WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Automated Food Feeder for Dogs Using Embedded Device

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Doi: https://doi.org/10.55248/gengpi.5.0424.0933

ABSTRACT:

The automated food feeder for dogs described in this project offers a convenient solution for pet owners with busy schedules. Controlled by a microcontroller, connected to various components and sensors, the system ensures timely and controlled feeding. Utilizing proximity sensors, Wi-Fi connectivity, and a real-time clock, it allows users to monitor food levels and schedule feedings remotely. The system employs a servo motor to dispense precise portions of food, while sensors prevent overfilling or depletion. Designed for reliability and user-friendliness, it includes features such as adjustable portions, multiple feeds, and easy cleaning. Alerts notify users of any irregularities in feeding, providing peace of mind and optimal care for pets.

Keywords: Automated food feeder, microcontroller, Wi-Fi connectivity, servo motor, user-friendliness, easy cleaning.

Introduction:

The emergence of the Internet of Things (IoT) has paved the way for a new era of automated solutions, and the pet industry is no exception. Recognizing the challenges faced by pet owners who struggle to maintain regular feeding schedules amidst their busy lives, we present the Smart Dog Feeder device designed to revolutionize pet care. This IoT technology provides controlled feeding for small pets such as dogs. With the ability to remotely monitor feeding processes via an Android smartphone, this introduction sets the stage for exploring the features and benefits of our automatic pet feeding solution. The Smart Dog Feeder is designed to provide regular feeding for dogs, allowing owners to monitor and control their pets' diets through an Android smartphone. It incorporates RFID authentication, load cell sensors for accurate measurements, and communication via MQTT protocol, aiming to address the challenge of irregular pet feeding for busy dog owners. (1) The project "Automatic Pet Food Dispenser by using Internet of Things (IoT)" aims to develop a feeder for small pets, utilizing IoT technology to automate feeding, monitor eating habits, and provide scheduled meals. The system includes hardware such as the ESP32 Wi-Fi microcontroller and MG995 servo motor, and software components like the Blynk application for smartphone connectivity and Arduino IDE for coding. Experiments with a real user showed positive results, indicating the system's potential to provide convenient and accurate pet feeding. (2) The document presents an IoT-based pet care system integrating a food feeder, water dispenser, and litter box, connected to a smartphone application for remote monitoring and control. It includes detailed hardware and software designs, testing results, and future improvements such as scheduled feeding and health analysis. The system aims to provide pet owners with an efficient and convenient tool for monitoring their pet's behavior and health, addressing the increasing demand for high-quality pet care products. (3) It discusses the development of an IoT-based automatic pet feeder and the challenges faced by pet owners in managing their pets' feeding schedules. It leverages IoT technology, utilizing a microcontroller and various hardware components to ensure the controlled dispensing of food to pets. The device is controlled via a mobile phone using the Blynk software, offering remote feeding capabilities. It includes focusing on IoT and long-distance detection of pets. This provides a natural and intuitive approach to pet care, meeting the diverse needs of pet owners. (4) The document discusses the development of an automatic pet feeder using IoT technology, allowing remote control through a web server. It outlines the components, advantages, and results of the system, emphasizing its ability to ensure pet well-being in the absence of the owner. The study also suggests potential enhancements, such as adding a watering trough and animal health sensor, to further improve the system's functionality. (5)

Methodology:

The methodology described in the paragraph outlines the process and approach to design and implement an automated food feeder system for dogs using an embedded device. The problem identified and recognized the need for a straightforward solution for pet owners who have hectic schedules and may struggle to feed their pets on time. Identifying the key components of the system, including the microcontroller, sensors servo motor, food dispenser, and Wi-Fi connectivity. Designing the system to allow user interaction, such as setting feeding schedules and monitoring food levels remotely via Wi-Fi connectivity. Mechanism Implementing a feeding mechanism controlled by the microcontroller, which triggers the servo motor to open the food dispenser and dispense the right amount of food into the pet's bowl. Integrating sensors to monitor the level of food in the dispenser to prevent overfilling or emptying, ensuring that the pet receives the appropriate amount of food. Reliability and User-Friendliness Ensuring that the system is reliable and easy to use, with features such as easy cleaning. Overall, the methodology involves identifying the problem, designing the system components and

functionality, integrating sensors and connectivity features, ensuring reliability and user-friendliness, and ensuring it meets the needs of pet owners and their pets.

HARDWARE REQUIREMENTS:

- ESP32 wi-fi module
- ULTRASONIC SENSOR
- SERVO MOTOR
- LCD
- POWER SUPPLY

ESP32

The ESP32 is a multifunctional microcontroller manufactured by Espressif Systems that is noted for its extensive feature set and sturdy performance. It has a dual-core processor, Bluetooth, and WiFi connectivity, and it powers cloud projects such as IoT and robots. Its broad array of peripherals in our project is the device's main memory; it functions as a microcontroller; it is employed as an ESP32 for supervisory control and data acquisition; and it also serves as a smart surveillance system. One of the ESP32's notable features is its built-in Wi-Fi and Bluetooth connectivity. It supports both conventional Bluetooth and Bluetooth Low Energy (BLE), as well as Wi-Fi standards including 802.11 b/g/n and dual-mode Bluetooth, providing smooth

