TECH-FEED: INTELLIGENT FEEDING FOR FURRY FRIENDS

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Abstract: Keeping pets means taking responsibility. This includes keeping their company, showing your concerns, and of course, feeding them on time and in a correct way. One of the top health concerns of pets is overeating and obesity. Especially at younger ages, they are usually satisfied with however much is given to them and also many adult pets are fed unscientifically which later may cause a short longevity. Automatic pet feeders have witnessed transformative growth, integrating smart features to build up pet care. The work is about a pet feeding system automatically for a daily minimum period of eight hours when all the nuclear family members are busy at work to survive in the metro cities and other cities. This paper concludes by identifying emerging trends and future directions in automatic pet feeder development and asserts the need for continued research to address advancing challenges and opportunities in this progressive domain.

Index Terms – **Node MCU, H-Bridge, ESP32-CAM, pet feeder, automatic**

I. INTRODUCTION

Nowadays, automation is being integrated into the lives of many people to make their lives easier and more suitable. Today many people are interested in having pets in our homes. But these pets must be properly cared for. Feeding them on time is an important task as they are part of the family. But in their busy lives, people fail to pay attention to their pets and thus fail to get proper nutrition on time. Owning pets can enhance people's lives, but it also has responsibilities that can cause hassle. Pet owners know all too well that feeding their pets provides joy and well-being, but sometimes they are too busy to give their pets the food they need, or they are not at home to check if they are eating or not. This is where a pet feeder comes in. This device replaces the manual feeding of pets with a modern system. It helps the owner to feed their pets while they are not at the house. This pet feeder will be controlled via mobile application through the webserver. Pet owners now have a convenient way to feed their pets. Also, portion sizes are easier to control with this system, as users can set the right portion size for their pet. Access to a healthy amount of food the whole day, regardless of the owner's schedule. This could help pets maintain their weight and eliminate the problem of pet owners giving too much or too little food. The owner can leave pets at home in the event of any emergency as well. The cost of caring for a pet has been reduced due to the introduction of such equipment on the market and also these products are gaining popularity throughout the world today.

II. LITERATURE SURVEY

Harsha Bongale, Nandakumar Mugali and Divya T L proposed Automatic Pet Feeder. The project emphasizes the need for a system that can automatically feed pets, specifically targeting dogs, cats, monkeys, and rabbits. The system is designed to function during the absence of the pet owner, ensuring that pets are fed regularly and adequately. The introduction highlights the importance of pet care and the challenges pet owners face, especially when they are busy or not present at home. It emphasizes the significance of an automated feeding system to ensure pets are nourished properly. The implementation details the use of various hardware components such as servo motors, IR sensors, ultrasonic sensors, and Arduino Uno. The system's design revolves around these components to automatically dispense food when the pet is detected in proximity. The project concludes by highlighting the successful integration of components and ideas to create an automated pet-feeding system using Arduino Uno. It emphasizes the benefits of freeing the pet owner from constant feeding duties and ensuring the pets receive food on schedule. [1]

Pushpa Birha, Ruchika Ingle, Samruddi Tajne, Payal Mule, Aanchal Pandey, Shivani Kukekar and Aachal Kadu proposed Design and Development of an IOT-based Pet Feeder. The IoT-based Pet Feeder incorporates network communication and remote operation via a webpage. It functions uniquely by receiving commands from owners via a webpage. The device is categorized into software (IDE Arduino and ESP8266 Downloader) and hardware (Arduino Uno microcontroller, ESP8266 devices, ultrasonic sensors, stepper motor, real-time clock, and weight sensor). Pets are integral to human life, particularly among the elderly. The pet care industry is evolving, prompting innovations to aid pet owners. The IoT Pet Feeder aims to simplify pet feeding, crucial for maintaining pets' health and preventing various illnesses due to irregular feeding schedules. The paper evaluates existing pet-feeding devices and their limitations. It compares trackers, automatic feeding systems, and monitoring solutions. Critically, it points out flaws like reliance on web applications and proposes improvements, such as a mobile application for enhanced accessibility. The project introduces a specialized mobile application connecting pet owners with their pets. It addresses feeding issues through engineering solutions and analysis, seeking to overcome drawbacks observed in existing pet feeder applications. [2]

