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DEVELOPMENT OF PET FOOD DISPENSER USING ARDUINO UNO

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Abstract: The creation of an automated pet feeder is the subject of this report. Tensor Flow Lite Convolutional Neural Networks, a specialized software, is used in conjunction with a laptop, an Arduino, and a camera to identify the animal. The meal is dispensed with assistance from a motor. By taking care of the meals for the pets, the intention is to make life easier for pet owners. The device is intelligent enough to provide the appropriate amount of food for each pet based on their individual needs. Additionally, it can identify when a pet appears ill during feeding and notify the owner. In other words, it's like giving your pet a personal chef with an integrated health checker.

Keywords: Automated pet feeder, Tensor flow, Neural networks, Arduino, Motor.

I. INTRODUCTION

Having a pet brings a great deal of happiness and company to many people. Nonetheless, the benefits of having a pet also come with a lot of obligations, the most important of which are feeding and taking care of our beloved animals. Even though many pet owners try to keep regular feeding schedules, the demands of hectic schedules or the need to travel can make this task extremely difficult. These difficulties in turn lead to justifiable worries about our pets' general health and diet. The creation and broad use of automatic pet feeder systems is a major advancement in meeting the requirements of both pets and their owners in response to these difficulties. By automating the feeding process, these cutting-edge systems provide a workable alternative, relieving pet owners of some of their burdens and guaranteeing that meals are given to pets on schedule and consistently.

Pet owners can relax knowing that their furry friends will receive the attention and nourishment they require while they are away, as they are no longer constrained by hectic schedules or travel obligations. Automatic pet feeders are primarily distinguished by their capacity to offer monitoring and customizing features that are specifically designed to satisfy each pet's unique dietary needs. These systems can be tailored to precisely dispense food portions that are optimized for each pet's individual needs through sophisticated programming and technical integration. Automatic pet feeders are capable of catering to a diverse array of dietary preferences and constraints, be it a veterinarian recommended specialist diet or just the right quantity of food for a pet's age and size. Automated pet feeder systems also provide remote tracking and supervision of feeding schedules, thanks to their monitoring features. Real-time updates and warnings about their pets' eating activities can be obtained by pet owners thanks to embedded sensors and networking features. Even in situations where pet owners are geographically separated, this degree of awareness and supervision offers priceless piece of mind and enables them to stay vigilant and informed about their pets welfare.

II. LITERATURE SURVEY

[1] This food dispenser is operated by an Android app that connects to Wi-Fi. The motor dispenses food by opening and closing the storage box lid under the control of a FRDM KL25Z microcontroller. How long the lid is left open determines how much food is served. When the meal is served, the motor shuts off the cover. How long the cover is left open can be adjusted using the app. Although it just has one feeding station and is simple to operate, the system feeds one animal at a time and lacks a water dispenser.

[2] They developed a method that uses the PCA Algorithm with eigenfaces to identify animals in images. They determine the Eigen Faces and Eigen Values of the images and resize them. Next, they compute the projection of the test image into face space using the picture that is centred. Euclidean Distance is used to compare the projection of the test image with the stored projections. The recognized image is the one with the shortest distance. Though it uses less power and is more precise, this system still employs antiquated detection techniques.

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[3] The primary source for image processing apps is images. The way people use computers in the future will be altered by image processing. Via the use of numerous tools and techniques, it enables the complicated feature extraction from images. Now, it is capable of more than just simple operations and can evaluate the contents of an image. For numerous real time applications, image processing is crucial as it facilitates the extraction of intricate information from single or multi-dimensional images. The technology is sophisticated and can be costly, though.

III. METHODOLOGY

The automatic pet feeder is a state-of-the-art system that combines multiple technologies to ensure pets are fed in a timely and enough manner. For the objectives of animal identification, classification, and health monitoring, this system makes use of a laptop that has a built-in camera. It also makes serial communication possible between an Arduino microcontroller and a laptop. Precise portion control is ensured using the Arduino microcontroller, which also controls the food distribution mechanism via DC motors.

In addition, the apparatus integrates a load cell to precisely gauge the weight of the food that is dispensed. Through the integration of these components, the automated pet feeder provides pet owners with a comprehensive and effective feeding solution, thereby augmenting convenience and alleviating anxiety. The architecture of an automated pet feeder system that is driven by a laptop and an Arduino is shown in the block diagram. It is made up of various interconnected parts that work together seamlessly. The central processing unit (CPU) of the system is a laptop equipped with an Arduino board, which enables it to coordinate its several functions. A camera module attached to the laptop with Arduino allows for the real time detection of animals using a TensorFlow Lite convolutional neural network (CNN). By reliably identifying various animal species that approach the feeder, the camera-based detection mechanism enables the system to provide targeted food dispensing that is catered to the individual nutritional requirements of each animal.

The laptop with Arduino detects animals and, depending on the kind of animal found, activates the appropriate food dispenser. The system can be configured to dispense different kinds of food or portions based on the dietary needs and tastes of different pets or animals thanks to its modular design. Using DC motors to precisely control the dispensing process, the food dispensing system ensures proper portion sizes and prohibits overfeeding or waste. The food is dispensed with a minimum of mechanical complexity and maintenance thanks to this motor-based vending machine. To protect pets' health and wellbeing, the system has an automated food dispensing feature as well as a sick animal detecting feature.

The technology can identify symptoms of disease or discomfort, such as decreased hunger or unusual movement patterns, by continuously observing the behaviour and physical state of the animals. The system instantly tells the owner or caregiver when it detects a sick animal through an integrated notification mechanism, including email or SMS notifications. To prevent major health problems and to ensure the general welfare of the animals, this proactive approach to health monitoring and alerting allows for prompt intervention and veterinarian care.

