

Development Of Smart Pet Monitoring System

Mr. Kiran Kumar K¹, Rishav Pandey², Nirmal Pereira³, Dabbara Sai Charan⁴, Anurag Kumar⁵

Department of Mechatronics Engineering Acharya Institute of Technology Bengaluru

¹*kirankumarkommu@acharya.ac.in*

Abstract

*In this paper, development of a Smart pet care system, which will provide feeding and monitoring assistance of the pet to pet parents who are unable to be present with their pets due to their work/job. The whole project is based on Arduino. 'Smart Pet Monitoring System' is designed with components like Arduino, ArduCam, Servo motor, 16*2 LCD, Sensors, ESP8266 Wi-Fi Module, 4x4 membrane keypad and weight sensor, HX711 AD convertor.*

Arduino is the main component which is used to control all processes. It acts like a controller. A camera is used to monitor the pet, which can be accessed through a dedicated website or a mobile application. A buzzer is used to notify the pet about food dispersal. The purpose of this project is to make monitoring and feeding pet remotely more affordable and efficient. This project also demonstrates the I2C protocol of communication, here used to let multiple Arduino boards communicate with each other.

Index Terms: *Arduino, Camera, Weight sensor, I2C Protocol, Electric motors*

1 Introduction:

Pets have proved to be really good companions to humans since ancient times. Earlier it was easier to let your pet tag along with you anywhere you go. But in modern times pets are restricted at many places and it is not easy to care of them between our busy schedule. At the end we are forced to leave our pets alone in home, most of the time. Whenever they are alone at home and they get hungry, they usually have to wait until their owner gets back. Also, during the time, they are alone at home the owner is usually unable to monitor them. A Pet Monitoring/Feeding System is required under these circumstances. These systems are sometimes complicated to use or are too expensive for it be affordable by everyone. We aim to make this system very cheap and highly efficient.

This device can provide regular feeding and monitoring abilities to owner without disrupting their daily professional routine. Owners can monitor and feed their pets with any device with internet connection. 'Smart Pet Monitoring System' can send feeding report, and pet arrival when the feeding time has come. Every setting about feeding time, food quantity can be set by the user on the system with the help of keypad provided or through any other device with Internet and a web browser. Primarily there will be a website as all the networking center to control the device over Internet connection or the machine can run fully automated in offline mode once the feeding time and food quantity is scheduled by user. Further, the user does not need any specific application as everything can be controlled through a website from any device.

Water for the pet will be available any time, that is, no need to schedule the timing to pour water in the bowl as we can't keep our pet thirsty for until the next scheduled time set in the system.

2 Aim And Objective

A.Aim

The basic aim behind this project is to build a device which can take care of the pet's diet in our home, in our absence during our busy schedules by providing them with the food in set quantity, water as well as monitoring them visually.

B. Objective

The objective of the project is to build a device which automatically feeds our pets in a scheduled manner. The device must be able to function in fully automated manner in offline mode and also should be able to let user control the system remotely in online mode. This project is efficient, easy to use and affordable.

3 Problem Definition

Owners often have a problem to feed their pets in the required time because of their work/job. If a pet does not get food in their habitual time then it is often seen that they will be stressed out. And also, on diet aspects, if we see for example a dog which has reached its expected adult weight, a well-maintained diet is recommended. The dietary goal is to maintain optimal body weight and condition for that particular dog and to avoid the mental stress and anxiety, which they are highly prone to. And monitoring them in our absence is also a challenge.

4 Existing Problem

Pets also need love and care. Due to nowadays busy life style, this task is not as simple as it used to be. Not everybody is a pet expert; it can be hard and time consuming to take care of your pet's diet. An overeating and obesity are among the top health concerns of pets. Especially at younger age, however much is given to them they are usually satisfied. Another problem with feeding pets is that owners may not always be consistently at home. Being busy with personal plans knowing they still have one still have a starving little fellow at home to be taken care of is always a concern that bothers owners.

5 Solution For Problem

Our project is designed to build a compact model which will help all the pet's owner to feed their pets and monitoring them visually, remotely and smartly.

The Benefits to the customer:

- Owners will be able to feed the water in the correct amount and in the scheduled time to their pets by setting it on their phone app. Water will be available anytime for the pet.
- Owners will be able to monitor their pet's health condition via their daily consumption of food recorded by the app.
- Sensors will be embedded on the gate of the food container, which measures the difference of weights of each time meal served.

