanced resource management and improved growing conditions for plants. Overall, the trial proved that the Internet of Things-based greenhouse monitoring system is both practical and successful in supporting precision agriculture techniques and increasing crop output in regulated settings.

 

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**Figure 2: Dashboard**

The dashboard provided a user-friendly interface for visualizing Realtime data


**Figure 3: Air results collect from DHT11 sensor**

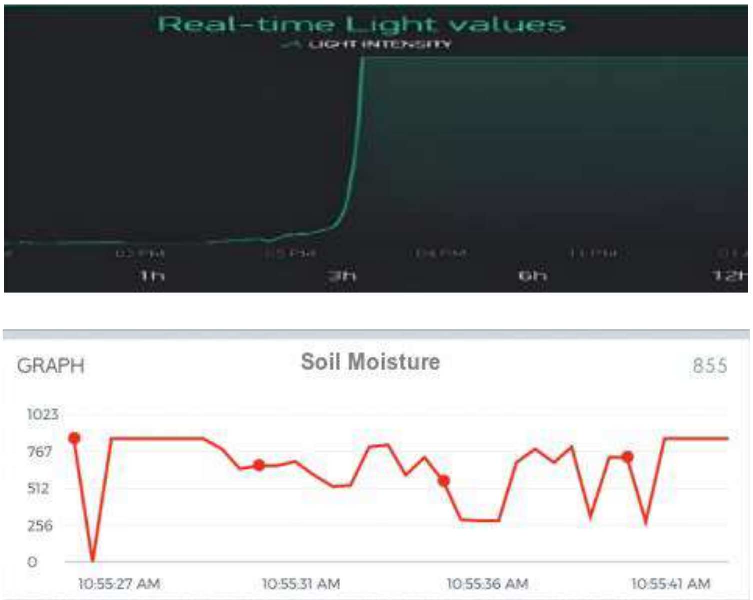


**Figure 4: Light Intensity Sensor & Soil Moisture sensor results**

**MOBILE APPLICATION :**

The mobile application provides a user-friendly interface for the smooth depiction of critical farming data, such as temperature, soil moisture, and light intensity—all of which are measured with DHT11 sensors and LDRs, or light dependent resistors, respectively. After connecting to network service area, users can open the application on their mobile devices and select the "Connect to Farmland Server" option to initiate a connection. Once connected, customers get instant access to real-time data, making it possible to remotely monitor and analyses greenhouse conditions. For simplicity of understanding, the software offers programmable visuals. Event alerts, historical data analysis, and remote environmental setting modification are possible further features. All things considered, the smartphone application is an essential resource for farmers, helping them make well-informed decisions and employ optimal agricultural techniques to raise output and promote sustainability.

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**Figure 5: Mobile application for real-time**

Users must access the Blynk app or platform and go to their project in order to add a new device to Blynk. After that, users choose the hardware platform or device type, start the device addition process, and link the device to Blynk.

## CONCLUSION :

We used the Blynk platform, an ESP8266 microcontroller, and a variety of sensors to successfully construct an Internet of Things solution. The system makes it possible to monitor and control environmental factors including light intensity, humidity, and temperature in real time. We've made a flexible configuration by combining parts like an LDR sensor for light detection, a relay module for controlling external devices, and a DHT11 sensor for temperature and humidity measurement. Through the Blynk platform, users may access and visualize data from any location with an internet connection, acting as the interface for remote monitoring and control. Users can examine light conditions, monitor temperature and humidity levels via the Blynk app or platform. Applications in home automation, agriculture, and industrial monitoring are just a few of the areas where this capacity creates opportunity.

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