WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

# IOT Based Green House Monitoring and Controlling System

***Ms. Punam Kumari Pandit, Mr. Gunratna Mangal Jiwane, Mr. Zubair Mohhamad Sheikh, Ms. Pooja J. Wankhede, Prof. P. R. Yelekar, Dr. M. M. Ramteke***

Department of Electronics and Communication Engineering, Shri Sai College of Engineering and Technology Bhadrawati, Maharashtra, India

**ABSTRACT:**

The IoT Greenhouse Monitoring and Controlling System addresses these challenges by providing automated monitoring and control capabilities, empowering growers to maintain optimal growing conditions and maximize crop productivity while minimizing resource waste and labour costs.

The IoT (Wi-Fi) Greenhouse Monitoring and Controlling System is a comprehensive solution designed to optimize the cultivation environment within a greenhouse. By leveraging Internet of Things (IoT) technology, this system enables real-time monitoring and control of key environmental parameters, including soil moisture, rainfall, temperature, humidity, light intensity, and water irrigation. The integration of various sensors, along with the Arduino microcontroller and Wi-Fi module, allows users to remotely access and manage the greenhouse conditions from anywhere with internet connectivity.

Additionally, this project aims to address the growing need for sustainable and resource-efficient agricultural practices. With increasing concerns about climate change and environmental degradation, there is a pressing demand for technologies that enable more precise and eco-friendly farming methods. By enabling growers to monitor and adjust environmental parameters in real-time, the IoT Greenhouse Monitoring and Controlling System promotes efficient water usage, reduces energy consumption, and minimizes chemical inputs. Ultimately, this contributes to the cultivation of healthier crops while minimizing the ecological footprint of greenhouse operations, thus supporting sustainable agriculture and food security initiatives.

***Keywords—ArduinoIDE, Arduino UNO, Soil Sensor, Rain sensor etc***

## Introduction:

The IoT (Wi-Fi) Greenhouse Monitoring and Controlling System represents a cutting-edge solution poised to revolutionize greenhouse cultivation practices. In recent years, the agricultural sector has witnessed a growing trend towards leveraging technology to enhance productivity, sustainability, and precision in crop production. Greenhouses play a crucial role in this evolution by providing controlled environments that optimize plant growth and yield. However, traditional greenhouse management approaches often rely on manual monitoring and intervention, leading to inefficiencies and suboptimal outcomes. To address these challenges, this project introduces an innovative system that harnesses the power of Internet of Things (IoT) technology to monitor and control key environmental factors within a greenhouse. By seamlessly integrating various sensors, microcontrollers, and communication modules, this system enables growers to remotely access, monitor, and adjust critical parameters such as soil moisture, temperature, humidity, light intensity, and irrigation, thereby optimizing growing conditions and maximizing crop productivity. This introduction provides an overview of the IoT Greenhouse Monitoring and Controlling System, highlighting its significance in advancing sustainable and efficient agricultural practices.

## Objective

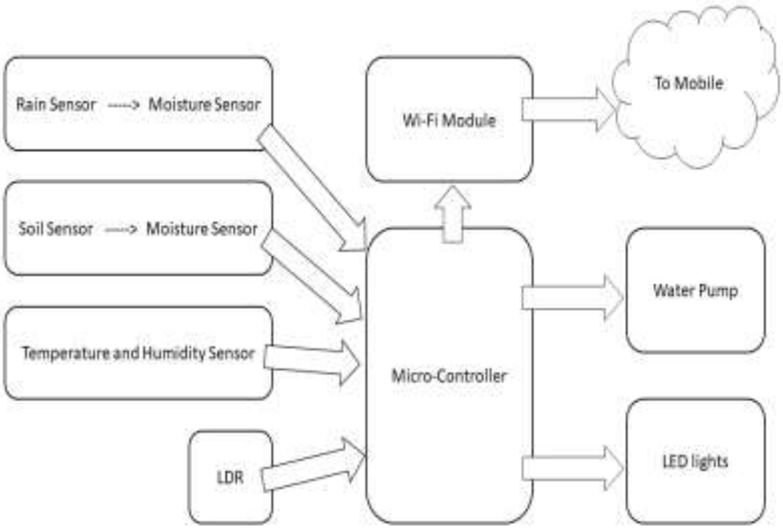
The primary objective of the IoT Greenhouse Monitoring and Controlling System is to provide an advanced and user-friendly solution for optimizing greenhouse environments.