ULTRASONIC SENSOR

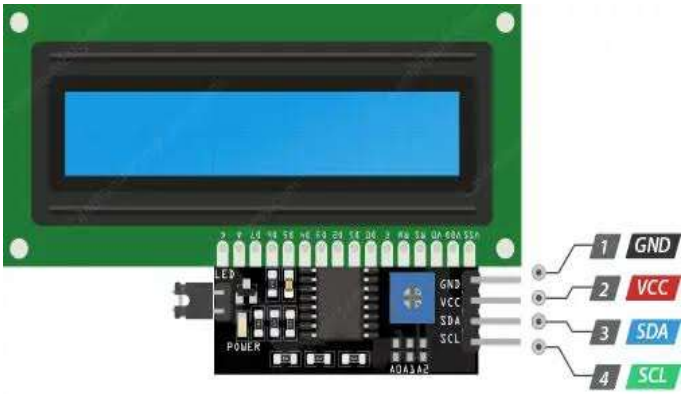
An ultrasonic sensor is a sophisticated gadget that uses ultrasonic waves to determine the distance to an object or it detects its existence. These sensors use echolocation to navigate and it generates the sound waves at frequencies above human hearing range between 20 kHz and 200 kHz. By this ultrasonic sensor, here we used this device to detect the food level in the food container. The measurement of the food can be calculated through this device's ultrasonic sensor is connected to the esp32 it is configured as the pin ultrasonic ground to esp32 ground and +vcc (positive) to the 5v in the esp32, then the trigger pin to the P22pin and the echo pin to the P23pin these are declared to connected to get an output

SERVO MOTOR

A servo motor is a form of rotary actuator that can precisely control its angular location, velocity, and acceleration. It is made up of a motor and a feedback mechanism. Typically, a system incorporates either a potentiometer or an encoder that continuously relays information regarding the motor's position. present position to a control system. This feedback loop enables the control system to precisely change the motor's output for the required position or velocity. In our project, a servo motor is used to open and close the food container. It is configured by connecting the pin as a servo motor ground pin to the esp32 ground, another pin of the +vcc is connected to the 3.3v, and the control signal (PWM) P2 pin is connected.

LCD

LCD is connected with the ESP32, with the pin configured as LCD is used here to show the level of the food in the container and this method is done with the help of an ultrasonic sensor. The ultrasonic sensor measures the food level inside the food container and gives the value as output shown to the LCD (LIQUID CRYSTAL DISPLAY) shows the output of the ultrasonic sensor



SOFTWARE

ARDUINO IDE

The Arduino IDE is an open-source Arduino program for constructing IoT projects that includes a large number of standard input and output functionalities. The application is written in the C and C++ languages. It allows you to build and upload programs to Arduino-compatible boards as well as other vendor development boards like the ESP32. Because of its open-source nature, programmers regularly use this software.

BLYNK APP

Blynk is a comprehensive smartphone software designed to improve how users interact with their Internet of Things (IoT) projects and connected devices. Blynk's user-friendly design and powerful capabilities enable users to easily create custom dashboards, operate smart devices, and monitor data from anywhere in the world using their smartphone or tablet. At its core, Blynk is a versatile IoT development system that offers a variety of features and applications for designing and managing linked projects. Whether you're a hobbyist building DIY electronics or a professional developer working on commercial IoT solutions, Blynk provides the flexibility and scalability you need.

Results

The connected devices are working successfully, and their output was verified by the Blynk application level of the food and the open and close processes of the servomotor. The experiment successfully demonstrated that an embedded device could properly automate pet feeding, bringing convenience and

dependability to pet parents. The constructive feedback and recognized constraints provide clear paths for improvement in future revisions of the product. Automatic pet feeders have the potential to significantly evolve by merging new technologies and features, integrating them into smart home ecosystems, and contributing to comprehensive pet care solutions.

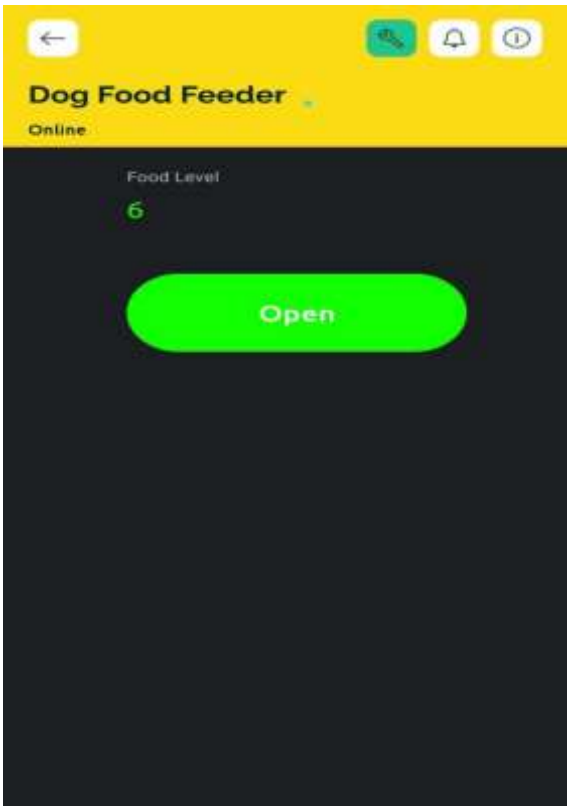


Fig 1 Output Display

Conclusion

Each pet user's lifestyle is not the same; some of them may use their residence in the house to feed the pets, but some people may not have residence or time. This proposed automated pet food feeder device is the solution to these problems, helps rectify them, and helps our pets take care of themselves more conveniently. Using this food dispenser will be different from the normal way in case the owners feed their pets by themselves. With more accurate feeding on time, as we set, it could be controlled from a distance in the normal way.

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