AUTOMATIC PET FEEDER

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Abstract-- The project is titled "AUTOMATIC PET FEEDER". The primary goal of this project is to provide automatic feeding for pets and serve as a remote monitoring system. Given the growing incorporation of Internet of Things (IoT) technologies in different areas of everyday life, this project offers a detailed answer for improving the care and surveillance of dogs in a day care environment. The suggested system utilizes the features of ESP 32, an adaptable and affordable single-board computer, to establish a smart and automated dog care setting. It comprises of two primary parts: an automated feeding system and a remote surveillance system.

The automatic feeding system is created to offer accurate and timed meals to dogs, meeting the nutritional needs and dietary requirements of each pet. By using advanced feeding technology, the system guarantees the timely and controlled distribution of food portions for dogs at the day care center, which helps improve their health and wellness. The remote monitoring system allows pet owners and day care staff to keep an eye on the dogs' behavior and activities in real time, providing reassurance. ESP 32 cameras are strategically positioned to record live video of the dog play area, enabling owners to watch their pets from a distance. Furthermore, the system includes motion detection and alert features to inform staff of any abnormal or risky behaviors.

Keyword— Automated pet feeding, Arduino,Remote management, Controlled

1.INTRODUCTION

A state-of-the-art approach to pet care is an automatic pet feeder, particularly for pet owners who are often gone from home. With the help of this cutting-edge gadget, pet owners can make sure their animals are fed even when they are not there. Pre-measured volumes of food and water are dispensed into the pet's bowls by the automatic pet feeder, such as the Internet of Things-based ones that are operated by a smartphone app and internet connectivity.

It is crucial for conscientious pet owners to comprehend and oversee their animals' nutritional needs. The automatic pet feeder provides peace of mind by guaranteeing pets are fed on schedule, regardless of whether they want to simplify their pet care routine or deal with unforeseen situations that take them away from home.

This technology helps pet owners with two frequent problems: making sure every pet eats enough food throughout the day, no matter what time the owner gets up, and keeping pets from getting to food meant for later feedings. Although there are many devices that address the first problem, the automatic pet feeder addresses the second problem in a unique way, greatly improving the lives of both owners and their pets.

Numerous automatic feeding systems can be configured to function remotely through the internet, giving owners the freedom to feed their dogs from any location. By adding sensors, these systems minimize the need for human interaction and streamline the feeding process.

When it comes to canine nutrition, automated feeding systems are essential for precisely and regularly distributing meals to dogs in order to satisfy their unique dietary requirements. By utilizing smart feeding technology, it is possible to guarantee that every dog's nutritional needs are satisfied, hence improving their general health and wellbeing. Furthermore, easy-to-use controls available via a smartphone app enable pet owners and caregivers to control portion sizes and feeding schedules, promoting a customized and careful approach to pet nutrition.

2. LITERATURE SURVEY

Title: Intelligent Food Dispenser (IFD)

Authors: Hari N. Khatavkar, Rahul S. Kini, Suyash K. Pandey, Vaibhav V. Gijare, 2019

Summary: Users can dispense food by controlling the food dispenser with an Android smartphone via a Wi-Fi module. The FRDM KL25Z microcontroller is set up appropriately to turn on the motor. Two essential components make up the food dispensing process: a storage box with an opening for storing food and a lid that sits underneath the box. The amount of food discharged by the lid is determined by its time alignment with the opening of the storage box. It is attached to a DC motor through which a FRDM board is connected. The motor then reverses course to shut the lid firmly after the food is released. For this particular application, it was beneficial to use the Android mobile application to control the motor's open duration.

Drawbacks: Limited Precision in Food Dispensing: The amount of food dispensed is determined by the synchronization of the lid and storage box openings, and the precision may be limited, making it challenging to control precise portions for different feeding requirements.

Title: A Remote Pet Feeder Control System via MQTT Protocol

Authors: Wen-Chuan Wu, Ke-Chung Cheng, PeiYu Lin, 2018

Summary: With the use of smartphones, owners may use the pet feeder's remote control features to give their pets food from a distance. Pet feeders with cameras are great for keeping an eye on your furry friends at home, but most of them are fixed in place and cannot be moved. Pets are free to roam about the house, but these cameras only take pictures from a set angle.

In the future, this article will provide a remote control system for a toy car that has the ability to dispense food and water and has a camera. With this creative solution, pet owners may supply food and water remotely by using an Android cell phone to control the toy car's movements and watch images from the remote camera over the MQTT protocol.

Drawbacks: Limited Mobility and Fixed Camera Angle: Traditional stationary feeders with built-in cameras have limited mobility, resulting in fixed camera angles that may not capture the pet's movement throughout the entire house.