Soumallya Koley, Sneha Srimani, Debanjana Nandy, Pratik Pal, Samriddha Biswas and Dr. Indranath Sarkar proposed Smart Pet Feeder. The article proposes a prototype for a Smart Pet Feeder, addressing the challenge of feeding and watering pets, especially during situations like lockdowns when owners are away from home. The system allows owners to schedule and supply food and water to their pets at specified times. The prototype integrates a variety of elements like a conical structure to reserve pet food, a servo motor controlling food outflow through a PVC pipe, a load cell for food weight monitoring, and a float sensor for water level maintenance. In modern times, people are inclined to keep pets for various reasons, but busy lifestyles often result in negligence in providing food and water for pets regularly. Automated pet feeders have been proposed to alleviate this issue, ensuring pets receive food and water at predefined intervals. This prototype aims to convert a standard pet feeder into a Smart Pet Feeder with additional features while keeping costs within an acceptable range for consumers. The Smart Pet Feeder prototype aims to address the challenge of pet feeding during the owner's absence by allowing users to set feeding schedules and quantities. The system is designed using recycled materials, making it cost-effective and eco-friendly. The authors envision its potential to serve pet owners, especially during situations like lockdowns when people may be away from home for extended periods. [3]

Ruini Liu proposed Automatic Pet Feeder Based on a Single-Chip Microcontroller which uses an STC89C52 microcontroller as the core control for each module to work. The single-chip microcontroller STC89C52 determines real-time clock ship, displays current real-time time by reading DS1302 real-time clock ship, and displays current real-time time through the LCD1602 liquid crystal and then through control buttons we can modify real-time time and set feeding time. When the device starts to work, the single-chip microcomputer continuously detects the current time and compares it with the feeding time. When the current time reaches the feeding time, the single-chip microcomputer controls the motor to rotate and put the real object, and at the same time controls the voice module to play music, attracting pets to come and eat. The current time, feeding time, and feeding status can be viewed through the LCD. Also, people can set the feeding time in advance by pressing the button. [4]

Borwornyot Sutam, Benchalak Maungmeesri and Dechrit Maneetham proposed A Smart Pet Monitoring and Feeding Based on Feedback Control System. The IoT-controlled smart pet feeder employs feedback control for precise pet food dispensing. It incorporates a silo with a screw conveyor, ultrasonic sensor, camera, and load cell for accurate feeding. Operated via IoT through a mobile app, the system offers scheduled feeding and continuous monitoring. The hardware design includes calculations for the silo and screw conveyor, while the control system utilizes an Arduino board. The feedback control system maintains the desired feeding rate. Experimental results demonstrate the system's ability to dispense various pet foods accurately, ensuring timely and efficient feeding. [5]

Archana P, Bojraj R, Rajeshraj P, Sakthivel K and Saravanan N proposed Automatic Pet Feeder Using Arduino IoT. A robotized pet feeder might be an item that may supplant manual taking care of strategy which may be set at a required taking care of amount and taking care of time. Advancement of pet feeders is utilized to beat absent-minded pet owners to take care of their pets worldwide through ubi-dots cloud and Node MCU. Ubi-dots cloud is connected to Node MCU which in turn is connected to servo motor. This Ubi-dots cloud is connected via mobile or webserver from where commands are passed by the owner and according to commands servo motor rotates and releases food. This device provides high-range connectivity. Voice recording to call pets and feeding can be done at any time. It takes care of pets in the absence of the owner. [6]

Hari N Khatavkar, Rahul S Kini, Suyash K Pandey and Vaibhav V Gijare proposed Intelligent Food Dispenser (IFD). When the owners of the pets are away, The Intelligent Food Dispenser can be set by a timer and the amount can be decided so that it gives the food to pets timely. The pets that are on medications can be easily given the medicine by dispensing it with the food. This paper primarily intends to provide a solution to pet care. It has demonstrated a cost-efficient method that makes use of a popular development board, the 'ARM FRDM KL25Z', an Android application, and some other standard peripheral devices. The usage of the device has been simplified due to its modular design and by providing an app interface. Thus, it can be concluded that when this system is developed further ahead at a later stage, it can be easily enhanced by incorporating a GSM module, RF ID tags, and much more. [7]

