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IOT BASED GREENHOUSE MONITORING AND CONTROLLING SYSTEM

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ABSTRACT

The Aim of this project to design a Green house monitoring and weather station monitoring over IoT System, which can be monitor A greenhouse is a structure that is built of walls and a transparent roof and is designed to maintain regulated climatic conditions. These structures are used for the cultivation of plants, fruits, and vegetables which require a particular level of sunlight, temperature, humidity. The project uses sensors to detect the Temperature, Light, and Humidity in the Greenhouse and weather monitoring. Temperature Sensor is used to detect the temperature and humidity readings from the DHT sensor is sent to the microcontroller. The microcontroller is connected to DC Fan switches accordingly. If the temperature is above or below the threshold value, the microcontroller would send signals to turn ON the Fan. Light Sensor is used to detect the amount of sunlight inside the greenhouse. Reading from the sensor is sent to the microcontroller. If the Sunlight is above the threshold value, the microcontroller would send signals to turn ON the relay. This now processes this data and keeps on transmitting it to the online web server over a wifi connection. This data is live updated to be viewed on the online server system

INTRODUCTION

Greenhouse agriculture has become increasingly popular due to its ability to provide controlled environments for optimal plant growth and productivity. With the advancements in Internet of Things (IoT) technology, monitoring and controlling greenhouse conditions has become more efficient and effective. This project aims to design a Greenhouse Monitoring and Controlling System using IoT, allowing growers to remotely monitor and regulate key environmental parameters such as temperature, light, and humidity.

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A greenhouse provides a controlled environment that is essential for the cultivation of plants, fruits, and vegetables, ensuring they receive the required levels of sunlight, temperature, and humidity for optimal growth. However, maintai nditions manually can be challenging and labor-intensive. Hence, there is a d systems that can monitor and regulate greenhouse conditions in real-time.

