

PAPER

Connected Automatic Tray (CAT)-Development of Animal Shelter With IoT-Based System

Muhammad Hafiz bin Noor
Tarmizi, Muhammad
Hariez Athmar bin Hafez,
Shafarizan binti Abd
Samad*

Program Sijil Teknologi
Maklumat, Kolej Komuniti
Arau, Perlis, Malaysia

Correspondence Author Email:
shafarizan@kkarau.edu.my

ABSTRACT

Due to the increase in the number of stray cats in public areas, especially in college areas, this has caused a nuisance situation due to these cute animals to the clean environment. This situation often causes the management to face problems in terms of providing the nutritional needs and welfare of the cats that are inadvertently neglected. Therefore, a pet shelter called Connected Automatic Tray (CAT) has been developed with an Internet of Things (IoT)-based system to ensure that the condition of feeding cats into food containers, drinking containers and the lighting of the shelter is always at an optimal level. This system solves the problem of automatic feeding by estimating the quantity of food needed in a certain period, thus reducing the need for continuous monitoring by the management. In addition, sheltering stray cats provides cats with a choice of shelter. This system also allows the college management to monitor the environment that is always the focus to be clean and not polluted by the actions of stray cats. In conclusion, the development of this animal care technology benefits abandoned animals and the management by ensuring optimal conditions and reducing the challenges of caring for cats living on the streets.

KEYWORDS

Internet of Things (IoT); Animal Shelter; Connected Automatic Tray (CAT)

How to Cite: [1] M. H. b. N. Tarmizi, M. H. A. b. Hafez, and S. b. A. Samad "Connected Automatic Tray (CAT)-Development of Animal Shelter With IoT-Based System." *Innovation and Creativity Product Exhibition*. vol. 1, no. 1, pp. 16-19, 2026.

Article Submitted 2026-06-01. Revision Uploaded 2026-06-12. Final Acceptance 2026-06-30

© by the authors of this article. Published under CC-BY.

1. INTRODUCTION

Stray cats are animals that are often found in public areas, including around colleges and educational institutions. The increasing presence of stray cats can cause various issues such as area pollution, scattered food waste, unpleasant odors and disruption to the cleanliness and comfort of college residents. This situation not only tarnishes the image of the college environment, but can also create negative perceptions of the level of cleanliness management in the area. However, stray cats are also living creatures that need attention, protection and appropriate welfare.

To overcome and reduce these problems, an innovation based on the Internet of Things (IoT) was introduced with the concept of humanity concern for stray cats. This innovation was developed through a smart shelter system known as the Connected Automatic Tray (CAT). This system is designed to provide basic facilities to stray cats such as automatic food and drink provision as well as the provision of a safer and more organized shelter. Through this approach, the cleanliness of the college environment can be maintained while ensuring that the welfare of stray cats continues to be given attention.

In addition, this system also integrates smart home technology and IoT to enable more systematic monitoring. The automatic feeding function helps ensure that food supply is provided in a controlled and consistent manner, while the lighting and environmental monitoring system can increase the comfort and safety of the shelter area. With this innovation, the college management can reduce the nuisance and unsightliness of the environment caused by stray cats, thus creating a cleaner, more organized and animal-friendly college atmosphere. So this study aims to build a cat shelter with an IoT monitoring system and develop an automatic feeding system.

2. METHOD

2.1 Hardware Components

The hardware part plays an important role in ensuring that the CAT system can function automatically and stably. Among the main components used are:

Table 1. CAT Innovation Project Hardware Components and Description

Components	Function
ESP32/Arduino	Acts as the main microcontroller of the system

Components	Function
Servo Motor	Controlling the opening and closing of food containers
Ultrasonic Sensor	Track remaining food levels
ESP8266 Wi-Fi Module	Enabling IoT connectivity
Solar Panel	Providing electricity in an environmentally friendly manner
LED Lighting	Shelter lighting
Food/Beverage Containers	Refilling food and water supplies

2.2 Application Software

Software development was carried out using Arduino IDE to produce programs to automatically control the system's operations. The programming code was developed using C++ and involved controlling feeding times, food quantities, automatic lighting and data transmission to the IoT platform. IoT integration allows the system to function more intelligently, flexibly and easily without the need for full manual monitoring such as the basic circuit in Figure 1.

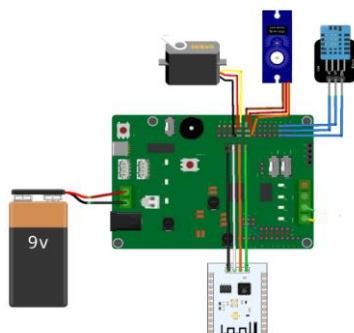


Figure 1. Simple basic circuit for CAT projects

To ensure that the system data management is done systematically, a database design is proposed through a Data Flow Diagram (DFD). This system involves several main processes as shown in Figure 2.

