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Design and Construction of an IoT-Based Automatic Chicken Coop Door System with Scheduled Time Control and Remote Control

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Abstract: *This article discusses the design and development of an Internet of Things (IoT)-based automatic system with scheduled time control and remote access control. The Internet of Things (IoT) is a system consisting of hardware, software, and internet technology designed to facilitate human interaction and enable devices with IP addresses to utilize internet networks as a communication medium. IoT can be used to monitor various physical parameters, such as temperature, humidity, pressure, and motion, depending on the application requirements. Designing systems using IoT-based technology can simplify daily human activities, as demonstrated in this study, which applies IoT methods to design an automatic chicken coop door with scheduled time control and remote access capabilities.The proposed method successfully produced an automatic chicken coop door design that operates effectively using IoT technology. All major components, including the ESP8266 microcontroller, RTC module, servo motor, I2C LCD, breadboard, and the Blynk application, were successfully interconnected and operated in an integrated manner according to their respective functions. The test results indicate that the component integration performed smoothly, where the ESP8266 microcontroller was able to process time data, control servo motor movement, display information on the LCD, and receive as well as execute commands directly from the application. Therefore, this device can serve as an efficient solution to support the modernization of poultry farming through IoT-based technology*

Keywords *: IOT, Chicken Coop Door, schedule Time Control, Remote Control.*

1. INTRODUCTION

As time progresses and technological advancements become increasingly evident, we continue to witness rapid developments in various fields. In the current era, technology has provided numerous conveniences in people's daily lives. These technological advancements can be seen in the increasing ability of electronic devices to connect with microcontrollers and networks, enabling monitoring and control through integrated systems. This system is designed to improve both the efficiency and effectiveness of chicken farm management, particularly in regulating and controlling coop doors. With the implementation of Internet of Things (IoT) technology, chicken coop doors can be operated automatically according to predetermined schedules while also allowing remote control. (Idofitraramdhan, 2022)[1] This technology focuses not only on increasing productivity but also on promoting sustainability and efficient resource utilization. Therefore, the development of an IoT-based automatic chicken coop door system can make a positive contribution to enhancing the competitiveness of the poultry farming industry at both the local and global levels.(Ahmad Syaroni1, 2025)

In the context of this research, the main focus is to design and develop a reliable automatic door system that is easy for farmers to operate. The system is designed to operate autonomously with minimal user intervention while still providing users with the flexibility to make adjustments and monitor the system according to their needs. In addition, the system must also consider aspects of safety and sustainability to provide long-term benefits for farmers. [1]

2. RESEARCH METHODOLOGY

This research employs the Research and Development (R&D) method with the aim of designing and developing an Internet of Things (IoT)-based chicken coop door control system equipped with an automatic notification feature and real-time monitoring of the chicken coop through the Blynk application (Sihombing, 2023).)

2.1 Research Materials

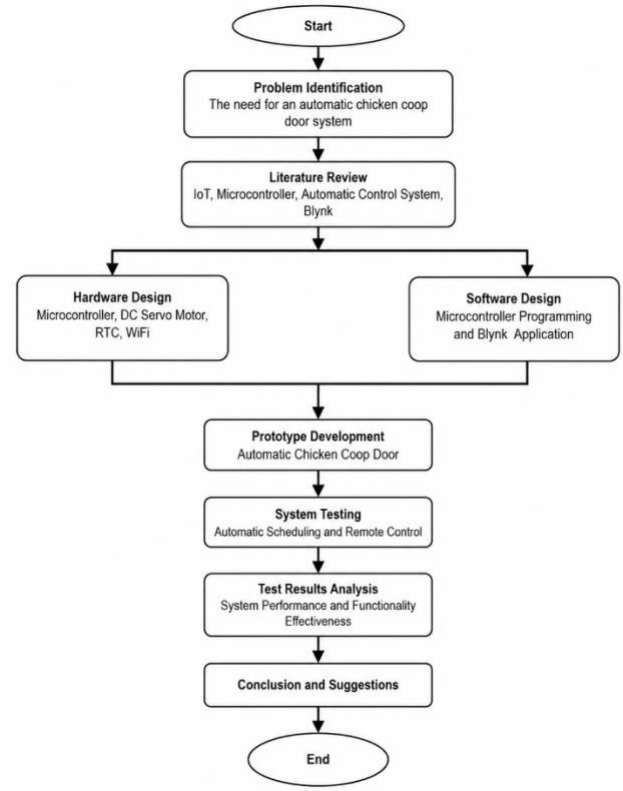
To operate the chicken coop door control system automatically and in real time, the following supporting hardware and software are required:[2]

Table 2. 1 Hardware Components and Their Functions :

