

CONSTRUCTION OF AN AUTOMATIC MICROCONTROLLER BASED CHICKEN FEEDING EQUIPMENT ARDUINO

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ABSTRACT

Current technological developments are a hope for society to make activities in daily life easier. One of them is supporting entrepreneurial activities, so that businesses can be run efficiently and effectively. Chicken farming business in Indonesia has become a rapidly growing industry. The advantage of raising chickens is that the demand for chickens is still very large, and there are still many people who like to consume chicken meat, The livestock sector is also quite tempting, but apart from several advantages, chicken farming can cause losses. Especially in chicken feeders which are still mostly used manually so a lot of feed is wasted. Because chicken growth really depends on the regulated feed provided. Therefore, tools and systems are needed that can provide automatic feed in real time using an RTC sensor to set the time, as well as a 12C 16x2 LCD as time information. It is hoped that the design of this tool can be used by chicken farmers to reduce manual feeding and can be beneficial for farmers in a broad sense.

Keywords: Microcontroler, Equipment, Arduino, Automatic Feeding

INTRODUCTION

In today's era, the rapid advancement of technology is undeniable. These technological advancements offer hope to society by simplifying daily activities. One such benefit is the support for entrepreneurial activities, enabling businesses to operate more efficiently and effectively. Technological advancements continue to grow, both in industry and in the agricultural and livestock sectors. It is hoped that these advancements will improve living standards and make life easier for people. It's not just industry and agriculture; the use of technology in Indonesia extends to the livestock sector as well.

For poultry farmers with large flocks of chickens, ensuring they are fed around the clock can be a daunting task. Generally, poultry farmers still rely on conventional methods to feed their chickens. They use their hands to scatter feed into feeders and walk the length of the coop, which can be quite extensive. Such activities are time-consuming and labor-intensive for chicken farmers. Feeding is typically done at 8:00 AM and 4:00 PM. If the farmer fails to feed the chickens on time, it will affect the chickens' weight gain.

Based on the background above, the research questions for this study are: (1) How can an automatic chicken feeding system based on an Arduino microcontroller be designed? (2) How does the Arduino microcontroller work to ensure chickens are fed on time? The objectives of this final project are: (1) To understand the operating system of an Arduino microcontroller-based automatic chicken feeder to facilitate the work of chicken farmers; (2) To understand the operating principles of an Arduino microcontroller-based automatic chicken feeder.

METHODS

To complete the Final Project (FP), the author created a design flowchart as a process for the creation and completion of the device, specifically an automatic chicken feeder using an Arduino Uno R3 to control the timing via an RTC DS3231. The following is the flowchart for the creation of the automatic chicken feeder.

A. Problem Identification

In preparing this final project, it is necessary to conduct an identification process—that is, the process of searching for, finding, collecting, researching, and recording data regarding the requirements and identifying issues related to the topic to be discussed. The identification referred to here involves determining the data used from the source of the automatic chicken feeder and how to assemble the automatic chicken feeder so that it can be used by farmers.

B. Data Collection

Data collection is the process of gathering the materials needed to design an Arduino microcontroller-based automatic chicken feeder system. The methods required for this data collection include:

a) Observation

Observation is a method aimed at collecting data by observing chicken farming practices and examining examples of systems similar to the one the author is developing. The objective of this observation is to understand the chicken feeding system.

b) Literature Review

A literature review is a data collection method that involves gathering necessary data from relevant literature, such as books on the design of Arduino microcontroller-based automatic chicken feeders, as well as from journals, magazines, and online sources.

c) Interviews

This method involves conducting direct question-and-answer interviews with relevant informants. In this study, interviews were conducted with poultry farmers who manage and determine the feeding regimen.

C. Device Design

Device design is the process of designing or the stages of manufacturing the automatic chicken feeder circuit and the system of the Arduino microcontroller-based automatic chicken feeder.

D. Conclusion

This section presents the final results of the Final Project, namely the conclusions drawn from the design of the Arduino microcontroller-based automatic chicken feeder that has been carried out.