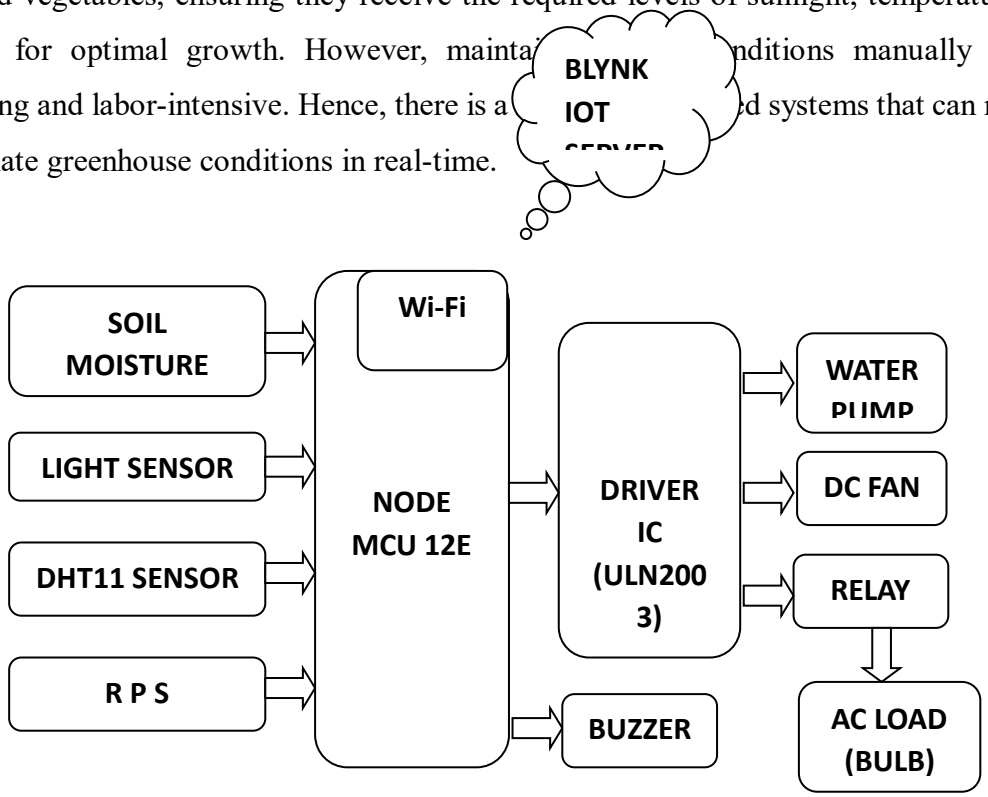

Figure.1 Block Diagram

OBJECTIVE OF THE PROJECT

The primary objective of a greenhouse monitoring and controlling system is to create an optimized and sustainable environment for plant cultivation. By continuously monitoring key parameters such as temperature, humidity, light intensity, and soil moisture, the system aims to ensure ideal growth conditions for plants. Through the implementation of automated or remotely controlled systems, it seeks to efficiently manage resources like water and energy using sensors, minimizing waste and promoting resource conservation. Early detection of potential issues, such as pest infestations or equipment malfunctions, enables timely intervention, reducing crop losses. The integration of data analysis and decision support tools allows for informed decision-making, optimizing crop management strategies over time using IOT Technologies. Additionally, the system contributes to environmental sustainability by promoting energy-efficient practices and compliance with regulations. Ultimately, the goal is

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to enhance crop quality, increase yield, and make greenhouse farming economically viable and environmentally friendly.

LITERATURE SURVEY

"IoT-Based Smart Agriculture: Toward Making the Greenhouse System Intelligent"

This paper explores the integration of IoT technologies in agricultural practices, particularly focusing on smart greenhouse systems. By harnessing real-time data insights, these systems aim to optimize resource management, improve crop yield, and enhance overall agricultural productivity. The paper highlights the significance of leveraging IoT in agriculture and offers valuable insights into the design, implementation, and potential benefits of smart greenhouse solutions. It serves as a comprehensive resource for researchers, practitioners, and stakeholders interested in advancing the field of IoT-based smart agriculture.

Design and Implementation of an IoT-Based Smart Greenhouse Monitoring and Controlling System

The authors aim to design and implement a system capable of effectively monitoring and controlling environmental parameters within a greenhouse environment. By integrating various sensors, microcontrollers, and communication protocols, the paper seeks to enable remote monitoring and control of critical factors such as temperature, humidity, light intensity, soil moisture, and CO2 levels. The ultimate goal is to optimize resource utilization, enhance crop yield, and improve overall efficiency in greenhouse operations through automation and data-driven decision-making.

"Wireless Sensor Network-Based Greenhouse Monitoring and Control System Using IoT"

The primary objective is to develop and demonstrate a greenhouse monitoring and control system based on wireless sensor networks (WSNs) and IoT technologies. The authors aim to address the challenges associated with traditional greenhouse management by leveraging the capabilities of WSNs and IoT devices to enable real-time monitoring and control of environmental parameters. By deploying low-power sensors strategically throughout the greenhouse, the system collects data on factors such as temperature, humidity, light intensity, and soil moisture. This data is then transmitted wirelessly to a central control unit, which

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utilizes IoT principles for data processing and decision-making. The ultimate goal is to optimize resource usage, enhance crop productivity, and facilitate more efficient and sustainable greenhouse management practices

“IoT-Based Smart Greenhouse: A Review”

The paper "IoT-Based Smart Greenhouse: A Review" authored by S. Mishra, A. K. Misra, and M. S. Obaidat provides an in-depth review of IoT-based smart greenhouse systems. The main objective of this paper is to offer a comprehensive overview of recent advancements, challenges, and opportunities in the field of smart agriculture, with a specific focus on greenhouse environments. The authors systematically explore key components and technologies involved in IoT-based smart greenhouse systems, including sensors, actuators, communication protocols, data analytics, and control mechanisms. Additionally, the paper discusses emerging trends such as edge computing and blockchain for enhancing data management and security in smart agriculture applications. By synthesizing existing research a/nd identifying gaps in the literature, this review aims to guide future research directions and facilitate the development of more efficient and sustainable smart greenhouse solutions.

