IoT Based Automatic Pet Feeding and Monitoring System

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Abstract*: With the increasing use of technology and busy life people look out for having emotional attachments which can bring some joy in their life. Pets are loyal and loving and this is the reason why many people adopt them. Pets are no less than real member in the family but now there are times you need to leave your pets at home for long duration. Pets require extra care, and it is not easy as it used to be with today's busy lifestyle. As a result, one of the significant challenges has been figuring out how to grow pets in a simple manner. We here propose to design a dog day care system so that we can monitor as well as feed the dogs or cats in a timely manner. The system is IoT based which is build using Raspberry pi which can take care of your pets alone at home. The system is integrated with the Pi camera that allows for live streaming over IOT platform to get on demand footage of home. SD card is key part of Raspberry pi which provides internal storage for files. Servo motor is used for opening and closing function of the container. Relay channel is used for pumping water into the container. We can control the system online over internet. This allows you to be with your pets no matter where you are. It is also integrated with the speaker that calls out the pet during the feeding time. The system consists of two containers, one of the containers is used for storing the dog food and another container is used for storing water. Food and water will be dispensed into these containers in fixed time intervals.

***Keywords*: IoT, Pi camera, Raspberry pi, SD card, servo motor, speaker.**

1. Introduction

For an animal lover, or specifically a dog lover, most of the pet owners nowadays want to enjoy the company of their pets, pets are no less than real member in the family. Some of the pet owners have the patience and time to feed the pets and some do not have the time to do. Due to concurrent tasks demanding owners' attention, couple with busy lifestyle, management of these pets may not be as simple as expected. Well, we here propose to style a dog day-care robot which will monitor as well as feed the dogs in an exceedingly timely manner. Not every pet owner is available to feed their pets according to their diet schedule, in fact most of the pet owners who are working or studying until late hours of the day are not punctual at feeding their pet, well generally people under estimate the harm of this problem, pet owners usually under look this issue with an un-solving dangerous solution which is over filling the food dish with a very large quantity of food, not only busy pet owners do this but also pet owners that have the impatience of putting food for their pets 3 times a day and doing this process daily is a burden on them. It is obvious that pets require special care and treatment. However, because of the busy routine, it becomes very difficult to care for pets.

The present research is an IoT-based pet care system which includes two subsystems:
- food feeder
- water dispenser

This device is useful for not only feeding the pet automatically but also dispense the water. This device is used to call the pet at feeding time, and we can also monitor our pet. Overall to own a good and more personalized experience of keeping pet, this device would be useful.

2. Literature Survey

"IoT Based Dog – Daycare Robot" this paper was published in IRJMETS in July 2022. This device is useful for feeding the pet automatically and to take care of pet's diet. It will call the pet at feeding time. Hardware components such as Atmega328p Microcontroller and Node MCU is used in this device and just by pressing one button from anywhere in Blynk mobile application through internet the user can feed their pet. Dispensing system consists of a container that acts as storage for the food, dc motor to mechanize the dispensing action and a Node MCU with motor driver to regulate the motor. Basically, the output current offered by developing boards like Node MCU is within the order of 40mA and dc motors require a decent 500mA to drive them that's why the motor driving shield comes in. The logic. The robot is intended to feed the dogs whenever the owners are off from them. This robot is integrated with a camera module that permits for live streaming and provides on demand footage of home. [1]

"Automatic Pet Feeder using Arduino IoT" this paper was published online in May 2021. Arduino, Node MCU, Servo Motor, IR sensor are the components used in this device. Pet feeding is done through a webserver/ mobile app. Manages the canine weight properly. Pet is taken care of thoroughly. This device is clear to take care of the pets at the shortfall of the

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owner. This programmed pet feeding system ensures of taking care of the pet without its lord.[2]

"Implementation of an IoT based Pet Care System" this paper was published in Fifth International Conference on Fog and Mobile Edge Computing (FMEC) in 2020. This project implements an IoT-based pet care system applying several sensors and actuators on three devices (food feeder, water dispenser, and litter box). The food feeder subsystem contains functions such as instant and remote food dispensing and food consumption monitoring. The water dispenser can monitor water consumption. The litter box records the frequency and timing of the pet goes to the toilet. To combine the three subsystems, an interface is used in a smartphone to control and monitor the devices as well as display the statistical records.[3]

"Design and development of IoT based Smart Pet Feeder" this paper was published online in May 2020. This project is software based where a mobile application is developed. This mobile application is for pet owners, it acts as an interface between pet owner and the pets. After logging in, the user will click on feed button where food will be thrown through the servo motor. Before that pet feeder is started. When image is capture is it stored in cloud and then it is taken from cloud. And finally, the photo is captured.[4]