System Block Diagram

Before proceeding with the system design, a system block diagram is first created. The system block diagram provides a general overview of how the entire automatic chicken feeder system operates. Based on the system block diagram shown above, there are three main

sections of the system block diagram designed for the automatic chicken feeder system, each with its own specific function. The functions of the system block diagram above are as follows.

1. Input Block (RTC DS3231)

The input block is the input section; this section functions to set the chicken feeding schedule, and the data is sent to the Arduino Uno. The RTC DS3231 activates the circuit at specific times.

2. Process Block (ARDUINO UNO R3 ATMEGA 328P)

The process block is the processing component of this system; it serves as the central unit responsible for processing the time data input by the RTC DS3231. It also controls the servo motor to open and close the chicken feeder lid, while the LCD displays the time information.

3. Output Block (SG90 SERVO MOTOR AND 16X2 LCD)

The output block is the output component of this system, functioning to open and close the lid of the container located beneath the chicken feed tray. Meanwhile, the LCD is also an output component that displays the chicken feeding time as desired.

System Design

In the design of the automatic chicken feeder, there are two interconnected system design components: hardware system design and software system design. The hardware involves the connections between each component and the Arduino. The software used includes the Arduino Flowchat software and the program.

Hardware System Design (Hardware)

In the hardware planning for this device, there are several components of the hardware design system based on the connections between each required component and the system's central unit, the Arduino.

1. RTC Design with Arduino Uno R3

The RTC DS3231 is an electronic clock module that functions to precisely set the time from seconds to years and to maintain or store that time data in real time. The RTC DS3231 is quite small, making it easy to arrange in the layout; in this device, the RTC DS3231 is used as an input. The RTC DS3231 functions to activate the circuit at that specific time.

2. Design of the Arduino Uno R3 with a 12V 16x2 LCD

The LCD on this device is used as an output to display the time received from the DS3231 RTC, so the LCD will display the time as text. Design of an MG90S Servo with Arduino Uno R3 A servo motor is an electrical device used in smart industrial machines that functions to push or rotate objects with high-precision control in terms of angular position, acceleration, and speed—a capability not possessed by ordinary motors. The Arduino Uno will move the servo motor from 0° to 180° and back. To control the servo motor using an Arduino, we only need to connect three pins: two pins for power and ground, and the other pin for the pulse signal to the servo motor.

Software System Design

The Arduino Uno does not require a chip programmer because it already contains a bootloader that handles program updates from the computer. Since it has USB communication capabilities, the Arduino Uno also features ready-to-use modules (shields) that can be plugged into the Arduino board.

RESULTS AND DISCUSSION

Design of a Chicken Feeding System

The first step in designing an Arduino-based automatic chicken feeding system is to determine and construct the equipment as required.

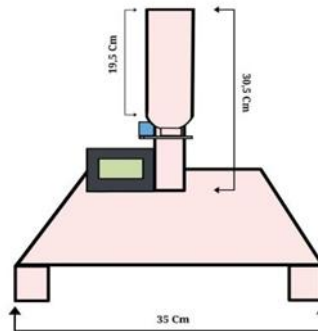
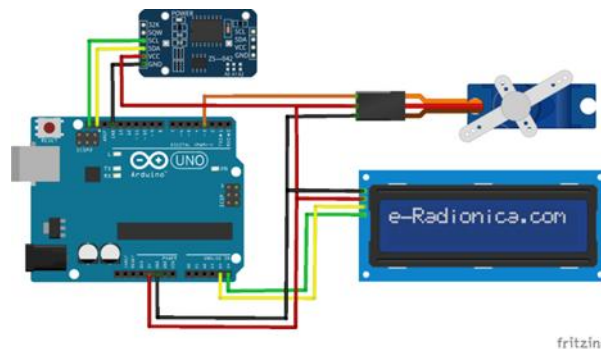


Image: Front view of the chicken feeder design

Assembly of the Device

Assembly is the process of arranging and joining components to form a device or machine with a specific function. The diagram shows the layout or arrangement of components on the installed microcontroller. Below is the overall hardware diagram.



