International Journal of Information Technology & Computer Engineering

ISSN 2347–3657

Volume 14, Issue 1, 2026

IoT Based Greenhouse Monitoring and Control System

Salivoju Akshaya[1], Bangaru Akshitha[2], Patlolla Mounika[3]

[1,2,3]B.Tech Students, Department of Electronics and Communications Engineering, Bhoj Reddy Engineering College ,Hyderabad, India

akshithabangaru7702@gmail.com, salivojuakshaya@gmail.com

***Abstract*—*The wireless sensor network (WSN) is one of the most significant technologies in the 21st century and they are very suitable for distributed data collecting and monitoring in tough environments such as greenhouses. The other most significant technologies in the 21st century is the Internet of Things (IoT) which has rapidly developed covering hundreds of applications in the civil, health, military and agriculture areas. In modern greenhouses, several measurement points are required to trace down the local climate parameters in different parts of a largescale greenhouse in order to ensure proper operation of the greenhouse automation system.*

Keywords: *IoT, WSN.*

I. INTRODUCTION

With the development of technology, it has become more important to cut back on power, water use, and labor-intensive agricultural practices. Additionally, research into intelligent irrigation systems and smart greenhouses has expanded to fulfil the rising food demands brought on by population growth and to help farmers produce high-quality goods under challenging economic conditions (Jianjun et al., Citation2013). Families require vegetables and other crops for daily use, but they are not available in sufficient amounts, and when they are available, they are very costly. If artificial greenhouses are used, it is possible to grow sufficient food, which has been tried as a solution to the global food crisis Intelligent greenhouses can produce more crops compared to normal farming systems used in the field. The cause of this has been identified as the ongoing analysis and regulation of the climatic factors that affect crop output to cultivate crops in the most advantageous environment. The green house system has limited area, so if farmers utilize the optimum space and arrange the crops properly; it is possible to enhance crop production. During the studies in this area of research, it was found that many articles were available that showed the effectiveness of various communication techniques that can help control the greenhouse parameters and the production of crops, but no one demonstrated a complete comparative study between all the proposed approaches in this research area. Due to this research gap, the authors of this article were motivated to conduct this study.

II. ADVANTAGES

The objective of this research article is to investigate the best techniques used to address the goal of monitoring and controlling greenhouse parameters in all sessions when environmental changes arise. The bulk of articles used wire-less communication systems with different setups, and it is very confusing which method is best and which farmers can easily adopt according to the size of their green houses and the geometrical conditions around them. To familiarize readers with the various techniques used for monitoring as well as controlling the internal parameters of the green houses, a brief explanation of these methods is given, and the most important contributions of each research project are introduced. Additionally, in order to create a helpful survey on the usage of suggested approaches by the researcher for monitoring and controlling parameters, the best solutions found in the articles under consideration are tallied. There are comparisons between the publications that have been examined in terms of objective function and restrictions. This article will be of great use to scholars looking at the best method for green house control. The rest of the document is structured as follows: Section 2 provides reviews of several methods used in the control of greenhouse parameters.

International Journal of Information Technology & Computer Engineering

ISSN 2347–3657

Volume 14, Issue 1, 2026

III. IMPLEMENTATION SETUP

Temperature and Humidity Sensors: These measure the temperature and relative humidity within the greenhouse, crucial for plant growth.

Soil Moisture Sensors: These detect the moisture content in the soil, aiding in optimizing irrigation.

Light Sensors: These measure the light intensity, crucial for photosynthesis and plant growth.

CO2 Sensors: These measure the carbon dioxide concentration, which plays a role in plant growth and photosynthesis.

Calibration and Accuracy: Each sensor needs to be calibrated and accurate for the specific environment it's measuring in, adding to the complexity of the overall system.

Data Processing and Algorithms: The processing unit may need to filter noise, calculate averages, and implement control.

Data Transmission: Sensors need a reliable way to send data to the processing unit, which could involve wired or wireless connections, further adding to the complexity.