Vineeth S and Renukumar B R proposed Automatic Pet Food Dispenser using Digital Image Processing. This project is designed in such a way that it provides an efficient and pocket-friendly method to build an automatic pet feeder and also serves automatically as it detects the presence of pets. Different sensors are used for the automatic pet feeder so that it works efficiently and a distance sensor will be used as the main component of the mechanism. This includes a distance sensor to detect or identify

the presence of the pet i.e. whether the pet is near the bowl or not and a servo motor which will be programmed to serve the food as soon as the pet comes closer. The owner does not have to worry about making plans or feeding his pet because of this automated pet feeder. [8]

Sahana S Khamitkar and Naveen Kumar B proposed Google Assistant Controlled Automatic Pet Feeder. The Google Assistant Controlled Automatic Pet Feeder, developed by Sahana S Khamitkar and Naveen Kumar B, leverages IoT and Google Assistant for remote pet feeding. This cost-effective system allows users to feed their pets using voice commands on smartphones. It addresses the challenge of maintaining pet diets and schedules, and ensuring timely and controlled feeding. The device records feeding data, offers user-friendly customization, and is applicable in various settings. The proposed model enhances pet care, providing a convenient and efficient solution for busy pet owners. [9]

Manoj A, Prasannakumar T G, Sathish Kumar V S, Surichandh S B and Saravanan B A proposed Automatic Pet Feeder via IoT. The paper presents an Automatic Pet Feeder utilizing IoT technology, allowing remote control via a web server. The system incorporates Arduino, ESP8266, servo motors, and a buzzer. It aims to address the challenge of timely pet feeding in busy schedules. The IoT-based feeder offers advantages such as remote operation, web server control, and the potential for additional features like cameras and audio. The study suggests further enhancements, including a Raspberry Pi for improved accessibility. The Automatic Pet Feeding system demonstrates efficiency in ensuring pets receive timely meals even in the owner's absence. [10]

Aasavari Kank, Anjali Jakhariya and Vaishali Gaikwad (Mohite) proposed Automatic Pet Feeder. This project brought together several components and ideas to achieve a common goal which is to design an automated pet feeder using Arduino uno. The key components of the project include a distance sensor to detect or identify the presence of the pet i.e. whether the pet is near the bowl or not and a servo motor which will be programmed to serve the food as soon as the pet comes closer. It relieves the owner from having to feed his pet multiple times a day. The proposed project senses the presence of the pet using the distance sensor and serves accordingly. The owner does not have to worry about making plans or feeding his pet because of this automated pet feeder. This automatic pet feeder serves as a helping hand as it works efficiently in the absence of the owner. [11]

B. Ravi Babu, P. Pavan Kumar and Dr. P. G. Kuppusamy proposed Arduino Mega-based Pet Feeding Automation. Automatic Pet Feeding System has an attractive design model. Arduino and IoT add Automation to the system. The paper showcased the basic design of the system to be made. And also, the Arduino circuit controls the functions of the system. The success of the Automatic Pet Feeding System would be a great help to pet lovers. The application of the proposed system is first, the feeder is used when the owner of the animal is not at home. So, before they have to wait too long for the meal, the automatic pet feeder will do it. This also includes keeping them company, showing your concerns, and of course, feeding them on time and in the correct way. [12]

Jayaram Kumar Kondapalli, Venkata Ramana Sanepu, Balakrishna Satyam Kothapalli,Shankar Pattabhi Ram Peketi,Venkata Dattu Naveen Kukatla proposed Automatic Pet Feeder using Internet of Things (An IoT based Pet Feeder). The proposed system is also referred to as smart-home technology, including the smart pet door and pet feeder. The results not only present the key improvement of the pet monitor system involved in the IoT technology but also meet the demand of pet owners. The basic vision behind the IoT, it may have a new way of operational method, it may have a new method of connecting devices and there might be a complete clean-slate approach. As a next step, it is fully integrated with other pet care devices including litter boxes, pet cam, etc. With that, the diverse needs of the owners can be met, and the health, monitoring, and entertainment topics for pets are all covered. [13]

