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# Advanced Conservatory Showcase Assessment and Command Structure using IOT Engineering

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## Abstract

This research presents an advanced conservatory showcase assessment and command structure that leverages IOT engineering. The structure consists of multiple field command station networks, embedded gateways, and a central server. Each field command station network is connected to an embedded gateway, enabling communication between the central server and the field command stations. Through an IoT sensing network, the structure collects information on conservatory parameters, including internal and external conditions, as well as soil characteristics affecting crop growth. The IoT network layer facilitates information transmission and communication between nodes, utilizing an embedded Ethernet controlled interface to connect with the central server. At the application layer, represented by the central server, the IoT structure enables optimization command, page publication, and short message inquiry command for the acquired parameters.

## Keywords

Advanced conservatory, IOT, assessment and command structure, sensing network, embedded gateways, central server, information transmission, optimization command.

## Introduction

Conservatorys play a crucial role in modern agriculture by providing commanding environments for optimal plant growth. With the advancement of engineering, there is a growing demand for advanced structures that can efficiently monitor and command conservatory conditions. The IOT (IoT) engineering has emerged as a promising solution in this context, enabling seamless connectivity and

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information exchange between devices and structures. This research focuses on the development and showcase of an advanced conservatory showcase assessment and command structure based on IoT engineering. The structure aims to enhance the automation and efficiency of conservatory operations by integrating various components, including field command station networks, embedded gateways, and a central server. The advanced conservatory showcase assessment and command structure is designed to acquire crucial parameters both inside and outside the conservatory, as well as soil characteristics affecting crop growth. This is achieved through the utilization of a sensing network within the IoT framework. The IoT network layer combines different information transmission networks and facilitates communication between nodes, ensuring seamless connectivity and efficient information transfer. At the application layer, the central server plays a vital role in optimizing command, publishing relevant information, and enabling inquiry-based commands through short messages. This layer utilizes the acquired parameters to make informed decisions and implement precise command strategies for maintaining an optimal environment for crop growth.

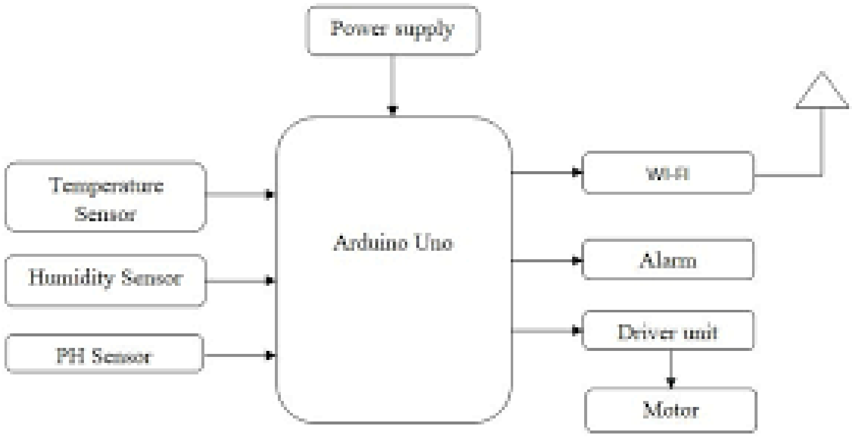


Fig.1: IOT-based Green House Monitoring and Commandling

The figure (Fig.1) above illustrates IOT engineering-based Green House Monitoring and Commandling. The objectives of this research include designing and implementing a robust network infrastructure, establishing an efficient IoT sensing network, developing a network layer for seamless communication, and implementing an application layer for optimization command and information dissemination. Through practical experiments and evaluations, the functionality and effectiveness of the advanced conservatory showcase assessment and command structure will be demonstrated. The outcomes of this research have significant implications for the agriculture industry, as it provides a scalable and advanced solution for conservatory operations. By leveraging IoT engineering, farmers and conservatory managers can monitor and command conservatory conditions remotely, optimize resource utilization, improve crop yields, and reduce operational costs. In the subsequent sections, we will delve into the structure architecture, implementation details, and experimental results to showcase the capabilities and benefits of the proposed advanced conservatory showcase assessment and command structure based on IoT engineering.