Overall, the automatic pet feeder system leveraging Laptop with Arduino offers a comprehensive solution for pet owners seeking to automate feeding routines while ensuring personalized nutrition and health monitoring for their animals. Through the integration of camera-based animal detection, customizable food dispensing, and sick animal detection capabilities, the system provides a versatile and intelligent feeding solution that enhances convenience, promotes responsible pet care, and fosters the well-being of beloved pets.

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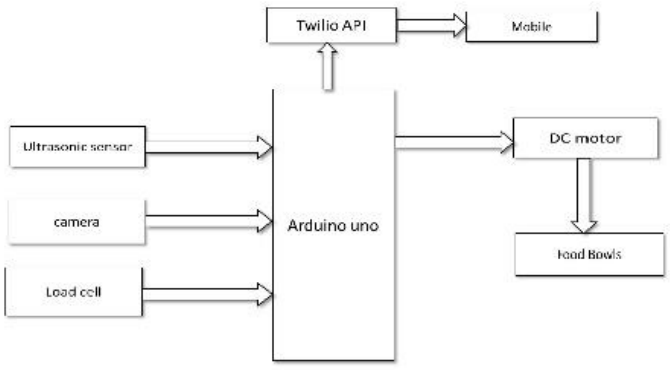
IV. PROPOSED SYSTEM

The suggested approach enhances development of pet food dispenser systems by utilizing contemporary technologies including computer vision, machine learning, and the Internet of Things (IoT). In order to overcome the constraints of the current system, it adds several significant features. The device identifies pets as they approach the feeder using a camera that is linked to a laptop for real-time animal recognition. Animals such as dogs, cats, and other popular pets can be categorized into groups with the aid of machine learning algorithms. Beyond merely identifying sick animals, the technology can also identify them by evaluating their behaviour and outward manifestations.



Block Diagram

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Hardware Components:

1. DC Motor

A vehicle can be made stronger by gear reduction, much like with a magic trick. Envision your car attempting to raise a large object like a superhero. However, lifting it by yourself is difficult. Consequently, it dons a customized gear outfit. The superhero's incredible strength allows them to move large objects more easily, but their speed is slowed down by the gear suit. For the uninitiated, gear reduction is the process by which a vehicle's gears increase its power while decreasing its speed—much like a superhero in a suit.

Figure 4.1: DC Motor

2. Load Cell

The figure displays a load sensor is a tool used to weigh items, including food. The gate closes if an object weighs more than the threshold amount, in this case 1.0 kg. Consequently, heavier things cannot fall into the basin. It generates an analog output that the Arduino's built-in 10-bit ADC is unable to comprehend. All Set to Communicate with Microcontrollers 8 Bit Output for Data Load UART output reference varies between 0 and 255. An SPI-based ADC device is interfaced with the load cell. Utilizing Microcontroller SPI to UART output and 8-bit output conversion Using 8-bit microcontrollers is Simple.

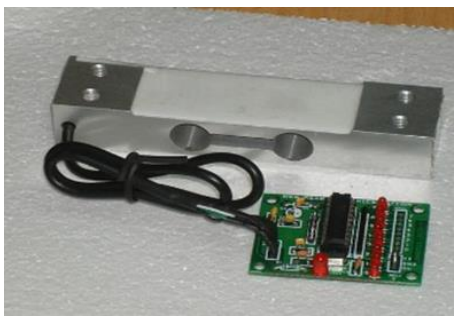

Figure 4.2: Load Cell

3. Arduino Uno

The Arduino Uno, introduced by Arduino in 2010, is an open-source microcontroller board based on the Microchip ATmega328P MCU. It features sets of digital and analog I/O pins that can interface with various expansion boards and circuits. The board can be powered by a 9-volt battery or through a barrel jack supporting 7 to 20 volts. It utilizes the same headers as the Leonardo board and the same microprocessor as the Arduino Nano board.

Figure 4.3: Arduino Uno

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4. Ultrasonic Sensor

An ultrasonic sensor is a device that measures distance by emitting ultrasonic sound waves and detecting their reflection from an object. These sensors are widely used in various applications, such as robotics, automotive systems, and industrial automation, due to their ability to provide precise distance measurements. Ultrasonic sensors typically consist of a transmitter and receiver, which work together to determine the time interval between the emitted and reflected signals. This technology enables accurate, non-contact distance measurement, making it valuable for obstacle detection, level sensing, and object avoidance system.

Figure 4.4: Ultrasonic Sensor

V. RESULTS

A variety of animals, including dogs, cats, sheep, and cows, were used to test the development of pet food dispenser system. The animals were correctly identified and categorized by the system, which then dispensed the appropriate kind and quantity of food in accordance with the preset parameters. Precise feeding was guaranteed by the load cell's accurate measurement of the food's weight. The system's capacity for health monitoring was further demonstrated by its ability to identify and notify users of sick animals.

Figure 5.1: Proposed System

After the pet is detected and recognized as the intended pet, the particular DC motor releases the correct type of food. For cat food, the dispensed quantity is based on the DC motor's rotation and measured with a load cell. Once the dispensed food reaches half of the predetermined amount, a notification is sent. The predetermined quantity of food is 50g. When the food amount drops to 25 of this predefined quantity, a message is sent to the mobile via the Twilio API.

VI. CONCLUSION

An development pet food dispenser using Arduino ensures consistent and convenient feeding schedules, promoting pet health and reducing manual effort. It uses an Arduino board, sensors, motors, and a real-time clock to dispense food accurately and on time.

The system can be customized for different pets. Although it has setup and maintenance costs, it improves the reliability and monitoring of pet diets. Future upgrades like IoT connectivity and advanced sensors could make it even better, making it a great project for integrating technology into pet care.

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