Title: Programmable Pet Feeder

Authors: TessemaGelilaBerhan,WorkuToyibaAhemed, TessemaZelalemBirhan , 2014

Summary: Automatic pet feeders are made to automatically distribute food at set intervals. Precise portions of food are delivered by these timed devices at predetermined times. The feeder, which is microcontroller-controlled, can be configured to function in accordance with particular parameters. When it comes time for the pet to eat, a buzzer notifies it, and an LCD panel shows user inputs. The dispensing speed is controlled by a stepper motor, and the turntable is segmented to hold several food varieties. Owners have flexibility and personalization in choosing which food to serve at particular times.

Drawbacks: Limited Interaction and Monitoring: While the system allows the owner to select the type of food and schedule feeding times, it may lack advanced features for real-time monitoring orinteraction with the pet, potentially missing opportunities to address specific dietary or behavioral needs.

Titles: Pet feeding Dispenser using Arduino and GSM Technology

Authors: - Smruthi Kumar, 2018

Summary: The idea of feeding dogs from a distance using a cell phone to transmit instructions is investigated in this research. The system that is being presented here uses GSM technology to receive text messages containing commands from the pet owner. The system turns on the servo motor and solenoid valve as soon as it receives the message. The valve is left open to allow water to flow freely while the servo motor turns to dispense food. The owner gets an SMS alerting them when the feeding process is complete. This creative solution is especially helpful for working families whose hectic schedules prevent them from keeping track of their pets' feeding schedules.

Drawbacks: Dependency on GSM Network Reliability: The system's functionality relies on GSM technology, and any issues with network connectivity may disrupt the communication, potentiallyaffecting the timely and reliable dispensing of food and water.

3.PROPOSED SYSTEM

3.1 Materials Used:

1. Hardware components

i . ESP32-WROOM-32

The ESP32-WROOM-32 is a popular and widely used microcontroller module that integrates the ESP32 chip. Developed by Espressif Systems, the ESP32 is a versatile and powerful microcontroller with integrated Wi-Fi and Bluetooth connectivity, making it appropriate for a wide range of IoT (Internet of Things) applications. The "WROOM-32" designation specifically refers to the module variant. The ESP32-WROOM-32 is based in ESP32 dual-core microcontroller. It features two Xtensa LX6 CPUs running at up to 240 MHz.
The module supports IEEE 802.11 b/g/n Wi-Fi connectivity, allowing it to connect to wireless networks.It also supports Bluetooth v4.2 and Bluetooth Low Energy (BLE) for short-range wireless communication.

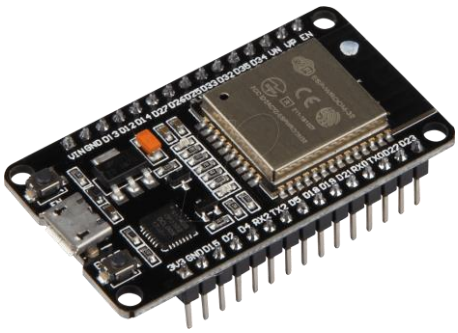

Figure: ESP 32- WROOM-32

ii. LCD 16X2

The 16x2 LCD (Liquid Crystal Display) is a commonly used alphanumeric display module in electronics projects. The "16x2" indicates that the LCD has 16 columns and 2 rows, allowing it to display up to 16 characters per line and 2 lines of text.
Most 16x2 LCDs use controllers such as the Hitachi HD44780 or equivalent. These controllers simplify the process of interfacing with the LCD and handling the display operations.16x2 LCDs are widely used in various applications, including microcontroller-based projects, Arduino projects, Raspberry Pi projects, DIY electronics, and educational purposes. Numerous programming libraries and code examples are available for interfacing 16x2 LCDs with popular microcontrollers like Arduino and Raspberry Pi. These libraries simplify the process of controlling and displaying information on the LCD.

Figure: LCD 16X2

iii. Battery

A 6V 4.5Ah (ampere-hour) battery is a rechargeable lead-acid battery mostly used on various applications, including small electronic devices, emergency lighting systems, security systems, and other low-power electrical devices. Here are key details about a 6V 4.5Ah battery.
The nominal voltage of the battery is 6 volts. When fully charged, the voltage may be slightly higher, typically around 6.5 to 6.8 volts. The capacity of the battery is 4.5Ah, which means it can deliver a current of 4.5 amperes for one hour or 1 ampere for 4.5 hours before needing recharging.
This type of battery is typically a sealed lead-acid (SLA) battery. Sealed lead-acid batteries are maintenance-free and have a closed construction, making them suitable for various applications.