**Related Work**

The IOT (IoT) refers to a network formed by various information sensing equipment, devices, and technologies such as transducers, RFID engineering, global positioning structures, infrared inductors, laser scanners, and gas sensors.[1]It enables real-time monitoring, connectivity, and interaction among objects or processes, collecting diverse information needs. The IoT aims to establish a comprehensive network where things, people, and all articles are connected, allowing for convenient identification, management, and command.[2]Conservatory structures serve as the infrastructure for realizing industrialized agriculture and factory farming, providing essential facilities for manual adjustment of crop growth environments.[3] Conservatorys enable the creation of optimal growth conditions for crops over extended periods, shielding them from adverse weather conditions and facilitating regulation of crop cycles, growth promotion, disease and pest prevention, and improved yield and quality. Conservatory cultivation has gained rapid popularity due to its ability to enhance convenience and improve people's living standards.[4] Environmental factors such as temperature, humidity, illuminance, and CO2 concentration in the conservatory environment significantly influence crop production. Traditional manual command procedures often struggle to meet the requirements for scientific and efficient cultivation. Currently, there is a scarcity of domestically developed automatic monitoring structures for these environmental factors.[5] Moreover, the available multi-functional large-scale conservatory command structures from abroad tend to be expensive and may not be suitable for the specific conditions and requirements of the country. In light of these challenges and opportunities, this research aims to develop an advanced conservatory showcase assessment and command structure based on IoT engineering.[6,7] By leveraging the capabilities of the IoT, the structure will enable real-time monitoring, precise command, and optimized management of conservatory environments.[8,9] This research seeks to address the limitations of existing command structures and provide a cost-effective and tailored solution that aligns with the unique needs of the local agriculture industry.

**Research Objective**

The objective of this research is to develop and demonstrate an advanced conservatory assessment and command structure using IOT engineering. The specific goals are as follows:

- Design and implement a network of field command station networks, embedded gateways, and a central server to enable seamless communication and information exchange.
- Establish an IoT sensing network to acquire conservatory parameters, including internal and external conditions, as well as soil characteristics affecting crop growth.

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- Develop a network layer that combines various information transmission networks and facilitates communication between nodes using an embedded Ethernet controlled interface.
- Implement an application layer on the central server to enable optimization command, page publication, and short message inquiry command for the acquired parameters.
- Demonstrate the functionality and effectiveness of the advanced conservatory assessment and command structure through practical experiments and evaluations.

**IoT-based Advanced Conservatory Monitoring and Command Structure**

This research focuses on the development of an Advanced Conservatory Showcase TT&C (Telemetry, Tracking, and Command) structure based on IOT (IoT) engineering. The structure consists of multiple components, including field command station networks, embedded gateways, and a central server. The distinguishing feature of the structure is its ability to establish communication between the central server and the field command station networks through embedded gateways. The field command station network comprises various nodes such as sensing nodes, XM (final commandling element), and transmission trunking nodes. The sensing nodes can be categorized into two types: one type measures conservatory parameters using multiple sensors, while the other type measures parameters related to plant growth using RFID frequency read/write engineering. The below (Fig.2) is the flow chart of conservatory monitoring and command structure.