- Information will be processed by PCB and sent to the phone app. Pet will have a RFID tag which will give signal to the device for dispensing food.

6 Proposed Block Diagrams And Flowchart

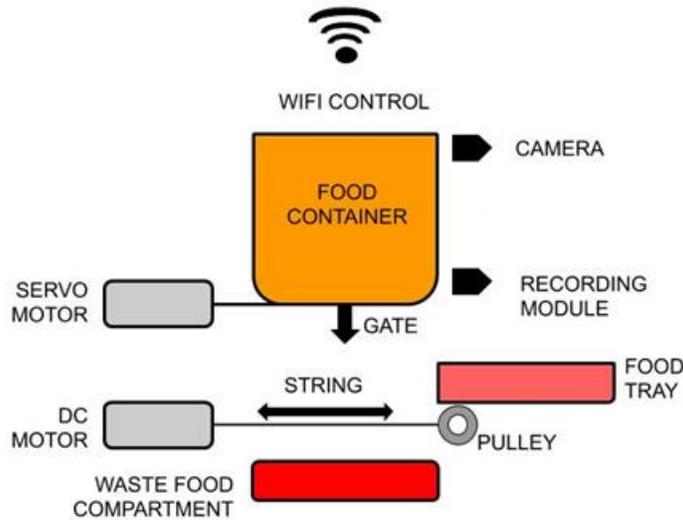


Fig 1: Block Diagram

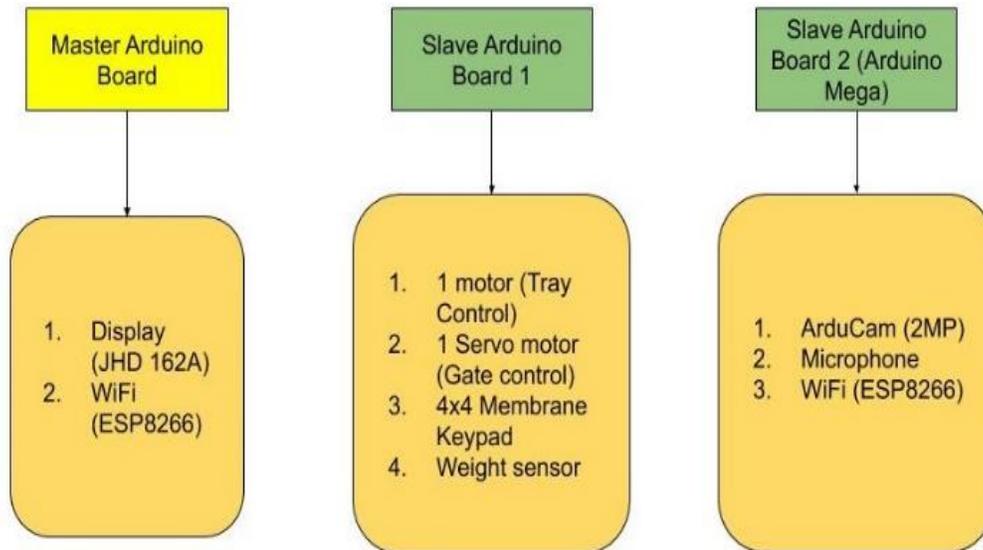


Fig. 2: Block diagrams of the process

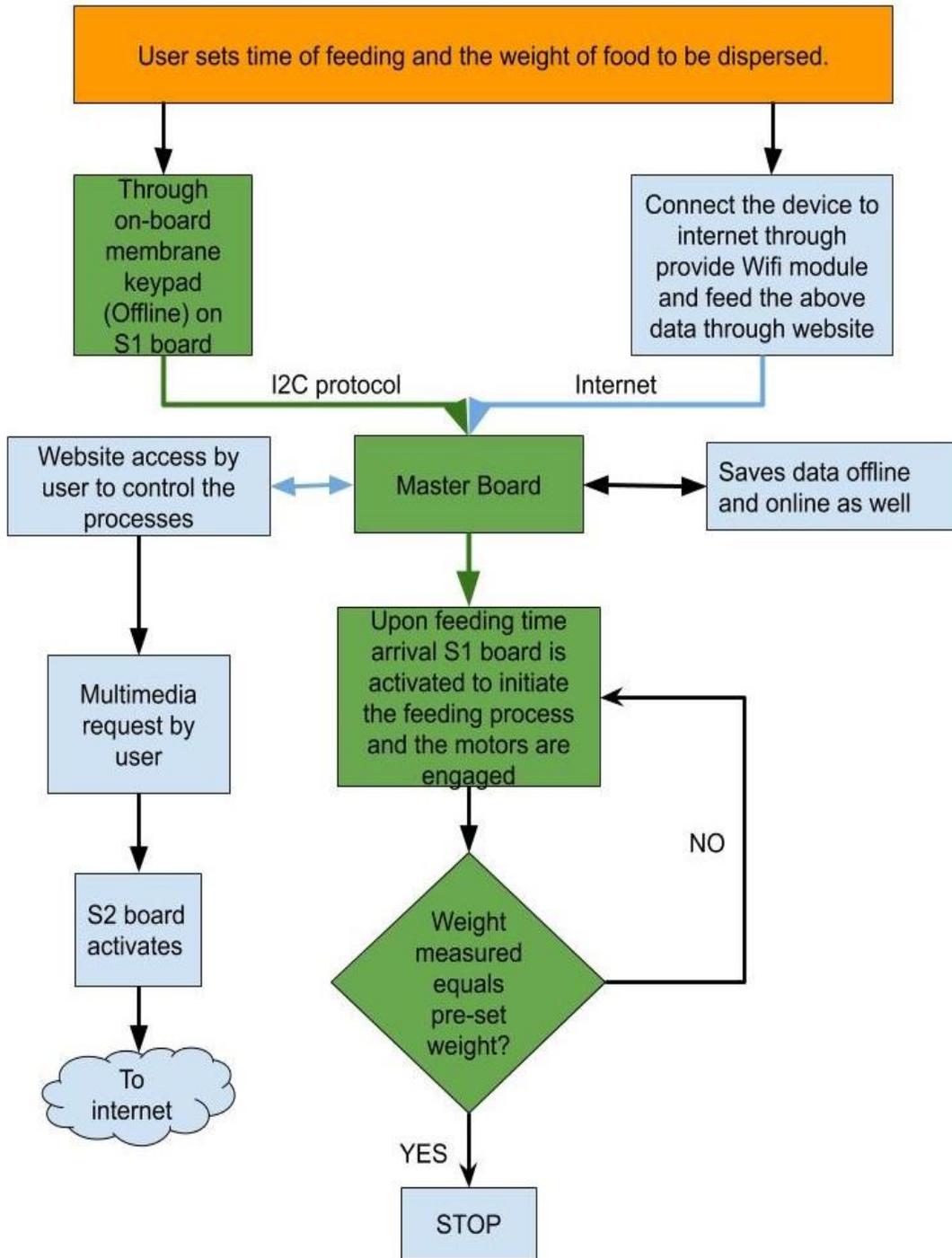
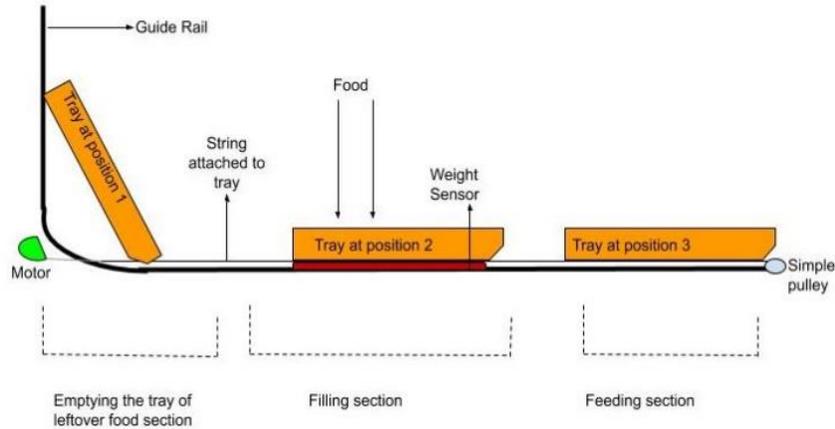


Fig. 3. Flowchart

TRAY CLEANING MECHANISM



7 Construction And Working

A. Construction

Different sensors and components have been used in this project, which will be controlled by Arduino. There will be one master Arduino and two slave Arduino communicating through i2c protocol. In I2C protocol used here we have one Master Arduino board and 2 slave Arduino boards. In general, I2C protocols can have one Master and 127 slave devices. Modern day microcontrollers are enabled to communicate with each other through this protocol which serves as a common platform between various devices like sensors, controllers etc. Slave 1 will read user input, read weight sensor data and engage/disengage dedicated motors to serve food and clean leftover food. The weight sensor is never connected to Arduino directly. Instead we use an Analog to Digital converter to read the data of the sensor. This is done because sensor's raw output is analog and for it to be readable by the Arduino the data should be converted in digital form. Slave 2 will be completely dedicated for monitoring function with the help of camera and microphone. Slave 2 will have its own Wi-Fi module to connect to the internet for multimedia sharing purpose. Similarly, master Arduino will have its own Internet connection to initiate all the process depending upon user interaction. To notify the pet for the food service, a buzzer will be used.

