ICEDES
International Conferences Engineering Design and Environmental **ISSN 3031-7320**
Volume 1, No. 1, December 2023

IoT (Internet of Things) Based Bird Feed Design With the Rational Method

Eko Budiraharjo [1] , Wismoyo Aris Munandar [2] , Hasbi Firmansyah [3] , Ria Indah Fitria [4]

[1,3,4] Informatics Study Program, Faculty of Engineering and Computer Science, Pancasakti University, Tegal
[2] Industrial Engineering Study Program, Faculty of Engineering and Computer Science, Pancasakti University of Tegal

*Email: ekobudiraharjo@upstegal.ac.id [1] , wismoyoam@gmail.com [2] ,
hasbifirmansyah@upsegal.ac.id [3] , ria indah@upsegal.ac.id [4]

Abstract . IoT (Internet of Things) Based Bird Feed Design With Rational Methods , Appropriate and quality feed is very important to maintain the health and welfare of pet birds. In an effort to provide innovative and smart solutions in giving feed to birds , we design system feed based on Internet of Things (IoT) with method rational . This study aims to integrate IoT technology in automatically and efficiently feeding birds, based on data obtained from sensors attached to the feed . bird.

The result is an IoT-based feeding system that can monitor birds' feeding habits in real-time and regulate feeding automatically . The system also comes with an easy-to-use user interface, allowing owner bird For monitor health and pattern Eat bird from distance Far through mobile application .

Study This confirm importance approach rational in designing IoT system for gift feed bird . By optimizing pattern meal and availability feed based on analytical data , system This can give significant benefits _ for health and welfare bird pet .

Keywords: Bird Feed, Internet of Things (IoT), Rational Methods, Sensors, Actuators, Machine Learning, Bird Health, Bird Welfare.

1. Introduction

In an increasingly modern era advanced with Internet of Things (IoT), applications technology This has penetrate various sector life humans are included _ _ is maintenance animal pets , like bird . Proper and quality feed is very important For guard health and welfare bird pet . In order presenting solution innovative and rational design _ feed bird IoT- based is an attractive alternative.

With the inventions in the field of science and technology currently developing very rapidly in an effort to make sophisticated tools, namely tools that work automatically and facilitate human work more efficiently and effectively. One of them is the internet of things, a concept that aims to expand the benefits of internet activities and various remote controls. IoT has developed rapidly offering a variety of wireless technologies, micro electromechanical systems (MEMS) and the internet for example smarthomes, animal rearing, optimization etc. (Triastuti et al. 2019).

The goal of this design is to provide smarter, more efficient and scalable solutions in gift feed to bird pet . By making use of IoT technology , system This will monitor and control gift feed in a manner automatically , based on the data obtained of the integrated sensors . With approach rational , design feed bird This will confirmed in accordance with need nutrition and patterns Eat the bird in question .

A number of steps to be taken in design This covers identification type bird that will given eat , use various sensors for monitoring , and implementation actuator For control gift feed . The data from the sensor will analyzed in a manner rational For optimizing gift feed and understand habit Eat bird as well as environmental conditions where birds live. The importance of a rational approach in this design is to ensure that the birds are properly fed and meet their nutritional needs. By using machine learning techniques, this design will be able to identify bird behavior patterns and food preferences , thus system can customized in a manner smart .

Apart from giving benefit for owner bird , design feed IoT -based is also expected can help understand more Good about habit Eat bird and give contribution positive in conservation and preservation of bird species. However, in presenting this design, aspects of data security and bird welfare are important to note. The adoption of IoT technology must be carried out responsibly and ethically, so that the health and comfort of birds is maintained.