Mritunjay Subhashchandra Tiwari, Sahil Manoj Hawal, Nikhil Navanath Mhatre, Akshay Ramesh Bhosale, and Mainak Bhaumik proposed an Automatic Pet Feeder using Arduino. Automatic Pet Feeder works efficiently and fulfills the objective of feeding a pet in the absence of its master. It works for on household 230V AC supply. The servomotor rotates the Auger and food gets delivered to the plate as programmed in the Arduino. The design can be made more factory-feasible and aesthetic. The auger can be made by 3D printing which can be created as the auger is the moving part. The APF could be made more advanced by installing cameras and an audio box as it would make it possible to interact with pets through smartphones as well as keep observation on it. APF is indeed a helper to the owner for proper caretaking of the pet and more advancements can be expected in the future. [14]

Smruthi Kumar proposed a Pet Feeding Dispenser using Arduino and GSM Technology. GSM technology is used in this system to receive a message from the pet owner. With the use of a phone, SMS can be sent on when to feed the pet. The solenoid valve and the servo motor will be activated when the message is received by the system. This will rotate the servo motor from which the food will be transported and for the water to be free-flowing, the solenoid valve will be open. Once the feeding process is done the owner will receive a message. [15]

Smart pet feeders offer convenience and peace of mind for pet owners, but like any technology, they come with their own set of advantages, Smart pet feeders allow pet owners to schedule feeding times remotely using a smartphone app. This is particularly beneficial for individuals with busy schedules or those who travel frequently. Many smart feeders offer portion control features,

ensuring that pets receive the right amount of food at each feeding. This can be helpful for pets with dietary restrictions or weight management needs.

Smart pet feeders rely on technology to function, which means they are susceptible to technical issues such as Wi-Fi connectivity problems or app malfunctions. In the event of a technical failure, pets may miss meals or receive incorrect portions of food. Smart feeders typically require a power source to operate, whether it's through batteries or an electrical outlet. In the event of a power outage or dead batteries, the feeder may stop working, leaving pets without access to food.
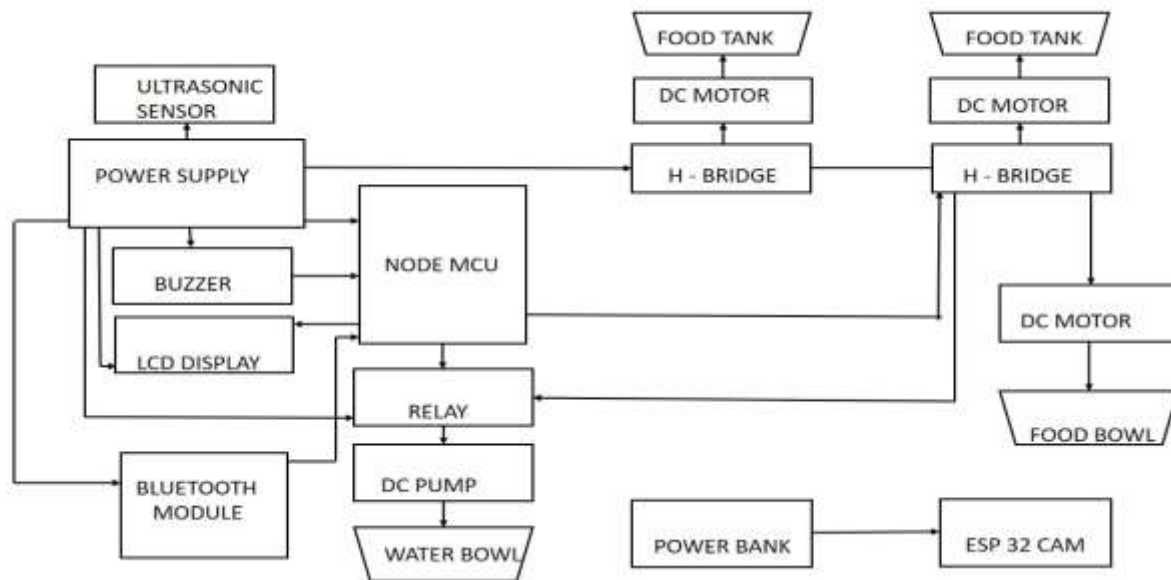