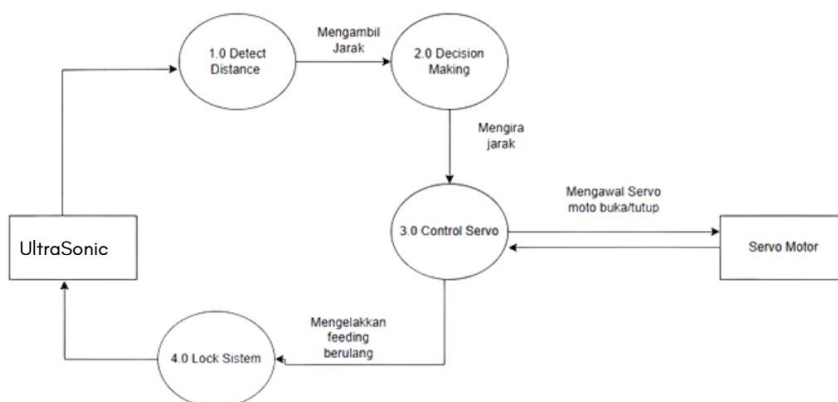


Figure 2. Simple Data Flow Diagram (DFD) for CAT projects

2.3 Methodology



Figure 3. ADDIE MODEL as project Development methodology

Project methodology is a systematic approach used to ensure that the development of a CAT project can be carried out in an orderly manner and achieve the set objectives. This project uses the ADDIE Model (analysis, design, development, implementation and evaluation) because this method allows system development to be carried out in stages through the process of analysis, design, development, testing and iterative improvement until the system reaches an optimal level of functionality.

The choice of this methodology is particularly appropriate because the project involves the integration of hardware and software based on the Internet of Things (IoT) which requires repeated testing of electronic components, automation systems and real-time monitoring functions. In addition, the prototyping approach helps identify system weaknesses early and allows improvements to be made before the final system is fully developed.

This methodology also helps ensure that the system developed truly meets the needs of users, especially in the aspects of automatic feeding, monitoring of food supply, and providing more comfortable protection for street cats.

3. RESULT AND DISCUSSION

3.1 CAT Project Prototype

The prototype as shown in Figure 4 features a system controller on a food container where the Arduino UNO microcontroller functions as the main hub that controls all the connected hardware components. With the Arduino UNO system control, the ultrasonic sensor can operate smoothly and is compatible with the power supply used. This integration ensures that the system performance runs efficiently and smoothly, thus allowing each function to be implemented comprehensively and in an organized manner.



Figure 4. CAT prototype

Figure 5. shows the entire prototype section featuring a user-controlled feeder system using an FS90R servo motor for food release.



Figure 5. The entire CAT prototype

3.2 Findings and Suggestions for Improvement

The test results showed that the CAT system successfully functioned according to the set objectives. The automatic feeding system was able to dispense food according to the set schedule well and consistently. The servoultrasonic sensor was able to detect the presence of the cat and dispense food in the container accurately and according to the set time.

In addition, the shelter system is equipped with solar lights as a source of lighting for CAT at night. From the animal welfare aspect, this project has successfully provided a more comfortable and organized shelter for street cats. The use of an automatic system also helps reduce food waste and improve the cleanliness of the college area.

In addition, the use of solar energy makes this project more environmentally friendly and suitable for use as a smart community innovation based on green technology. This project also has the potential to be expanded to residential areas, educational institutions and animal welfare centers in the future.

Among the improvements that can be made in the future are the integration of Artificial Intelligence (AI) for cat recognition, the use of more accurate food weight sensors, full mobile application integration, the use of a cloud database system, as well as the installation of GPS and anti-theft security systems. These improvements can improve the efficiency, security and usability of the CAT system more comprehensively.

4. KESIMPULAN

In conclusion, the development of a pet shelter with an IoT-based monitoring system successfully provides a comprehensive solution to the problems of caring for cats among busy owners. This system combines the functions of automatic feeding, feces separation, temperature monitoring and real-time monitoring via the internet. The combination of hardware such as Durian Uno, ESP8266-01, DHT11 sensor and servo motor with Arduino IDE and Blynk applications proves a holistic approach to pet care. This system not only improves the welfare of cats, but also makes things easier for owners through the use of modern automation technology.

REFERENCES

- [1] Amen, L., Bos, E., Climie, N., Deutch, K., Lamothe, N., & Mitchinson, C. (2023). Designing and Testing a Smart Cat Feeder Prototype
- [2] Aziz, A. A., Azaharan, N. A. E. M., & Alias, P. N. H. N. (2024). Conceptual Design of Smart Cat Feeder. *APS*, 86.
- [3] Husin, N. A. H. B. M., & Nordin, S. A. Automated Stray Cat Feeding Solution. *EESEE 2025*, 427.
- [4] Parthasarathi, T., Rajarajan, P., Vignesh, E., & Nithya, M. (2025, October). Smart Timed Pet Feeder Based on Arduino and IoT for Autonomous Pet Care and Feeding Automation. In *2025 2nd International Conference on Artificial Intelligence and Knowledge Discovery in Concurrent Engineering (ICECONF)* (pp. 1-9). IEEE.
- [5] Priya, B. V., Jitesh, R., Lekha, I. K., & Suresh, E. C. (2025, November). IOT Based Smart Pet Feeding System Using ESP 32. In *International Conference on Computer Science and Communication Engineering (ICCSCE 2025)* (pp. 1994-2004). Atlantis Press.
- [6] Ramli, F., & Mohamed, M. (2024). Development of Pet Shelter with IoT-Based Monitoring System. *Evolution in Electrical and Electronic Engineering*, 5(1), 60-68.
- [7] Yin, L. J. (2018). Design and Development of 2-in-1 automatic pet feeder. *University Sains Malaysia*.