In conclusion , design feed bird IoT- based with method rational is step innovative going to gift intelligent , efficient , and appropriate feed need . By making use of IoT technology and rational data analysis , expected design This can give benefit for health and welfare bird pets , as well give contribution positive in preservation of the bird species as a whole. Based on the problem, we do the right solution and research to provide food reliable and cheap bird . Therefore, the author has the idea to design a favorite tool based on *IoT (Internet Of Things)* using a rational method . cutlery _ birds

 ISSN 3031-7320

with technological innovation with a systematic approach to design. This tool is very useful because it can check the availability of raw materials through *smartphone control* when the owner is away from home (Wiajaya et al. 2019).

2. Research methodology

The research methodology for IoT-Based Bird Feed Design with Rational Methods will cover systematic and rational steps in designing and implementing IoT-based solutions for bird feeding. The following are several stages in the research methodology:

Literature Study: The first stage is to conduct a literature study on the nutritional needs and dietary patterns of the birds to be studied. Gather information on specific bird species, suitable diets, amount of feed required, and different food preferences.

Identification of Bird Needs: Determine the type of bird that will be the focus of the research. Understand the characteristics and nutritional requirements specific to the bird, such as the type of feed, when to feed, and the quantity of feed needed.

Design Data Collection Plan: Determine the type of sensors to be used to monitor the bird and its environment. Also plan how the data will be collected, the frequency of data collection, and how the data will be stored.

IoT System Implementation: Next, implement an IoT system consisting of suitable sensors and actuators to monitor and control the automatic feeding of birds. Make sure that this system is well integrated and can function according to research needs.

Data Collection: Start collecting data from sensors attached to the bird and its environment. The data collected should include information about the birds' feeding habits, feeding time, amount of feed consumed, and environmental conditions such as temperature and humidity.

Data Analysis: Perform rational data analysis using statistical methods and machine learning techniques to identify bird behavior patterns, food preferences, and look for correlations between certain factors and birds' eating habits.

Validation and Correction: After conducting data analysis, validate research results against existing scientific knowledge about the nutritional requirements of birds and their diets. If necessary, make corrections to the IoT system design and data analysis to increase the accuracy and reliability of the results.

System Performance Evaluation: Evaluate overall system performance to ensure that IoT-based feeding meets the nutritional and health needs of birds efficiently and effectively.

Conclusion and Publication: Finally, draw conclusions from this research and publish the research results in the form of a scientific report or article. Share your findings and experiences in developing IoT-based feed designs with the scientific community and avian enthusiasts.

With a rational approach and scientific method, it is hoped that this IoT-based bird feed design can provide real benefits in better caring for pet birds.

3. Design Planning

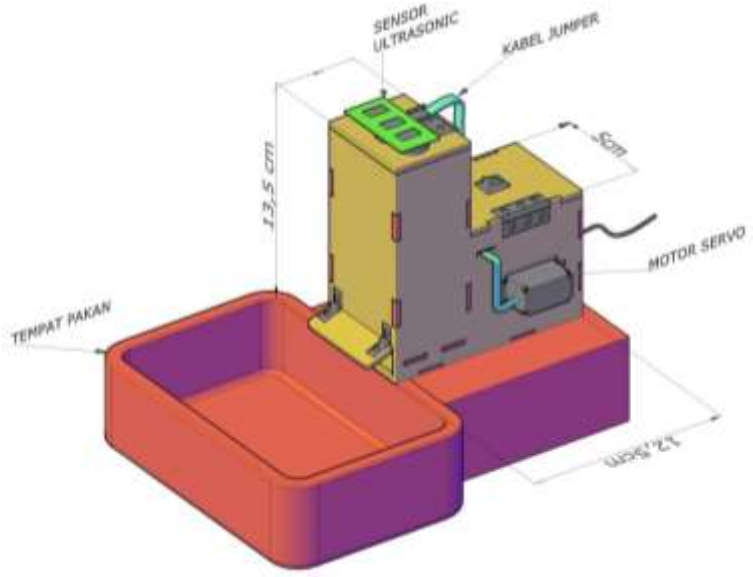


Figure 1. *Pet Feeder Design*

Bird Feed Design Planning with the Internet of Things (IoT) involves systematic steps in designing and implementing an IoT-based automated feed system. Here are the planning steps that can be followed:

1. **Initial Research and Needs Identification:**

   Start by doing some initial research on the nutritional needs and diet of the bird you are studying. Identify the bird species to focus on for planning and understand their characteristics and specific nutritional requirements.