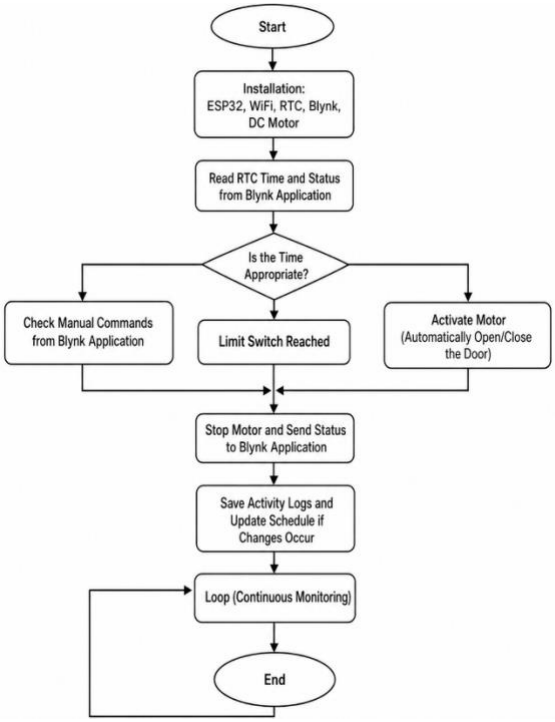
No.	Hardware	Function
1	Laptop	Used for programming and system development.
2	RTC (Real-Time Clock)	Stores accurate time information for scheduled operations even when the Wi-Fi connection is unavailable.
3	Motor Servo	Drives the automatic opening and closing mechanism of the chicken coop door.
4	Microcontroller	Controls, monitors, and processes data in real time.
5	Breadboard	Used as a temporary platform for connecting and assembling electronic components during the system development process.
6	ESP8266	Used to control and process data from the connected components.
7	LCD	Displays visual information such as text, numbers, and images clearly.
8	Jumper Wires	Used to connect electronic components during the assembly process.
9	NodeMCU	Serves as the main microcontroller that controls the system, connects to Wi-Fi, and communicates with the Blynk application.

2.3 Research Flow

The workflow and sequence of steps serve as guidelines for designing and developing an automatic chicken coop door system using Internet of Things (IoT) technology.



2.4 Results Data Analysis



RESULTS AND DISCUSSION

System design is an essential part of the initial stage in developing an IoT-based automatic chicken coop system with scheduled time control and remote control. This stage involves determining the required components, including the Arduino Uno as the main controller, a servo motor to operate the chicken coop door, and the ESP8266 as a communication module for connecting to Wi-Fi and transmitting and receiving data, The system also uses an RTC (Real-Time Clock) to manage time-based operations, while an LCD is used to display information about the ongoing system activities. Jumper wires serve as connectors between the components in the electronic circuit,[3].

The breadboard is used as a platform for assembling the electronic circuit, while the Blynk application is utilized to display the opening and closing status of the chicken coop door on a mobile device. With proper system design and careful planning, the proposed system is expected to operate automatically using Internet of Things (IoT) technology, enabling scheduled time control and remote control of the automatic chicken coop door.

3.1 System Diagram

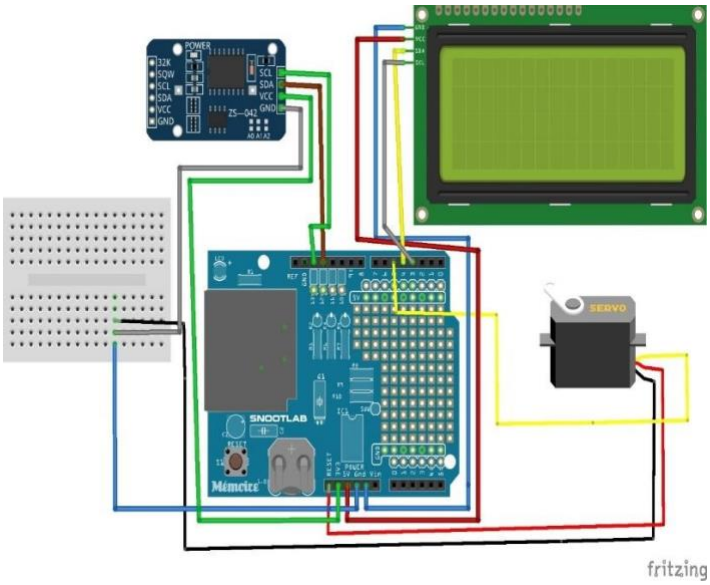


Figure 3.1. IoT-Based Automatic Chicken Coop Door System illustrates the interconnection between the hardware components, consisting of the ESP8266 D1 as the main microcontroller, the DS3231 RTC module as the timekeeping device the 16×2 I2C LCD as the information display, the SG90 servo motor as the door actuator, and the breadboard as a power distribution and circuit connection platform. The system operates by continuously reading time data from the RTC module. The ESP8266 then compares the retrieved time with the programmed schedule. If the current time matches the scheduled door-opening time, the microcontroller sends a PWM signal to the servo motor, causing the servo to rotate and open the chicken coop door. Conversely, when the current time reaches the scheduled closing time, themicrocontroller (ESP8266) commands the servo motor to return to its initial position, thereby closing the chicken coop door. Throughout the operation, the LCD displays the time and the chicken coop door status in real time..