Fig.1.System Block Diagram

This system is designed to detect object by an ultrasonic sensor, the pet is identified via camera i.e., whether the pet is a cat or a dog. If the identified pet is a dog, then dog food will be dispensed likewise if theidentified pet is a cat, then cat food will dispensed.
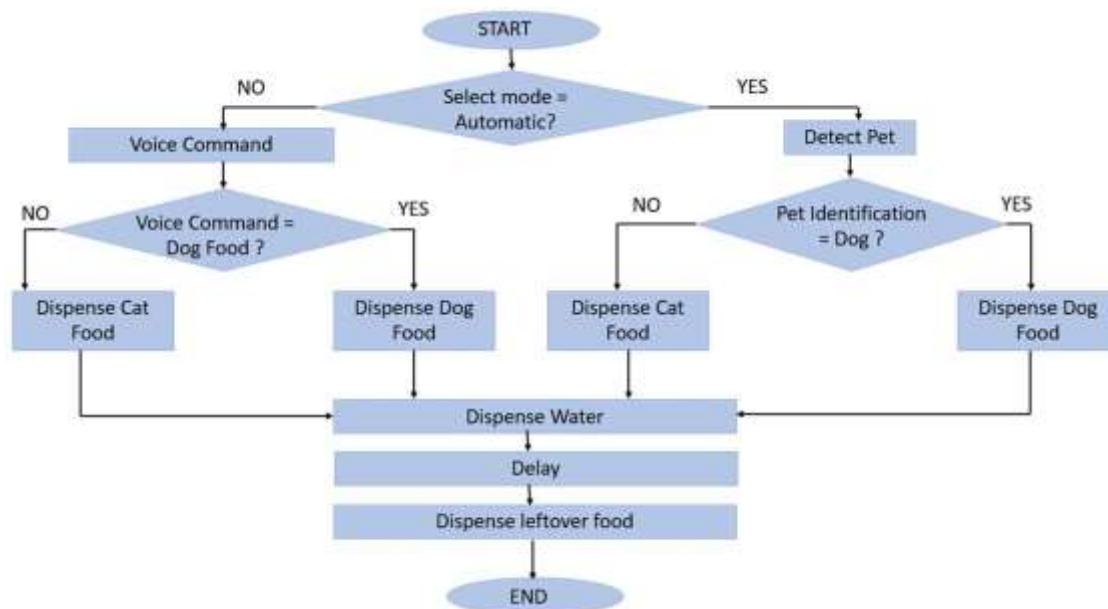

Fig.2. Flow chart

The flowchart (fig.2.) for the tech feeding automation system consists of several components and processes, working together to provide an efficient and convenient pet feeding solution. Here's a description of the flowchart works:
- The user interacts with Google Assistant, providing commands such as "dog food", "cat food", or "automatic".
- Google Assistant captures the user's voice command and sends the necessary data to the Node MCU.
- The Node MCU receives the signal from Google Assistant and extracts the essential data from the received message.
- The Node MCU interprets the user's command and sends control signals to the DC motor and water pump.
- The DC motor rotates, activating the food dispenser, and pet food is dispensed from the container in predetermined quantities.

- The water pump pumps water from the tank, dispensing it into the water bowl, ensuring that pets have access to fresh water at all times.
- The EPS32-CAM captures an image of the pet food bowl after food dispensation, providing visual confirmation that the food has been successfully dispensed.
- The captured image is sent via Telegram to the pet owner, allowing them to monitor their pets' feeding remotely.

This flowchart demonstrates the seamless integration of various technologies, enabling users to control the pet feeding system remotely and hands-free. The system ensures that pets receive proper feeding and hydration, while visual confirmation and remote monitoring provide peace of mind to pet owners. Overall, the flowchart illustrates the system's efficiency and convenience, making it an attractive option for pet owners looking for a reliable pet-feeding solution.