"IoT based Pet Feeder" this paper was published online in March 2020. In this the device can be set in two different modes such as smart mode and control mode. In smart mode the specific amount of food is dispensed based on pet's weight. In control mode, there are two methods. It can be run as automatic where the system is scheduled for certain time to dispense the food with adjustable dispensing time. In manual mode, user can dispense food at any certain duration defined.[5]

"Mobile based monitoring system for an automatic cat feeder using Raspberry pi" this paper was published in 2020. The cat is a clean animal but keeping one at home takes effort and attention. As a result, utilizing a webcam and a stepper motor coupled to a Raspberry Pi as the main controller, this study constructed a monitoring system for an automated cat feeder. With the webcam and ancon functions, the camera captured images (pictures or movies) stored on the Raspberry Pi. The stepper motor will switch the supply valve using a General-Purpose Input Output (GPIO) pin and a program on the Raspberry Pi. The Raspberry Pi is then connected to the internet and a cloud network, allowing remote device monitoring via a web browser or smartphone app. The overall function of the machine, either immediate or planned, as well as tracking images or videos around the food in the form of feeding the cat. Finally, it is proposed to upgrade the monitoring system used to feed cats using a high-resolution camera. In addition, the use of a large stepper motor makes the revolution more powerful and faster when feeding the cat.[6]

"Pet care system based on android application" this paper was published in International Journal of Trend in Scientific Research and Development (IJTSRD) in June 2018. It is a pet care system based on android application. It helps in giving temporary pet adaptation facility on payment basis. The android application consists of two parts. There is owner application and doctor application. With the use of owner application one can search for temporary caretaker where the application will be used by pet owner as well as pet caretaker and doctor application allow veterinary doctor to upload pet related any kind of information.[7]

"A Pet Animal Tracking System in Internet of Things using Deep Neural Networks" this paper was published in 13th International Conference on Computer Engineering and Systems (ICCES) in 2018. Pet monitoring in smart cities is a challenging issue. The classic approach to identifying animal tracking methods, such as airbags, GPS, and RFID, has the disadvantage of providing full monitoring and tracking of pets. Such devices have many limitations and are very expensive. This paper presents an approach to video tracking pets to identify and categorize the object of interest using in-depth learning skills. This includes three steps, the first one is object localization or where is the pet. The second step is object recognition or is it a cat? The third step is tracking the object frame by frame. All this is done using the Fast RCNN.[8]

"Health experts for pets using mobile apps" this paper was published in International Conference on Technologies (ICAMMAET) in 2017. This is a pet mobile application which can be used for health management and clinical practices. It can also help prevent any disease attacks to pets. In emergency time a pet specialist can be called by taking appointment through online mode. All the nearby pet hospitals will be shown to the pet owner which becomes an easy task as it saves a lot of time. Pet can be taken for the treatment in the nearby hospital at the earliest.[9]

"The Study and Application of the IoT in Pet Systems. Adv. Internet Things" this paper was published in 2013. The pet system is divided into two parts, the first one is the smart pet door which helps the pet owner to control the pet activity. The other device is the smart pet feeder in which the pet owner can schedule pet feeding time. As a next move, they will attempt to bring into their setup the other pet grooming tools, including litter boxes, pet monitors, etc. This will satisfy the owners' varied desires as well as concerns of wellness, surveillance, and entertainment.[10]

"For the Pet care Appliance of Location Aware Infrastructure on Cyber Physical System" this paper was published in 2012. This thesis introduces an intelligent method of pet care based on Internet definition. They suggested a mobility-aware algorithm to allow digital home technologies for pets, including an intelligent pet door and a pet feeder. The device uses control software in control/web server. The pet owner can monitor the pet location, can also schedule feeding time, and command the food bowl cover to open remotely. To make it more interactive, music will be played when it is eating time for pet. For the software making, C# is used for the native client user and PHP language is used for PHP program which can be remotely executed on smartphone as the pet owner wishes. [11]

3. Hardware Used

A. Raspberry Pi

The Raspberry Pi is a credit card sized computer. The Raspberry Pi 3 Model B+ is an improved version of

the Raspberry Pi 3 Model B. It is based on the BCM2837B0 system-on-chip (SoC). The Raspberry Pi was designed by the Raspberry Pi Foundation to provide an affordable platform for experimentation and education in computer programming. The Raspberry Pi can be used for many of the things that a normal desktop PC does, including word-processing, spreadsheets, high-definition video, games, and programming. USB devices such as keyboards and mice can be connected via the board's four USB ports.

Fig. 1. Raspberry pi 3b+

B. Pi Cam

The Camera Module 2 can be used to take high-definition video, as well as stills photographs.