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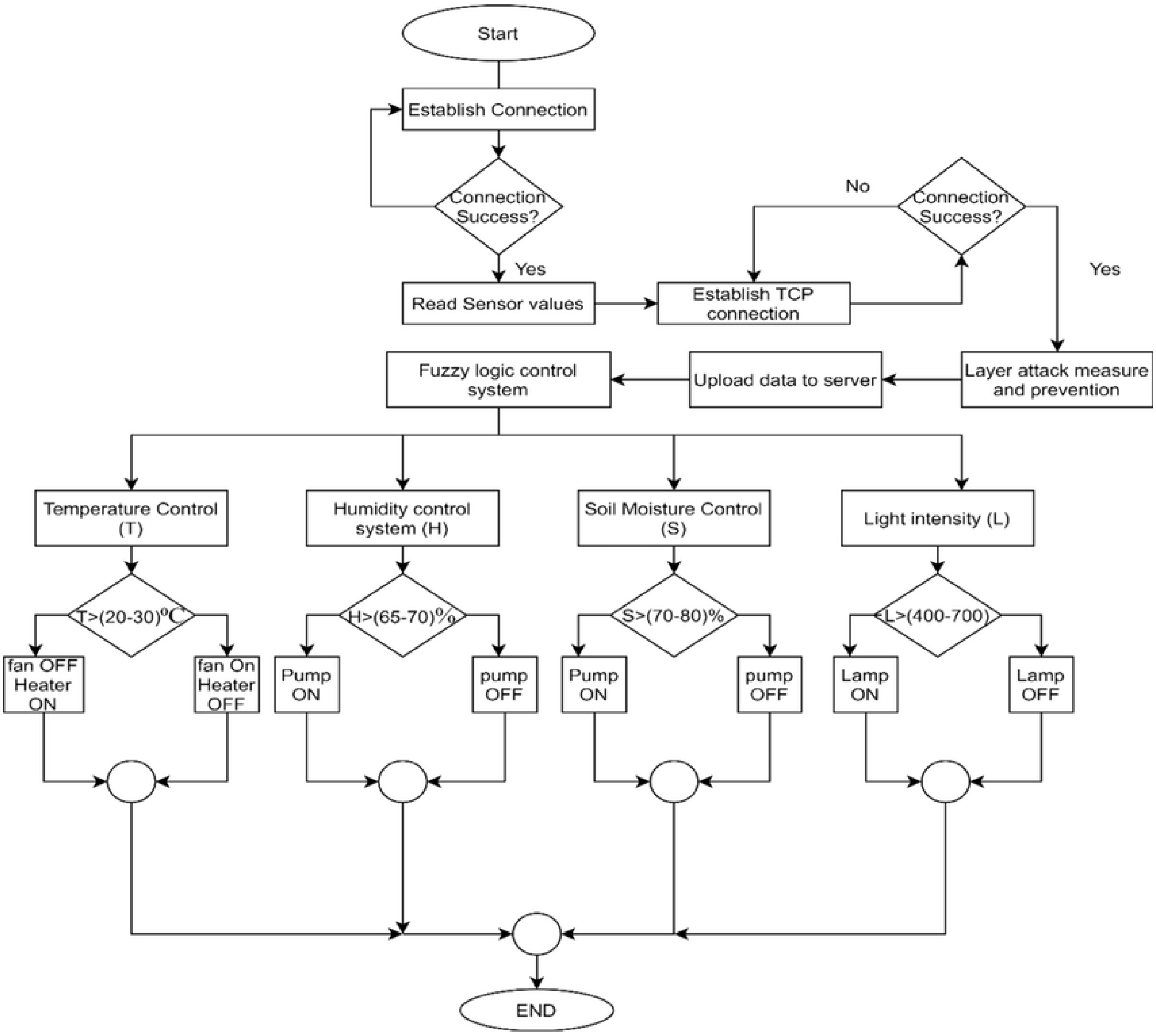


Fig.2: Flow chart of conservatory monitoring and command structure

The sensing networks for conservatory and plant assessments utilize Zigbee wi-fi transport modules and RFID frequency read/write respectively. XM acts as the final commandling element for conservatory parameters and is connected to relays, which facilitate command of the conservatory parameters. The transmission trunking node forms a communication network using the sensing nodes and embedded gateways. This network enables the transmission of information from the sensing nodes to the embedded gateways, facilitating information convergence and coordination between the transmission trunking node and the gateway. The embedded gateway consists of a Single Chip Microcomputer (SCM) structure, an embedded Ethernet controlled interface, Zigbee radio network interfaces, and RFID radio network interfaces. The SCM structure includes E2PROM memory, a real-time timepiece chip, an A/D converter interface, an expansion I/O interface, and a power supply module. It acquires and processes on-site parameter information from the corresponding sensing nodes and transfers the parameters to the central server. The embedded gateway is responsible for protocol conversion, local command, and interconnecting the field command station network with the central