A camera is also installed in the device that will monitor the pet visually. The camera will take pictures at the time in between feeding and also when we command it to take pictures. Additionally, the device can have set delay between consecutive pictures, say 15-minute, 1 hour or so on.

Servo motor is used at the gate of the food container which will rotate at a certain angle to dispense the food into the tray. And an electric motor is used which will move the tray in and out of the system by a string attached to it. A special movement of tray guided by guide rails is used to collect leftover food in the waste food compartment. It is done to clean the tray every time before new food is dispersed.

B. Working

First the user will set the date and time for the machine using keypad provided. Then user needs to set the time for food dispensing and the weight of food to be given. This data will be stored in master Arduino board. Second thing which user must do is connect the device with a Wi-Fi network. To assist the user in these processes an LCD (16x2) is provided.

Now after the set-up is completed, user's job is done. After that machine can handle further processes on its own. When the time arrives for feeding, the Master Arduino sends a signal to Slave 1 Arduino. Slave 1 will have direct control to the gate motor, and tray control. Also, the keypad is attached to the S1 board and will send the entered data to master Arduino through I2C protocol. This setup is chosen to minimize hardware requirement and decrease the overall cost. The S1 will have weight sensor attached to it to stop the dispensing of food.

The user can initiate dispensing manually through a website anytime. The user can also request images/videos anytime they wish. For that user initiates a request through a website. The request is then sent to Master board which then sends the request to S2 board. Now, the S2 board has camera and microphone connected to it. It also has its own Wi-Fi module for connection. As soon as it receives a request, it starts sending the multimedia data to the website directly. The reason why S2 board is provided with its own Wi-Fi module is to provide a faster data transfer by avoiding data to go through master board.

Communication between device and website is simple. Both the boards, which are provided with their own Wi-Fi modules are programmed to communicate with a specific page of the website. For instance, the master board will communicate to food related data base management system. This section is provided with a different page of same website. Similarly, the S2 board will be communicating with multimedia page of the same website.

8 Advantages And Applications

A. Advantages

- The 'Smart pet monitoring system' is used to regulate the food of the pet.
- It delivers a proper quantity of food in the given scheduled time.
- Monitoring them in owner's absence by adding camera and speaker to the machine.
- The owner can stay virtually in contact with the pet anytime

B. Applications

- The main purpose of this pet feeder is that it will maintain health of the pet by giving them proper quantity of food so that the pet doesn't get malnourished or over-weight.
- We can schedule and reset the timing for food as and when required from website
- No need to measure and segregate each dose for the pet as the system will do by itself
- The owner can leave the house for few hours to few days without worrying that the pet will be starved in his absence.

9 Conclusion And Future Scope

A. Conclusion

In this project, we have taken several components and integrated them to form a device which will be easy to use for the pet's owner. This automated system is possible by using Arduino as the microcontroller.

Other components include camera, a voice module and a Wi-Fi module.

The camera will capture the image of the pet as it is eating the food and also at our command whenever it is given. Recording module will store voice of the owner to notify the pet for food serving. And a Wi-Fi module will be integrated to the system, so that the owner can control the device away from home using their smartphone.

B. Future scope

- The device will provide food and water along with the surveillance in their absence.
- Based on its development and owner's needs, it can be made more advanced by adding more sensors for respective tasks.
- The future is of home automation, therefore it can be integrated with the same.
- This will be an excellent approach to the animal's lovers and people who feed stay dogs with more advancements in existing software and hardware.

Acknowledgment

The paper is based on creating an automated system that is used to feed home pets. Here we analyzed and did the necessary calculations to choose the components for this system. We provide both manual and online methods of control for user. The user can operate and monitor the system irrespective of his location. We all the authors are very much thankful for continuous support and inspiration received from our guide and also very grateful to our family members for moral support, inspiration and financial support.

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