2. **Define IoT System Features and Functions:**

   Define the features and functions that an IoT-based feed system will have. This includes automatic feeding monitoring and control capabilities, as well as other relevant features such as environmental monitoring and notification of problems with feed or bird health.

3. **Selection of Sensors and Actuators:**

   Determine the type of sensor to use to monitor the bird and its environment. For example, you can use a feed weight sensor, a motion sensor, a temperature sensor, and a humidity sensor. Also select a suitable actuator to control feeding, such as an automatic feed dispenser.

4. **Connectivity Plan:**

   Make sure the IoT system can connect to the internet or local network to send and receive data. You can use Wi-Fi, Bluetooth, or other network technologies to connect IoT devices to the monitoring and control platform.

5. **Application Design and User Interface:**

   If needed, design an easy-to-use application or user interface to monitor and control the IoT feed system. This application can be accessed via a mobile device or computer, making it easier for bird owners to manage feed schedules and monitor bird health in real-time.

6. **Data Security and Privacy:**

   Ensure that this IoT-based feeding system has a sufficient level of security to protect user data and bird privacy. Use appropriate security protocols and encrypt data where necessary.

7. **Implementation and Test Plan:**

   Plan the physical implementation phase of the IoT feed system, including the installation of sensors and actuators in the aviary. Perform thorough testing to ensure that the system is functioning properly and meets requirements.

8. **Evaluation and Improvement:**

   After the system is implemented, periodically evaluate the performance of the system. Review the data that has been collected and identify potential improvements or improvements that can be made to improve feeding efficiency and effectiveness.

9. **User Training:**

   Provide training to bird owners or system users on how to properly use the app or user interface and maximize the benefits of an IoT feed system.