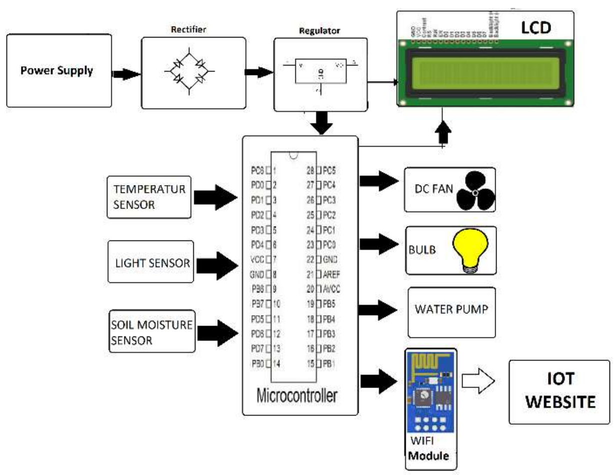

Fig: Block Diagram

Technical Limitations:

Limited Range: Wi-Fi modules, often used for data transmission in IoT systems, can have a limited range, potentially requiring repeaters or other solutions to cover larger greenhouse spaces.

- **Radio Frequency Interference:**

The radio frequencies used by some IoT devices can, in some cases, negatively affect plant growth, though this is not a universal issue and depends on the specific frequencies and plants.

- **Sensor Placement Challenges:**

Sensors need to be strategically placed to avoid shading plants, which can affect their growth. Careful consideration needs to be given to sensor placement to ensure accurate data collection without negatively impacting the plants.

IV. WORKING OF PROTOTYPE

The prototype can be used in following two ways :

1.Thresholds and Action

2.Microcontroller

ISSN 2347–3657

Volume 14, Issue 1, 2026

V. PROPOSED ALGORITHM

A proposed algorithm for an IoT-based monitoring and control system involves several key steps: data collection, preprocessing, analysis, decision-making, and control actions. This system typically utilizes sensors to gather data, followed by algorithms for data cleaning, transformation, and feature extraction. Advanced techniques like machine learning can be used to analyze the data, make predictions, and trigger control actions based on the identified patterns and thresholds.