“Design and Implementation of an IoT-Based Smart Greenhouse System for Urban Agriculture”

The main objective of this study is to address the unique challenges and requirements associated with greenhouse farming in urban environments. The authors aim to design and implement a system that enables efficient monitoring and control of environmental parameters crucial for plant growth within limited urban spaces. By leveraging IoT technologies, such as sensor networks, data analytics, and automation, the paper aims to optimize resource usage, enhance crop yield, and promote sustainable urban agriculture practices. The study provides insights into the design considerations, implementation challenges, and potential benefits of deploying smart greenhouse systems in urban settings, thereby contributing to the advancement of IoT-based solutions for agriculture in densely populated areas.

“A Study on IoT-Based Smart Greenhouse for Agriculture Using Wireless Sensor Networks”

The primary objective of this study is to explore the feasibility and effectiveness of integrating WSNs with IoT principles to enable real-time monitoring and control of greenhouse

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environments. The authors aim to design and implement a smart greenhouse system that utilizes WSNs to collect data on key environmental parameters such as temperature, humidity, soil moisture, and light intensity. By leveraging IoT for data processing and decision-making, the paper seeks to optimize resource management, enhance crop productivity, and improve overall efficiency in greenhouse operations. Through a comprehensive analysis of the design, implementation, and performance of the proposed system, this study contributes valuable insights to the growing body of research on IoT-based solutions for agriculture.

PROPOSED SYSTEM

This project uses sensors to detect the Temperature, Light, and Humidity in the Greenhouse and weather monitoring. Temperature Sensor is used to detect the temperature and humidity readings from the DHT sensor is sent to the microcontroller. The microcontroller is connected to DC Fan switches accordingly. If the temperature is above or below the threshold value, the microcontroller would send signals to turn ON the Fan. Light Sensor is used to detect the amount of sunlight inside the greenhouse. Reading from the sensor is sent to the microcontroller. If the Sunlight is above the threshold value, the microcontroller would send signals to turn ON the relay. This now processes this data and keeps on transmitting it to the online web server over a wifi connection. This data is live updated to be viewed on the online server system.