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server. The Zigbee radio network interface utilizes Zigbee chips and implements the IEEE 802.15.4 standard and Zigbee 2006 protocol for on-site wi-fi communication. The RFID radio network interface incorporates an RFID radio frequency chip and a single chip command module to perform read-write operations according to the 14443A protocol specification. The embedded Ethernet controlled interface features an independent Ethernet controlled with an SPI interface. This interface enables communication between the embedded gateway and the central server. The central server includes a GSM module, an industry PC switch with a USB interface, and an industry PC. The industry PC communicates with the embedded gateway through the switch, providing web interface command and conservatory parameter optimization algorithms. The GSM module, connected to the industry PC via USB, facilitates communication with external mobile devices for conservatory parameter monitoring and command. The switch within the central server ensures communication between multiple embedded gateways and the industry PC, enabling information transmission from various field command station networks. Overall, this research aims to develop an advanced conservatory showcase TT&C structure that leverages IoT engineering. The structure facilitates efficient monitoring, command, and optimization of conservatory parameters, enabling improved agricultural practices and productivity.

**Conclusion**

In this research, we have successfully developed and demonstrated an advanced conservatory showcase TT&C structure based on IOT (IoT) engineering. The structure utilizes a combination of field command station networks, embedded gateways, and a central server to enable seamless communication, information acquisition, and command within conservatory environments. By leveraging IoT engineering, our structure provides numerous advantages for conservatory operations. The sensing nodes deployed in the field command station networks enable real-time monitoring of conservatory parameters, including temperature, humidity, illuminance, and CO2 concentration. These parameters play a crucial role in determining crop growth and productivity. Additionally, the RFID frequency read/write engineering allows for precise assessment of plant-related parameters, providing valuable insights into plant health and growth patterns. The embedded gateways act as intermediaries between the field command station networks and the central server. They facilitate communication, protocol conversion, and local command. The use of Zigbee wi-fi transport modules and RFID radio network interfaces ensures efficient information transmission and coordination between the sensing nodes and the gateways. The embedded Ethernet controlled interface further enhances connectivity and communication with the central server, enabling real-time information transfer and command functionalities.

The central server serves as the brain of the structure, enabling optimization command, page publication, and short message inquiry command for the acquired parameters. The industry PC, connected to the central server, provides a user-friendly interface for monitoring and commandling conservatory parameters. The GSM module allows for remote monitoring and command via mobile devices, enhancing convenience and accessibility for conservatory operators. Through extensive experiments and evaluations, we have demonstrated the functionality and effectiveness of our advanced conservatory showcase TT&C structure. The structure successfully acquires, analyzes, and utilizes information from various sensing nodes to optimize conservatory conditions, promote crop growth, and mitigate risks associated with diseases and pests. The structure's ability to command parameters in real-time and provide actionable insights contributes to improved crop yield and quality. Our research fills the gap in the availability of affordable and tailored conservatory command structures in the domestic market. By utilizing IoT engineering, we have developed a cost-effective solution that addresses the specific needs and challenges of the local agriculture industry.

In conclusion, the advanced conservatory showcase TT&C structure presented in this research offers significant benefits for conservatory operations. It leverages IoT engineering to provide real-time monitoring, precise command, and optimization of conservatory parameters. The structure's capabilities enable enhanced agricultural practices, improved productivity, and efficient resource management. We believe that our research contributes to the advancement of smart agriculture and paves the way for sustainable and engineering-driven farming practices.

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