10. **Monitoring and Treatment:**

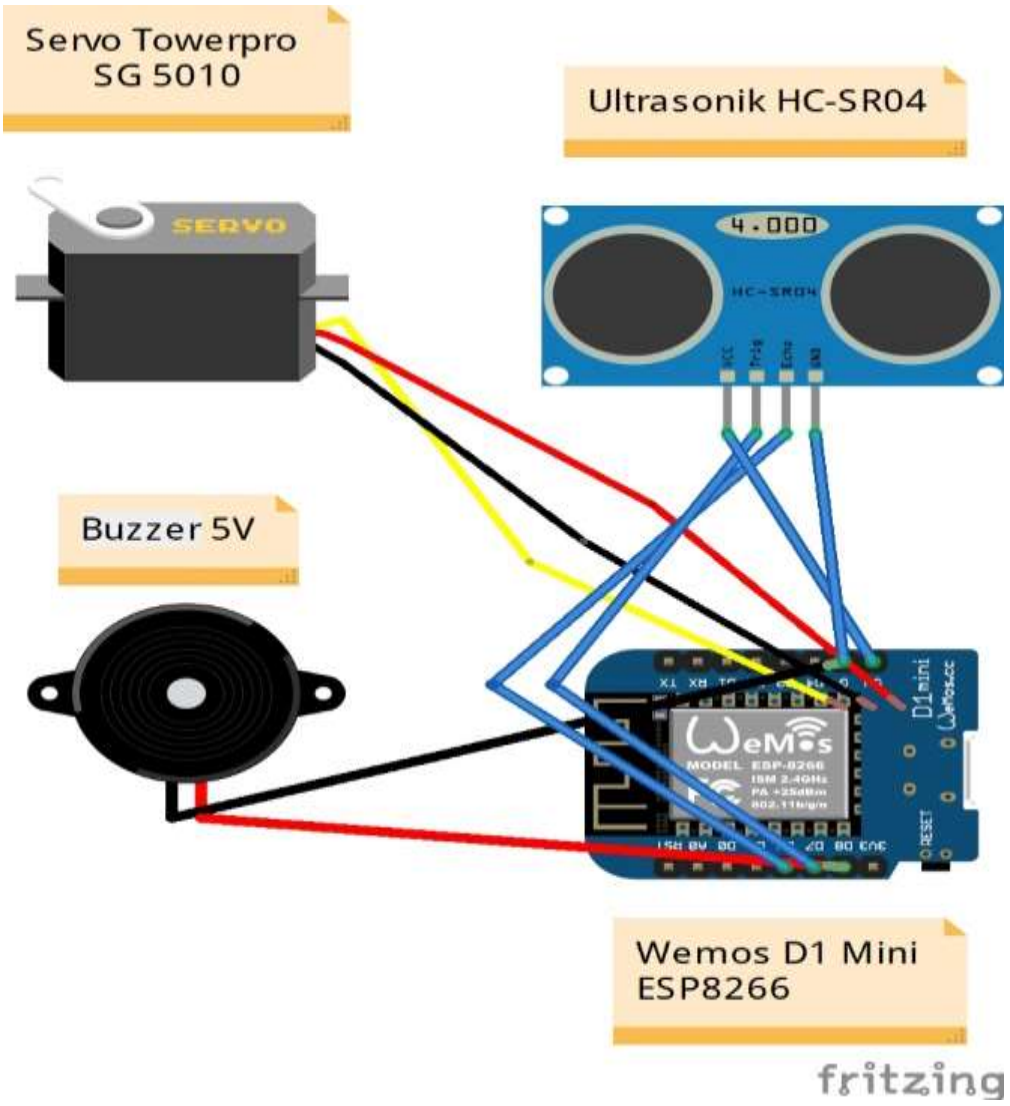
    Keep monitoring and carrying out routine maintenance of the IoT-based feed system to ensure optimal performance and prevent technical problems that may arise.

A Internet of Things System Network

The Internet of Things (IoT) System Network is an infrastructure that allows devices or objects to connect and communicate with each other via the internet. The IoT network provides a framework for collecting data from various connected devices and sending commands or information back to those devices.

The following is a schematic structure proposed by the author. The system works when the circuit is connected to a 5V Adapter power source via a micro USB cable to the ESP8266 microcontroller. However, for more stable operation, it is recommended that the sensor and servo circuits be connected to a power source from an external circuit or a battery.

 ISSN 3031-7320



***Picture* 2 .** *IoT Cat Feeder Diagram Schematic*

Table 1. Components and Functions

Component	Information
Wemos D1 Mini ESP8266	Platform for communication and control of user applications, actuators and sensors over a WLAN network.
HC-SR04 Ultrasonic Sensor	Measure the distance of the object in front of it. In this case measure the height of the food in the food storage box.
servo machine	As an actuator, it functions to push cereal food from the storage box so that it falls into the food bowl.
Bell	Gives a sound signal when the device is successfully connected to the internet and also successfully pushes food out of the storage box.

B. ESP8266 Microcontroller Program

The microcontroller runs programs written and uploaded via the IDE. The next step is to write the Wemos D1 Mini ESP8266 microcontroller program code via Arduino IDE 1.8.9 using the C++ programming language which aims to establish communication between users and cat feeders. The following is a list of programs uploaded to the ESP8266 microcontroller:

 ISSN 3031-7320

```
    delay(20);                          // waits 20ms for the servo to reach the position
    Serial.println("\nServo goes to 8 degress");
  }
}

// Menghitung sisa makanan dalam %
void calcRemainingFood() {
  digitalWrite(trigger, LOW);
  delayMicroseconds(2);
  digitalWrite(trigger, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigger, LOW);
  t = (pulseIn(echo, HIGH) / 2);
  if (t == 0.00) {
    Serial.println("Gagal membaca data dari HC-SR04");
    delay(1000);
    return;
  }
  distance = float(t * 0.0343);
  Serial.println(distance);
  Serial.println(t);
  percentageFood = (100 - ((100 / max_food) * distance));
  if (percentageFood < 0.00) {
    percentageFood = 0.00;
  }
  Serial.print("Ketersediaan makanan:\t");
  Serial.print(percentageFood);
  Serial.println(" %");
```

***Picture* 3 .** *Bird Feeding Sketch Program*

4. Result of Bird Feeding Design

***Picture* 4 .** *Prototype Results and Filling of Bird Feed*

 ISSN 3031-7320

5. Discussion

5.1. Connect gadgets and wifi

The device can work when it is connected to a WiFi network and has an internet connection so that the exchange of messages between the user and the system can take place. *Access point* information in the form of SSID and password is embedded in the microcontroller program *sketch* .

5.2. Check system connection

To ensure that the system is connected to the local network, the user needs to type in an ' IP ' message and then send it to any application blynk will send a return message containing the IP address locally.

***Picture* 5 .** *The Blynk Off app*

***Picture* 6 .** *The Blynk On app*

A Feeding process

After the availability of food in the feed storage box known birds , can be done by typing 'on' then pressing through the blynk send application so that the command is executed and then generates a servo motor response pushing a number of food from the food box.

B. Tool Testing Success

In this test the main discussion is testing the motion of the servo motor drive to ensure the transfer of food to the container.

Table 2. Testing Tool

Date	time	Testing		
		Succeed	**Fail**	**Information**
14 -07-202 3	08:00	Yes		Succeed
	16:00	Yes		Succeed

6. Conclusion

Based on the results of the design, implementation and testing of the system carried out, the following conclusions can be drawn:

1. Using the *blynk application* and microcontroller can be implemented according to the scheme.
2. *an internet of things* based cat feeder keeps costs down and is widely available in the market.
3. *The Sketch* program works well and effectively on command.

Reference ___ _

[1] Anwar, MK, Setyaningrum, R., & Jazuli. (2017). *Design of Yangko Cookie Cutters with Rational Methods . 01* (01), 1–14.
[2] Cross *s, N. (1994). Strategy Engineering Design Methods for Product Design. John Wiley and Sons Ltd.*
[3] Kurnianingtyas, CD, & Heryawan, T. (2018) . *Design of Leather Cutting Tools for Bag Raw Materials with Rational Methods. Scientific Journal of Industrial Engineering, 17(2), 99. https://doi.org/10.23917/jiti.v17i2.5755*
[4] Rahmalisa, U., Mardeni, M., Helmi, R., & Linarta, A. (2020) . *Automatic Cat Feeder Using Android-Based Raspberry Pi. Journal of Technology and Open Source, 3(2), 298–308. https://doi.org/10.36378/jtos.v3i2.782*
[5] Triastuti, KY, Putra, SA, Electrical, S., Malang, UW, Informatics, PS, Malang, UW, Electrical, PS, & Malang, UW (2019). *Monitoring of Health Conditions in Animals. Seminar on National Research Results, Ciastech, 293–300.*
[6] Wardana, MR, Fathimahhayati, LD, & Pawitra, TA (2020) . *Design of Soybean Porridge Filter Device and Ergonomic Soybean Porridge Press Equipment in Tofu Industry. Matrix, 21(1), 29. https://doi.org/10.30587/matrik.v21i1.1323*
[7] Wiajaya, KAK, Somawirata, IK, & Limpraptono, Y. (2019). *Design and Development of Internet of Things (IoT) Based Cat Feeding and Monitoring Tool. Results of ITN Malang S1 Electrical Seminar.*
[8] Wikipedia. (td). *Cat food. Wikipedia. Retrieved March 25, 2021, from https://en.wikipedia.org/wiki/Makanan_kucing*