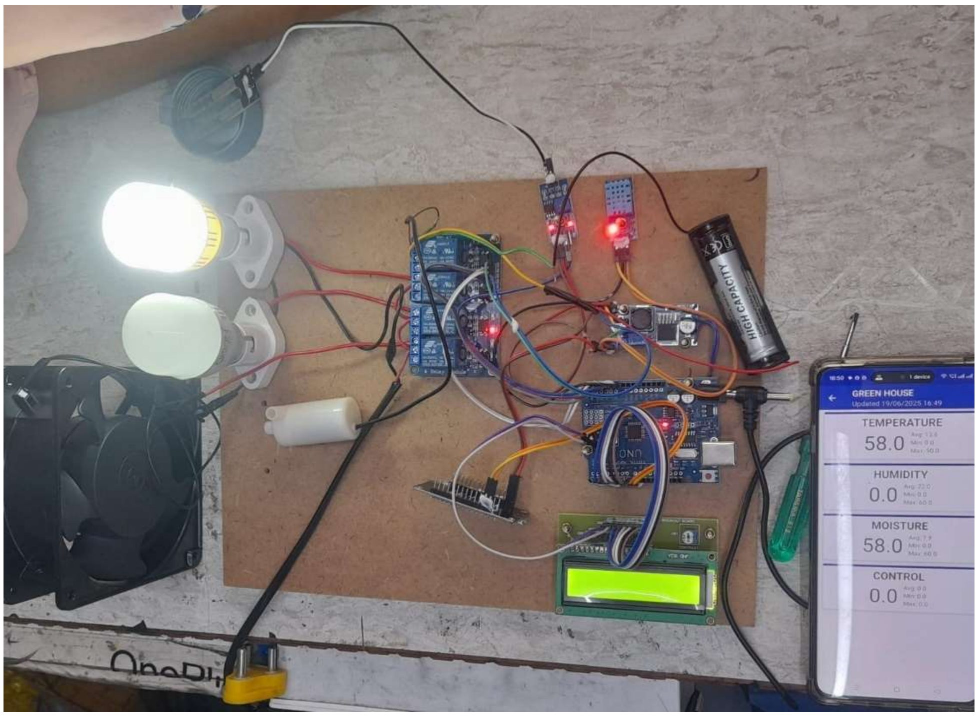

Fig: Result

VII. IOT GREENHOUSE SYSTEM

An IoT (Internet of Things) greenhouse monitoring system utilizes various sensors and wireless communication to remotely track and manage environmental conditions within a greenhouse, optimizing plant growth and resource utilization. These systems monitor parameters like temperature, humidity, soil moisture, light intensity, and CO2 levels, transmitting data to a central hub or cloud platform for analysis and automated control. Proper digits known to him. Since the appliances mains supply through a relay they can be easily micro-controller.

Fig: IoT Based Greenhouse System

VIII. EXISTING SYSTTEM

The existing system for greenhouse automation comprises of three main components: the HSM 20G humidity sensor module with signal conditioning circuit, the PIC18F452 microcontroller, and the ZigBee transceiver present at both the transmitting and receiving ends. At the receiving end, the ZigBee module is connected to a host computer for continuous monitoring and database maintenance. Wireless communication with simple hardware and user-friendly software, such as Lab view, has been demonstrated as an efficient solution for automated greenhouse management in agriculture. The approach allows for monitoring and control of climate and irrigation systems, making it a valuable tool in high-tech agriculture. Although the experimental results have been shown for two parameters, the system is scalable and can be extended to monitor and control additional parameters. The proposed approach has the potential for remote crop monitoring and control using Wireless Sensor Network (WSN) technology for large-scale greenhouses. The system is user friendly, low-cost, and easily implementable, making it a promising solution for modern greenhouse automation.

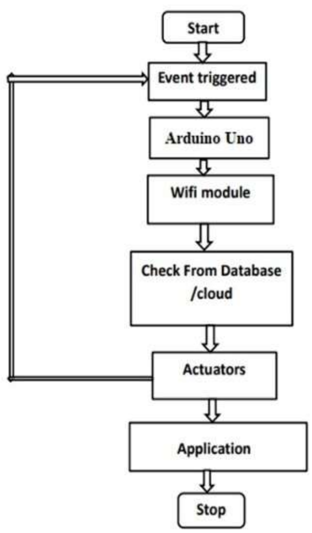

Fig: Flow Chart

IX. CONCLUSION

The implementation of an IoT-based smart greenhouse monitoring system has proved to be a game-changer for the agriculture sector, which previously relied on laborintensive and time-consuming traditional monitoring methods. The proposed system has not only saved time, money, and human effort but has also provided a controlled environment for the plants, resulting in an overall increase in yield. The smart greenhouse automatically optimizes various parameters for plant growth and sends real-time data to a customized webpage for continuous and effective monitoring. This project can be used not only in greenhouses, botanical gardens, and agriculture farms but also in mechanical companies and mills to measure various parameters of operating machines such as temperature and others with minimal modifications.

X. FUTURE SCOPE

In the future, we can expand the capabilities of plant monitoring systems by incorporating image processing techniques to assess the health condition of plants. This would allow us to identify any areas with dead cells or unhealthy plant parts. Additionally, we could use various technologies to detect the amount of chemicals required for optimal plant growth. By monitoring the specified climatic conditions, such as temperature, humidity, soil moisture, and sunlight, we can ensure that plants are maintained in a perfect environment, resulting in good production and healthier plants and surroundings. By deploying wireless sensors throughout a greenhouse, we can measure temperature, humidity, CO2, and light levels, and adjust the environment in real-time with a grow room controller. The sensors send crop-level data to an operating system, which controls motors that open or close based on specific triggers.

XI. REFERENCES

[1] Data Acquisition of Greenhouse Arduino - Babylon University and Applied Science.

[2] Greenhouse Automation System Using psoc 3 Journal of Information knowledge Research.

[3] Arduino Based Automatic Plant Watering System Devika 4(10) October-2014.

[4] Remote Sensing In Greenhouse Monitoring System- of Electronics and Communication Engineering (SSRG-IJECE)-EEFS April 2015.