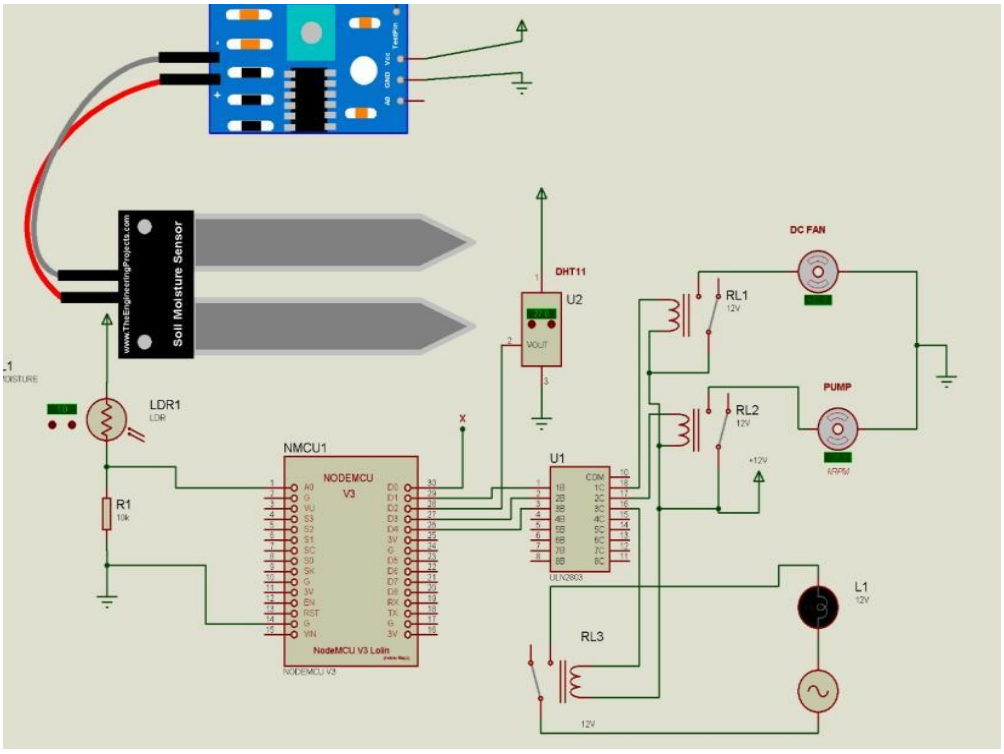

Figure.2 Schematic Diagram

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RESULTS

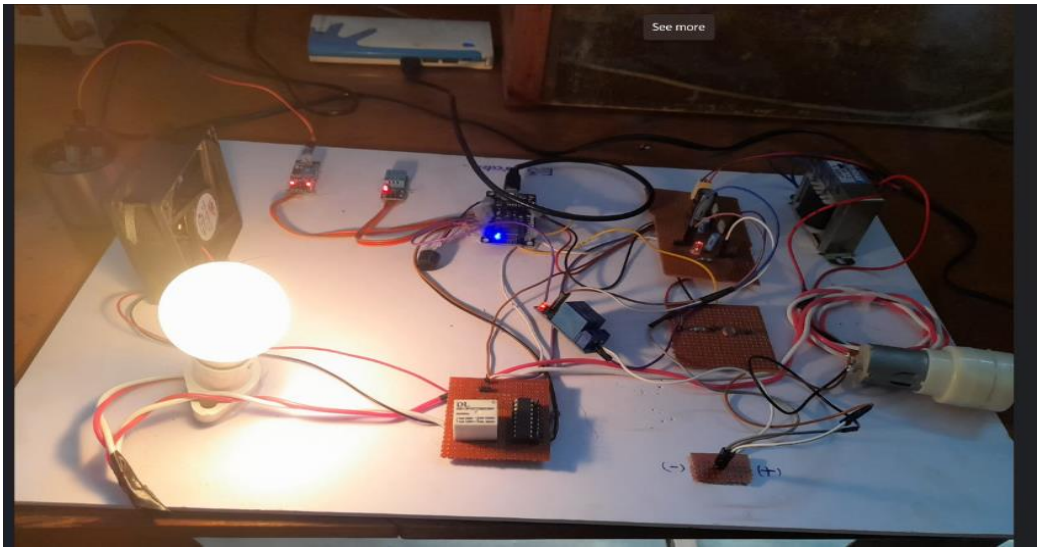

Figure.3 Bulb status ON

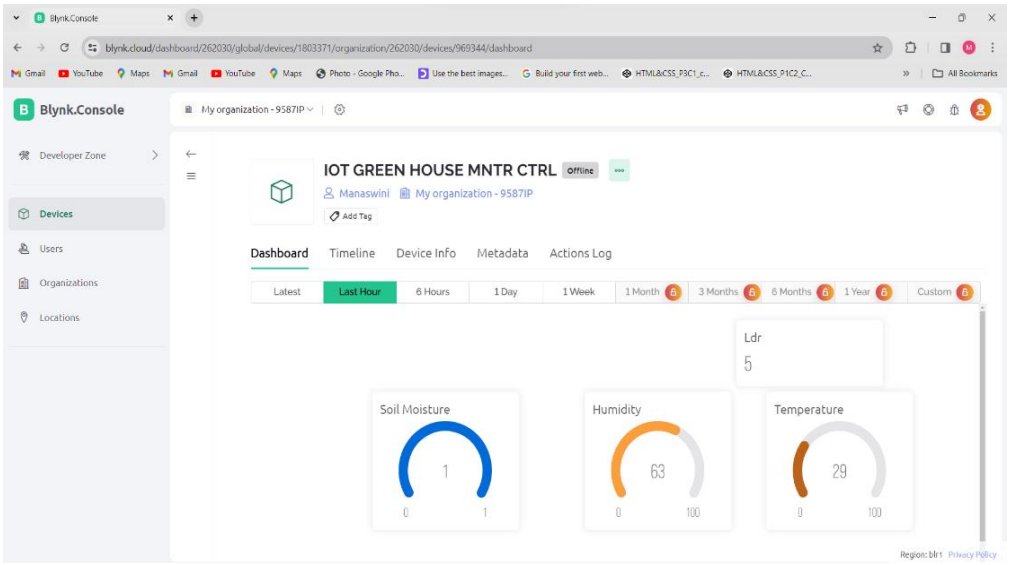

Figure.4 Parameter on Blynk

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CONCLUSION

The project presents a comprehensive solution for greenhouse management, leveraging IoT technology to monitor and control environmental conditions remotely. By integrating sensors for soil moisture, temperature, light, and humidity, the system offers real-time insights into the greenhouse environment. Users can remotely access the data through a web server interface, allowing them to make informed decisions and take necessary actions to maintain optimal growing conditions for plants. The automation features, such as automatic watering based on soil moisture levels and activating fans or relays in response to temperature and light levels, streamline greenhouse operations and enhance efficiency. Overall, the project demonstrates the potential of IoT technology in agriculture, offering a scalable and adaptable solution for greenhouse management.

FUTURE SCOPE

1. Advanced Data Analytics: Implementing advanced data analytics techniques such as machine learning and AI can enable predictive analytics for optimizing plant growth conditions. By analyzing historical data and environmental trends, the system can provide insights and recommendations for improved crop management strategies.

2. Integration with Smart Irrigation Systems: Integrating the greenhouse monitoring system with smart irrigation systems can further automate watering processes based on real-time environmental data, plant water requirements, and soil moisture levels. This integration can optimize water usage and minimize wastage while ensuring optimal plant health.

3. Remote Sensing Technologies: Leveraging remote sensing technologies such as satellite imagery and drones can provide additional layers of data for monitoring crop health, detecting pests and diseases, and assessing overall greenhouse performance. Integrating these technologies with the IoT system can enhance decision-making and early detection of issues.