3.2 Testing of All Sensors and Devices Connected to the ESP8266

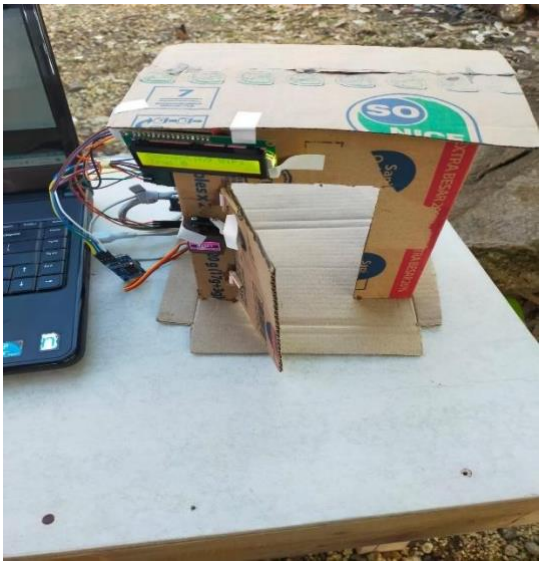


Figure 3.2 presents the results of the system design and testing for the IoT-based automatic chicken coop door system with scheduled and remote control. Comprehensive system testing was conducted to evaluate the extent to which the developed system could successfully perform the automatic opening and closing functions of the chicken coop door using Internet of Things (IoT) technology through scheduled and remote control. The testing involved all major system components, including the ESP8266 microcontroller, RTC module, servo motor I2C LCD, Wi-Fi connection, and Blynk application, which served as the platform for remote monitoring and control. The purpose of the testing was to verify that all components operated in an integrated manner according to the proposed system design. The testing was performed in several stages, starting with individual component testing and subsequently proceeding to comprehensive system integration testing. The primary limitation identified during the testing process was the system's dependence on a stable internet connection. In the event of network connectivity issues, the remote control function may be disrupted; however, the automatic functions based on the RTC continued to operate properly. Overall, the developed system was considered successful and feasible for implementation as an IoT-based.

3.2. Hardware Assembly Test Results

Based on the test results presented in Table 3.3, the IoT-based automatic chicken coop door system operated successfully and performed as designed. The RTC (Real-Time Clock) module was used to control the scheduled opening and closing of the chicken coop door, automatically opening the door at 07:30 and closing it at 17:00 each day. The servo motor functioned as the actuator responsible for opening and closing the coop door automatically, ensuring that the door operated according to the predefined schedule. The system was tested continuously for one week, and the results demonstrated that the IoT-based automatic chicken coop door system with scheduled time control and remote control operated reliably and efficiently throughout the testing period. Furthermore, the integration ensured that all hardware components were properly connected and functioned cohesively as a unified system in accordance with the intended design and operational requirements.

Tool Name	Function	Success / Failure
ESP8266	Acts as the main microcontroller to control and coordinate all sensors and system components.	**Successful**
RTC (Real Time Clock)	Controls the timing on the ESP8266, enabling the servo motor to automatically open and close the chicken coop door according to the predetermined schedule.	**Successful**
LCD	Displays all system information clearly, accurately, and responsively according to the system's operating conditions.	**Successful**
Servo Motor	Functions as the actuator to automatically open and close the chicken coop door.	**Successful**
Breadboard	Serves as the platform for assembling and connecting the electronic circuit components.	**Successful**
Blynk	Enables remote monitoring and control of the system using a smartphone.	**Successful**

5. CONCLUSION

Based on the system design, integration, and testing results, it can be concluded that the development of an Internet of Things (IoT)-based automatic chicken coop door with scheduled time control and remote access was successfully implemented. All major components, including the ESP8266 microcontroller, RTC module, servo motor, I2C LCD, and the Blynk application, were successfully interconnected and operated as an integrated system according to their respective functions.The developed system was capable of automatically opening and closing the chicken coop door based on the predefined schedule configured through the RTC module. In addition, the system could also be operated manually from a remote location using a smartphone via the Blynk application over an internet connection. These results demonstrate that the proposed system provides a reliable and efficient solution for automating chicken coop door operations while enabling flexible remote monitoring and control. The test results demonstrated that the integration of all system components was successful. The ESP8266 microcontroller effectively processed time data, controlled the servo motor.[4] movements, displayed system information on the LCD, and received and executed commands from the

Blynk application in real time. These results indicate that the proposed system has a high level of reliability in supporting the modernization of poultry farming through the implementation Of Internet of Things (IoT) technology.

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