Design and Construction of a Smart Clean Vegetable Cultivation Cabinet

Hoàng Trọng Đức Duy
Thai Nguyen University of Information and Communication Technology
Thai Nguyen University, Thai Nguyen, Vietnam
student423@ictu.edu.vn

***Abstract*—This undergraduate thesis designs and constructs a smart cabinet for growing vegetables indoors, aimed at households with limited land. The report describes an Arduino Nano, ESP8266, environmental sensors, and relays used to monitor conditions and control irrigation and lighting. The author states that the model met approximately 85% of the project's aims; this is an overall self-assessment rather than a separately measured system-accuracy result. The source notes the need for more stable and precise control and proposes pH monitoring, a larger model, and solar power as future work. The project demonstrates a small-scale prototype while leaving long-term cultivation performance for later evaluation.**

***Index Terms*—IoT, vegetable cultivation, LED lighting, Arduino, sensors**

I. Introduction

The report introduces the application of IoT in agriculture and details the hardware components used in the design, including Arduino Nano, LCD displays, and various sensors. The author explains the importance of using LED lighting for indoor vegetable cultivation and discusses the selection and benefits of LED lights. The system is intended to help urban residents cultivate fresh vegetables in limited spaces. The design addresses the challenges of stable and accurate control in a small-scale indoor environment, which is crucial for the success of indoor vegetable cultivation [1]. Published articles on the methods and subject of this project provide context for this English summary [3]. Published books on the methods and subject of this project provide context for this English summary [4].

II. Methods

The thesis describes the design and implementation of a smart vegetable cultivation cabinet using Arduino Nano, ESP8266, and various sensors. The author provides detailed descriptions of the hardware components and their functions, as well as the software implementation for data processing and control. The system includes sensors for measuring soil moisture, air humidity, light intensity, and temperature, and controls relays for irrigation and lighting. The author also discusses the selection and integration of various components, such as the Arduino Nano for microcontroller operations, the ESP8266 for Wi-Fi connectivity, and various sensors for environmental monitoring. The software implementation involves reading sensor data, processing it, and controlling the relays for irrigation and lighting [1].

Supervisor: Đào Tô Hiệu, Thai Nguyen University of Information and Communication Technology (dthieu@ictu.edu.vn).

III. Results

the author estimated that the project met about 85% of its requirements, but the author notes that the project faced challenges due to the need for stable and accurate control in a small-scale indoor environment. The author mentions that the product still has room for improvement and suggests several potential enhancements, such as adding pH monitoring, developing a larger-scale model, and incorporating solar energy. The system successfully reads soil moisture, air humidity, light intensity, and temperature, and controls relays for irrigation and lighting. However, the author does not provide any measured evaluation or test results to demonstrate the system's performance [1].

IV. Discussion

The author discusses the limitations of the current system and suggests areas for future development, including the addition of pH monitoring, larger-scale models, and the use of solar energy. The system is designed to read soil moisture, air humidity, light intensity, and temperature, and to control relays for irrigation and lighting. The author acknowledges that the product still requires improvements and suggests several potential enhancements to address the limitations of the current system. The limitations include the need for more accurate and stable control in a small-scale indoor environment, which can affect the overall performance of the system [1].

V. Conclusion

The project demonstrates the feasibility of a smart vegetable cultivation cabinet for urban residents with limited land. The author acknowledges that the product still requires improvements and suggests several potential enhancements to address the limitations of the current system. The system successfully reads soil moisture, air humidity, light intensity, and temperature, and controls relays for irrigation and lighting. However, the author does not provide any measured evaluation or test results to demonstrate the system's performance. The project highlights the importance of stable and accurate control in a small-scale indoor environment for the success of indoor vegetable cultivation [1].

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