III. METHODOLOGY

The user interacts with Google Assistant, providing commands such as "dog food", "cat food", or "automatic". Google Assistant captures the user's voice command and sends the necessary data to the Node MCU, enabling remote and hands-free control. The Node MCU receives the signal, extracts the data, and interprets the user's command, controlling the DC motor and water pump accordingly.

Google Assistant and Node MCU Interaction: Google Assistant is a voice-activated virtual assistant developed by Google. It allows users to interact with technology using natural language voice commands. In this system, Google Assistant captures the user's voice command and sends the necessary data to the Node MCU. This interaction enables users to control the feeding system remotely and hands-free, making it convenient and accessible. Node MCU (Command Extraction and Device Control): The Node MCU is a low-cost, Wi-Fi-enabled microcontroller board that can be programmed to control various devices. In this system, the Node MCU receives the signal from Google Assistant, which contains the user's voice command. The Node MCU parses the received signal, extracting the essential information required to execute the user's command. Once the necessary data has been extracted, the Node MCU interprets the user's command and sends control signals to the DC motor and water pump. This process enables the Node MCU to activate the food dispenser and water pump, ensuring that pets receive proper feeding and hydration. DC Motor and Water Pump: Food and Water Dispensation: The DC motor and water pump are essential components of the pet feeding automation system. Once the Node MCU sends the control signals, the DC motor and water pump perform the following actions. The DC motor rotates, activating the food dispenser. Pet food is dispensed from the container in predetermined quantities, ensuring proper feeding. The DC motor's rotation speed and duration can be adjusted to control the amount of food dispensed. The DC water pump starts to pump water from the tank, dispensing it into the water bowl. This feature ensures that pets have access to fresh water at all times. The water pump's flow rate and duration can be adjusted to control the amount of water dispensed.EPS32-CAM (Image Capture and Transmission): The EPS32-CAM is a low-cost, Wi-Fi-enabled camera module that can be integrated with the Node MCU. In this system, the EPS32-CAM captures an image of the pet food bowl after food dispensation, providing visual confirmation that the food has been successfully dispensed. The captured image is then sent via Telegram to the pet owner, allowing them to monitor their pets' feeding remotely. This feature provides peace of mind to pet owners, ensuring that their pets are being fed properly even when they are away from home.

IV. CONCLUSION

The onset of smart pet feeders represents a notable leap forward in pet feeder machines. These innovative machines offer pet owners unprecedented control and insight into their pet's nutrition. With features like remote scheduling, portion control, and real-time monitoring through smartphone applications, smart pet feeders enable owners to modify their pet's feeding routines with precision. Moreover, the integration of smart technologies not only enhances convenience but also nurtures a deeper connection between owners and their pets. The ability to remotely interact, observe, and even dispense treats provides a sense of engagement and care, even when physically apart. This is particularly useful for pet owners with busy schedules, ensuring that their pets receive nourishment and attention consistently. Although the initial cost may be higher compared to traditional feeders, the long-term benefits in terms of customization, health monitoring, and peace of mind make smart pet feeders a valuable investment for those seeking an elevated standard of pet care. As these devices continue to evolve, the future promises even more sophisticated features, further enhancing the lives of both pets and their devoted owners.

V. FUTURE SCOPE

The future scope of smart pet feeders holds several exciting possibilities as technology continues to advance and evolve. Future smart pet feeders could incorporate advanced artificial intelligence algorithms to better understand and cater to pets' dietary needs. AI could analyze factors such as pet activity levels, age, and health conditions to optimize feeding schedules and portion sizes, it also could incorporate biometric recognition technology to identify individual pets and dispense personalized meals based on their dietary requirements. This could be particularly useful in multi-pet households with pets on different diets. Advances in connectivity technologies such as 5G and improved Wi-Fi standards could enhance the reliability and responsiveness of smart pet feeders, reducing the risk of connectivity issues and ensuring seamless operation. Smart pet feeders could collaborate with pet healthcare providers to offer personalized nutrition and wellness plans tailored to each pet's unique needs.

VI. REFERENCES

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