Specific objectives include:

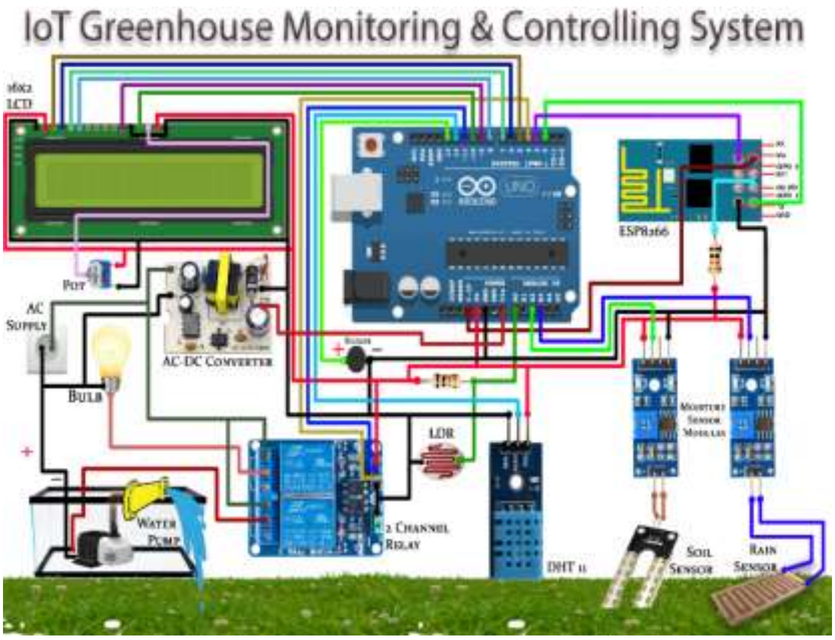
1. **Real-time Monitoring:** Implementing a network of sensors to continuously monitor key environmental parameters such as soil moisture, rainfall, temperature, humidity, light intensity, and water irrigation levels.
2. **Remote Control:** Enabling growers to remotely access and manage greenhouse conditions via internet-connected devices, allowing for timely adjustments and interventions as needed.
3. **Automation:** Implementing automated control mechanisms to regulate environmental parameters, such as activating the water pump based on soil moisture levels or adjusting grow light intensity based on ambient light conditions.

4. **Data Logging and Analysis:** Logging sensor data over time to facilitate analysis of environmental trends and patterns, helping growers make informed decisions to optimize crop growth and resource utilization.
5. **Sustainability:** Promoting sustainable agricultural practices by minimizing resource waste, reducing energy consumption, and improving water efficiency through precise monitoring and control of greenhouse conditions.
6. **User-Friendly Interface:** Developing an intuitive and user-friendly interface for interacting with the system, ensuring accessibility and ease of use for growers of varying technical backgrounds.

## Block Diagram




## Circuit Diagram



## Working

From the programming side first, we have to configure the Arduino Wi-Fi in communication mode for communication purpose and that is common part for all Arduino Wi-Fi for communication.

Multiple sensors are made to work together in this project as a whole system like:

- Rain sensor to send rain warnings on mobile so that necessary action can be taken to protect crops.
- Soil sensor to monitor the moisture in soil and also it is integrated with water pump which will automatically turn on whenever soil sensor detects dry soil.
- LDR here used as light sensor, whenever it detects low sunlight, microcontroller turns on the grow LED lights for crops.
- Temperature and humidity sensors are used to monitor atmospheric conditions.
- Data from all the sensors is sent through Wi-Fi module to the mobile device using local network to monitor real time conditions.

This system provides uniform and required level of water for the Greenhouse, and it avoids water wastage. When the moisture level in the soil reaches below threshold value then the system automatically switches ON the motor. When the water level reaches normal level, the motor automatically switches OFF. The sensed parameters and current status of the motor will be displayed on user's android application in real-time.

After the compilation, the program is in the online simulation mode. Online simulation is used to check how a program is running step by step.