Fig. 2. Camera module

C. SD Card

The SD card is a key part of the Raspberry Pi; it provides the initial storage for the Operating System and files. Storage can be extended through many types of USB connected peripherals.
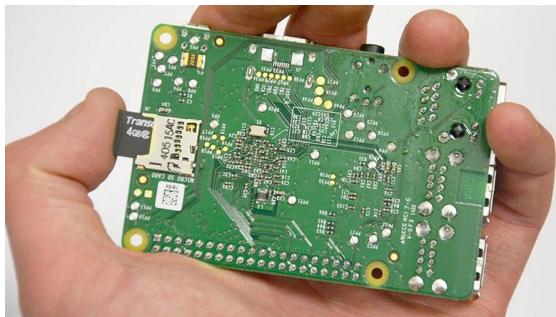

Fig. 3. SD card

D. Servo Motor

A servo motor is a type of motor that can rotate with great precision. Normally this type of motor consists of a control circuit that provides feedback on the current position of the motor shaft, this feedback allows the servo motors to rotate with great precision. If you want to close or open object at some specific angles or distance, then you use a servo motor.

Fig. 4. Servo motor

E. Relay

A Relay is a simple electromechanical switch. While we use normal switches to close or open a circuit manually.
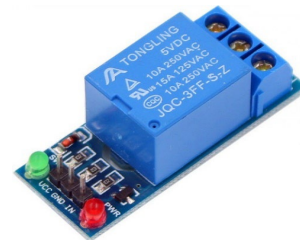

Fig. 5. Relay 1 Channel

F. Speaker

The purpose of speakers is to produce audio output that can be heard by the listener.

Fig. 6. Speaker

4. Software Used

VNC is a tool for accessing your Raspberry Pi graphical desktop remotely. Setting up VNC is easy, but it usually only gives you access from another computer that is on the same network as your Raspberry Pi. VNC (virtual network computing) is a client-server software which can be used to display and control the screen content of the target system (server) on another system (client). For this purpose, keyboard entries, mouse movements, and clicks on the client side are transferred directly to the remote computer. So, if you install and activate VNC on a Raspberry Pi, you can easily install, configure, and manage the minicomputer from another PC. VNC is based on the cross-platform network protocol remote framebuffer protocol (RFB), which transmits the content as bitmaps and uses TCP port 5900.
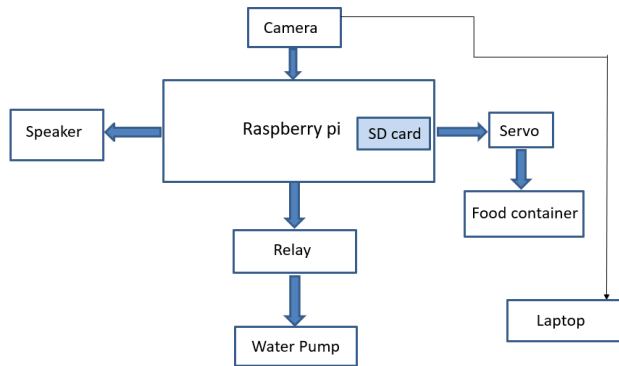
Fig.7. Block diagram

5. Working

Firstly, we have to give input to the software called VNC Viewer. Now from the given input, the raspberry pi 3B+ dispenses water using pump which is connected to relay 1 channel. Also, raspberry pi 3B+ opens lid of food container using servo motor. Now to put IP address of raspberry pi 3B+ in the url section for the live surveillance through camera module. Finally, we can feed our pet as well as can keep watch on them.

Fig. 8. Working model (Result)

6. Conclusion

Automatic pet feeder is the solution for those who love to keep pet in house but because of busy schedule they may not be able to provide food to their beloved pets at fixed time. This prototype can be used to release food by inputting the chosen time. Water will also dispense in the container through the water pump in which it will be stored. A speaker is also attached in the robot in which the voice is added to make the pet feel that the owner is communicating which can comfort them. In addition, a camera is also fixed in the robot which helps in monitoring the pet.

Thus, the proposed prototype is expected to have immense opportunity to serve the said purpose in present society, because of which pet owners can go anywhere without worrying about their pet. The project is being made such that it could be affordable to everyone easily.

7. Future Scope

After a series of troubleshooting and code editing, we were able to create an Automatic Pet feeder that dispense food and water at right time that can help the owner to feed the pet easily. The Automatic Pet feeder is also integrated with camera which helps in monitoring the pet. Our Automatic pet feeder has a lot more things to improve. The body of the pet feeder can be made in such a way that even if the pet does something to the device it will not get damaged from outside as well as inside. One of the ways of taking this device to next level can be done by adding some features and technology to the device so that the pet owner can do live interaction with the pet. The pet will not only enjoy this but also can become an interactive device for the pet.

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