Figure: Battery

iv. DC Motor

One kind of electrical motor that transforms electrical energy from direct current into mechanical energy is called a DC motor. Direct current (DC) electricity is used to power it. The construction of DC motors and their mechanism for converting DC electrical energy into mechanical energy will be covered in the parts that follow.

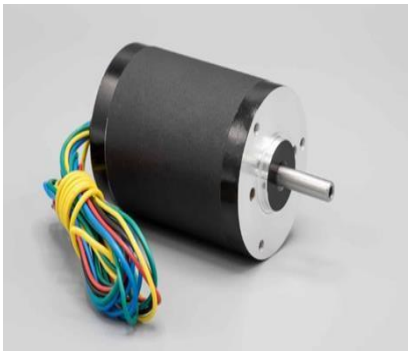

Figure: DC motor

v. Servo motor

A servomotor, also known as a servo motor, is a precision actuator used for controlling angular or linear position, velocity, and acceleration in mechanical systems. It consists of a motor paired with a position-feedback sensor and requires a specialized controller for operation. While often associated with closed-loop control systems, servomotors encompass various motor types adapted for precise control applications. Widely utilized in automated manufacturing, robotics, and CNC machines, servomotors play a critical role in achieving accurate motion control for various industrial and mechanical tasks.

Figure :Servo Motor

vi. Camera

The ESP 32 Camera Board is a custom designed add-on module for ESP 32 hardware. It attaches to ESP32 hardware through a custom CSI interface. The sensor has a 5 megapixel native resolution in still capture mode. In video mode it supports capture resolutions up to 1080p at 30 frames per second.

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Figure: Camera

vii. Ultra Sonic Sensor

Ultrasonic sound waves are used by an ultrasonic sensor to measure distances and identify nearby objects. Extensively utilized in proximity sensing, robotics, and industrial automation, these sensors are vital parts of many systems. The following are key facts regarding ultrasonic sensors:

Operating Principle: The echolocation principle underlies the operation of ultrasonic sensors. They produce sound waves that are higher in frequency than what is audible to humans, known as ultrasonic waves, and then time how long it takes for the waves to leave the source and return to the sensor.

Transducer: The sensor consists of a transducer, which is an ultrasonic wave transmitter and receiver.
Control Circuit: A control circuit determines distances by measuring the lag time between the transmission and receipt of ultrasonic pulses. It also controls their emission and reception.

Calculating Distance: The sensor measures the time it takes for ultrasonic waves to travel to and from an item in order to calculate the distance to it. The formula for this calculation is Distance = (Speed of Sound × Time) / 2.

Detection Range: The farthest distance at which ultrasonic sensors can reliably detect objects is indicated by their designated detection ranges. Typically, detection ranges from many meters to a few centimeters.

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Figure: Ultra Sonic Sensor

2.Software Components

i. ARDUINO IDE

The open-source Arduino platform is well-known for its readily available hardware and software. Arduino boards are capable of translating a wide range of inputs—including messages from Twitter, button presses, and sensor data—into outputs like LED lighting, motor activation, and publishing material online.

You communicate a set of commands to your Arduino board's microprocessor to control its operations. The Arduino programming language, which is based on Wiring, and the Arduino software (IDE), which is built on Processing, enable this. The IDE is compatible with Linux, Windows, and Mac operating systems and is made to be intuitive for novice users while remaining sufficiently adaptable for more experienced users. It's frequently used in educational settings to introduce robotics and programming, educate chemistry and physics topics, and create inexpensive scientific tools.

Arduino is used by designers and architects to create interactive prototypes, and by musicians and artists to create new musical instruments and installations. Makers also use Arduino for a variety of projects that are on display at Maker Faires and other events. All things considered, Arduino is a priceless instrument for education and creativity.

Figure :Arduino IDE

Ii .C Language

Dennis Ritchie created the popular computer language C at Bell Laboratories in 1972. Thanks to its efficiency, versatility, and intimate hardware interaction, C has become a software development need. Since its inception in the early 1970s, its direct access to memory and hardware resources have made it a popular option for system programming, embedded systems, and low-level operations.

One noteworthy feature of C is its portability. C programs' standardized syntax and utilities make it simple to adapt them to run on several platforms with little effort. Its broad adoption in a variety of computing contexts, from microcontrollers to supercomputers, has been facilitated by this characteristic.

The imperative procedural language C allows for recursion, lexical variable scope, structured programming, and a static type system. It was meant to be compiled, providing minimum runtime support, low-level memory access, and language structures that map effectively to machine instructions.

Figure :C Language

3.2 Methodology:

With the help of a microcontroller, the ESP 32 Automated Pet Feeder may automatically distribute food to pets at the owner's request. With just a swipe of the screen on a smartphone app that is online, owners can effortlessly feed their dogs. The interface of the system is meant to be simple to use and intuitive.