Assembly of the Chicken Feeder

Assembly is the process of arranging and joining components to form a device or machine with a specific function. The operation of this assembly process begins with components ready for installation and is considered complete once they are fully integrated. This is the assembly of an automatic chicken feeder system based on an Arduino microcontroller. Additionally, assembly can be defined as the joining of one part to another or to its counterpart.

System Operation

This device automatically dispenses chicken feed according to a set schedule. In addition to dispensing feed automatically, it can also measure chicken temperature; the RTC DS3231 sensor displays the time, date, and temperature on the LCD.

Device Testing

Device testing aims to determine whether the completed system functions as planned. Testing is necessary to understand the workflow of the chicken feeding scheduling system. This testing aims to verify whether the device operates as intended. The following tests were conducted:

1) RTC DS3231 Testing

The DS3231 RTC is a digital clock electronics module that functions to regulate the chicken feeding schedule. The DS3231 RTC was chosen because it is equipped with a battery capable of permanently storing feeding time data according to the set schedule, and it can also measure temperature. During testing, the DS3231 RTC was connected to a 5-volt power supply via the Arduino pins. Below is an image of the test program code for the RTC time and temperature.

The results of the RTC test show the time, date, year, and temperature; it can be concluded that the RTC DS3231 functions properly.

2) LCD Testing

The purpose of testing the LCD is to ensure that it displays results correctly and accurately according to the planned input. A 5-volt input voltage is required to test this LCD, and the pin used is LCD 12C. In the image below, the LCD screen displays the programmed results.

3) Servo Motor Testing

Testing of the servo motor is conducted to verify that the servo motor functions as the valve opener for the chicken feed dispenser. The test is conducted by setting the servo's opening angle to 360°, closing it to 110°, and opening it to 135°. The servo then closes and opens according to the chicken feeding schedule. The servo motor functions properly and operates as intended; during the test, the servo successfully opened and closed the chicken feed valve.

4) Mechanical opening and closing test

This test focused on the opening and closing of the feed valve to determine the width of the opening when open and whether the amount of feed dispensed from the container met the requirements. This test also aimed to determine the time required for feeding, as well as the angles and widths of the valve opening and closing. Testing of the automatic chicken feeder After completing the testing stages on the hardware components, the next step was to test the entire circuit of the automatic feeder that had been built. The testing was conducted at my home, located in the village of Suka Baru. The device was connected to a power source. In the testing of the chicken feeding device, the feeding schedule was set for three feeding times, from 7:00 AM to 5:00 PM WIB. The results of the device testing in this study can be seen in the table below.

The automatic chicken feeder uses several small electronic components, so it doesn't take up much space. The feeder container is made from a bottle and held together with hot glue. The valve is made from scrap metal shaped into a square with two holes on the sides. There is also a black box attached to the side of the pole.

CONCLUSIONS

Based on the testing and measurement of the automatic chicken feeder using an RTC to control the feeding schedule of the Arduino-based chicken feeder, the following conclusions can be drawn:

1. Based on the test results of the automatic chicken feeder using Arduino, it can be concluded that this device is capable of automatically feeding chickens according to a preset schedule, and each component functions properly according to its respective role.
2. The DS3231 RTC functions effectively in providing timing information for the chicken feeder's schedule.
3. The servo motor activates according to the RTC schedule.

The following are the results of the development of the automatic chicken feeder using an Arduino Uno-based RTC:

1. The chicken feeder must be set to dispense feed 2 or 3 times; it should not be set for more than that, as excess feed may be wasted or contaminated by chicken droppings.
2. Based on test results of the automatic chicken feeder, the feed reserve in the main container must not run out, as this could cause delays in feeding.
3. The automatic chicken feeder can be equipped with a button in case the servo motor malfunctions, ensuring that feeding is not delayed.

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