4. Energy Efficiency Optimization: Implementing energy-efficient technologies such as solar panels, energy storage systems, and intelligent HVAC (Heating, Ventilation, and Air Conditioning) systems can further optimize energy consumption within the greenhouse. IoT-based monitoring and control can help dynamically adjust energy usage based on environmental conditions and energy availability.

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5. Integration with Supply Chain Management: Integrating greenhouse monitoring systems with supply chain management solutions can enable seamless tracking of crop production, quality control, and distribution. Real-time data from the greenhouse can be used to optimize inventory management, scheduling, and logistics for improved efficiency and traceability.

REFERENCES

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2. "Design and Implementation of a Low-Cost IoT-based Greenhouse Management System" by A. M. Khan, M. S. Islam, and M. M. A. R. Sarker. This paper presents a low-cost IoT-based greenhouse management system for monitoring and controlling environmental parameters.

3. "Internet of Things for Smart Agriculture: Technologies, Practices and Future Direction" by Hardeep Singh and Gurvinder Singh. This book covers various IoT applications in agriculture, including greenhouse monitoring and control systems.

4. "Greenhouse Technology and Management" by Nicolas Castilla. While not specifically focused on IoT, this book provides valuable insights into greenhouse management practices which can be integrated with IoT technology.

5. "Building an IoT Greenhouse with PubNub and Raspberry Pi" by Srinivas Panuganti. This article provides a practical guide to building a greenhouse monitoring and controlling system using Raspberry Pi and PubNub IoT platform.

6. "Implementing IoT in Agriculture: Smart Greenhouse Example" by Swathi and Suhas. This article explains how IoT can be implemented in agriculture, with a focus on greenhouse management.

7. The website of IoT solution providers like IBM IoT, Microsoft Azure IoT, and AWS IoT often feature case studies and whitepapers on IoT applications in agriculture, including greenhouse monitoring and control systems.

8. Agricultural research institutions and universities may also publish reports and findings on IoT-based greenhouse systems on their websites.