- When the power supply is ON, the input module of four sensors starts to activate.
- When sensors get ON, the Arduino module will activate.
- If Moisture level in soil is low, the water pump motor is operated, and it water the plant.
- If LDR output is high, grow light will turn on.
- All the information is sent via Wi-Fi hotspot through server.
- User can See the information from their smart phone.

## Conclusions

Thus the "Automated Agriculture monitoring system based on Arduino" has been designed and tested successfully. It has been developed by integrated features of all the hardware components used. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. Thus, the Arduino Based Automatic Plant Watering System has been designed and tested successfully. The application of agriculture networking technology is need of the modern agricultural development, but also an important symbol of the future level of agricultural development; it will be the future direction of agricultural development. After building the agricultural water irrigation system hardware and analysing and researching the network hierarchy features, functionality and the corresponding software architecture of precision agriculture water irrigation systems, actually applying the internet of things to the highly effective and safe agricultural production has a significant impact on ensuring the efficient use of water resources as well as ensuring the efficiency and stability of the agricultural production.The smart agriculture using Wi-Fi network has been experimentally proven to work satisfactorily by monitoring the values of humidity and temperature successfully. Through the local Wi-Fi control the motor in the field. It also stores the sensor parameters in the timely manner. This will help the user to analyse the conditions of various parameters in the field anytime anywhere. Then control or maintain the parameters of field properly. Finally, we conclude that automatic irrigation system is more efficient than scheduled irrigation process.

## Future Recommendations

1. **Expand Sensor Capabilities:** Incorporate additional sensors to monitor other critical parameters such as CO2 levels, air quality, and nutrient levels in the soil. This would provide a more comprehensive understanding of the greenhouse environment and enable more precise control over growing conditions.
2. **Implement Predictive Analytics:** Integrate machine learning algorithms to analyze historical sensor data and predict future trends in environmental conditions. This predictive capability can help growers anticipate changes in growing conditions and proactively adjust cultivation strategies to optimize crop growth and yield.
3. **Enhance Remote Control Features:** Develop advanced remote-control features, such as scheduling irrigation cycles, adjusting lighting schedules based on plant growth stage, and receiving automated alerts for abnormal conditions or system malfunctions. This would provide growers with greater flexibility and automation in managing greenhouse operations.
4. **Integrate Energy Management:** Incorporate energy management features to optimize energy usage within the greenhouse, such as scheduling heating and cooling systems based on weather forecasts and integrating renewable energy sources like solar panels to power the system.

### References


[1]. "Securing data in IoT using Cryptography & Steganography" by Manju Khari, Aditya Kumar Garg, Amir H Gandomi, Rashmi Gupta, Rizwan Patan, and Balamumgan Balusamy (2019)

[2]. "Collaborative handshaking approaches between IoT & IOC Telecommunication Systems" by Le Hoang Son, Sudan Jha, Raghvendra Kumar, Jyotir Moy Chatterjee, and Manju Khari (2019).

[3]. "A Review of IoT-Based Fault Detection Techniques for Underground Cable Networks" by Anushka Sharma, Rahul Singh, Priya Patel, and Suresh Kumar (2020)

[4]. "Design and Implementation of an Intelligent Parking Guidance and Information System using Wireless Sensor Networks" by Dohyeun Kim et al. (2015)

[5]. "IoT-Enabled Fault Detection and Localization Techniques for Underground Cable Networks: A Comprehensive Review" by Ashish Verma, Neha Gupta, Shubham Jain, and Rajesh Kumar (2021)

[6]. "State-of-the-Art Review on IoT Applications for Fault Detection in Underground Cable Systems" by Deepak Sharma, Meenakshi Garg, Ankit Bansal, and Vineet Kumar (2019)

[7]. "Recent Advances in IoT-Based Fault Detection Techniques for Underground Cable Networks: A Review" by Varun Gupta, Nidhi Singh, Saurabh Sharma, and Rakesh Kumar (2020)

[8]. "IoT-Driven Fault Detection Solutions for Underground Cable Networks: A Survey" by Mohit Gupta, Pooja Verma, Rohan Sharma, and Anuj Kumar (2021)