The feeder has a DC motor for food distribution, an ESP 32 microprocessor with a motor driver to regulate motor activities, and a dispensing tube with a food storage container. A motor driving shield is necessary because the DC motors on development boards normally require 500mA of current to ensure appropriate functioning.

In order to engage the DC motor, the user must push a button on the related phone app. This causes the DC motor to be activated via an internet command. To improve the feeder's functionality, an ultrasonic sensor is also used to detect the presence of water

1. **ESP32 Module:** The ESP32 module is the main microcontroller of the IoT Dog Day Care system, handling a variety of duties. In addition to managing feeding schedules and the dispensing device, it also supervises Wi-Fi connectivity to establish and maintain communication with the main system and interacts with sensors and actuators within the automated feeding system. In addition, it exchanges data with the Raspberry Pi to send important information

2. **Automated Feeding System Module:** This section concentrates on the project's automated feeding component, making sure dogs are fed precisely and on schedule. In addition to working with the ESP32 to schedule and manage feeding schedules, it has a motorized or servo-controlled food dispenser, uses sensors to check food levels and avoid overfeeding, and offers an intuitive phone application interface for remote feeding management.

3 .**Remote Surveillance System Module**: The project's Remote Surveillance System Module is centered on security features and real-time monitoring. In order to provide the best possible coverage, cameras are positioned strategically, and motion sensors are used to identify any strange activity occurring within the dog play area. It also sends alerts for any motion detected or security issues, and transmits live video to the UI for remote viewing

4. **Power Supply Module:** The power supply module makes sure the system has a steady and dependable power source. uses voltage regulators and safety measures to deliver the necessary voltage levels, such as 12V for motors and 3.7V for the ESP32. allows power to be distributed to each module seamlessly, avoiding possible power-related problems.

5. **User Interface Module:** The IoT Dog Day Care system's User Interface Module facilitates smooth communication between users and the system. It provides easy-to-use mobile applications and websites for remote device management and supervision. Users can personalize schedules and receive warnings through the interface, which shows real-time video feeds, feeding schedules, and system status updates.

6. **Camera Module:** This part uses a live-streaming camera system to record live video data. It controls the camera's operations and sends the user interface module's live video stream for observation and evaluation.

7. **Internet Connectivity Module:** guarantees smooth communication between external networks and the IoT Dog Day Care system. oversees the ESP32's Wi-Fi connections and transmits data using secure communication protocols (like HTTPS). allows for control and remote access from any location with an internet connection.

The unique functions and tasks of each part of the Internet of Things Dog Day Care system are highlighted in this modular breakdown. It offers a thorough grasp of how these components work together to produce an all-inclusive and integrated solution for monitoring and caring for pets.

4.OUTCOMES

Our goal was to develop a simple and easy-to-use method for pet owners to submit service requests. The increasing trend of combining IoT technology and pet management holds promise for future developments. Additionally, our suggested system integrates smart-home elements such as intelligent pet doors and feeding. The results of our study show that pet owners' needs can be satisfactorily fulfilled by an Internet of Things-enhanced pet monitoring system.

The idea behind the Internet of Things has the potential to completely change device management strategies, connectivity techniques, and operations. Many research directions can be pursued after we have a comprehensive definition of our operating parameters. The next phase of our plan is to incorporate more pet care products into our system,

such litter boxes and pet cameras, to address the many demands of pet owners in terms of entertainment, health, and surveillance.

Moreover, connecting the various networking devices across the world is the next issue as we aim toward inclusion. We will soon be devoting more of our attention to studying IoT gateways and creating techniques for tracking pets over long distances.

5.CONCLUSION

The growing interest is focused on the interactions between human and physical device and objects. Numerous studies have tried to offer a simple and instinctive way to ask for services. The exciting potential for future advancements lies in the merging of pet management and IOT technology. The system being suggested is also known as smart-home technology featuring the intelligent pet doors and pet feeder. The findings showcase both the significant enhancement of the pet monitoring system utilizing IOT technology and its alignment with pet owners' needs. The fundamental concept behind the IOT may introduce a fresh operational technique, a novel way of linking devices, and possibly even a completely new approach. Once the comprehensive operational definition is completed, there are still several research issues that will be addressed. Next, we will incorporate all other pet care gadgets into our system, such as litter boxes, pet cams, etc. This will address various owner needs and cover pet health, monitoring, and entertainment aspects. Additionally, the next challenge is how to link the numerous networking devices worldwide, as the cloud term stands. In the time to come, our focus will be on researching the IOT gateway and remote tracking of pets.

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