Mini Project report on

SMART PET FEEDER

Submitted by

THOMAS JOSE [FIT21EC119]

Focus on Excellence

Department of Electronics & Communication Engineering

FEDERAL INSTITUTE OF SCIENCE AND TECHNOLOGY (FISAT)®
Angamaly-683577, Ernakulam

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FEDERAL INSTITUTE OF SCIENCE AND TECHNOLOGY (FISAT) ®

Mookkannoor(P.O), Angamaly-683577

Focus on Excellence

CERTIFICATE

This is to certify that the Mini project report titled **Smart pet feeder** submitted by **THOMAS JOSE**, towards partial fulfilment of the requirements for the award of the degree of **Bachelor of Technology** in Electronics and Communication Engineering is a record of bonafide work carried out by him during the academic year 2024.

Project Guide

Head of the Department

Internal Examiner

External Examine

Place: Mookkanoor

Date:

ACKNOWLEDGEMENT

We extend our heartfelt gratitude to all those who have contributed to the completion of this project. Their support, guidance, and encouragement have been invaluable throughout this journey. First we thank our college for proving the necessary resources, facilities, and funding, allowing us to undertake this project. We are also thankful to the principal **Dr. Jacob Thomas V** and the Head of the Department of ECE **Dr. S Krishna Kumar and** our mini project coordinators **Asst. Prof. Anoop E.G** and **Asst. Prof. Nimmy M Philip** for their wholehearted support. We are also thankful to one and all faculty members of the department of Electronics and Communication Engineering for their guidance and wholehearted support. Their effort and sincerity will always be remembered in our hearts. We thank our guide **Asst. Prof. Deepa N.R:** For her invaluable guidance, support, and expertise the project's development, providing valuable insights and encouragement. This project's success would not have been possible without the collective efforts and encouragement from her.Last but not the least, we wish to thank our parents for financing our studies in this college as well as for constantly encouraging us to learn about engineering. Their sacrifice in providing this opportunity to learn engineering is gratefully acknowledged.

Furthermore, we would like to extend our thanks to our fellow classmates and colleagues for their cooperation and assistance during various stages of this project. Their collaboration and constructive discussions have enriched our understanding and helped us overcome many challenges. Our team members for their dedication, hard work and collaboration in bringing the feeder system, contributing their skill and efforts to its successful implementation.

Last but not least, we owe a debt of gratitude to our friends and family for their unwavering encouragement, understanding, and patience throughout this endeavor. Their moral support has been our source of strength during both the highs and lows of this project.

ABSTRACT

At present automated technology is a trend and is easy to access, user friendly and easy to monitor. Having pet can be an enjoyment in our life. In this paper a prototype has been proposed to solve the problem of providing food and water for all types of pets when owner is residing away from home such as lockdown situation or constantly travelling. By the application of this prototype, the owner can supply food and water to the pet at their needed time. The system comprises a food dispenser and a water dispenser, both equipped with ultrasonic sensors to monitor food and water levels in real-time. Additionally, a load cell beneath the food bowl detects when food is consumed, providing instant feedback to the owner via the mobile app.

Integration with an ESP32CAM module allows owners to access live video feeds of their pets during feeding times, providing peace of mind and ensuring that pets are eating properly. The dispensers are controlled by servo motors, connected to an ESP8266 microcontroller, enabling precise and timely dispensing of food and water. Furthermore, the system includes a cleaning feature initiated through the mobile app, where a water pump delivers water to the bowl, facilitating easy cleaning. The bowl then rotates to its original position, ensuring cleanliness for the next feeding cycle.

LIST OF FIGURES

Fig. No.	Fig. Name	Page No.
3.1 a.	1st ESP8266 Block Diagram	17
3.1 b.	2nd ESP8266 Block Diagram	18
3.1 c.	ESP32CAM	18
3.2 a.	1st ESP8266 Circuit Diagram	21
3.2 b.	2nd ESP8266 Circuit Diagram	22
4.1	ESP8266 Wi-Fi Module	23
4.2	Servo Motor	24
4.3	Ultrasonic Sensor	24
4.4	Load Cell	25
4.5	ESP32-CAM	26
4.6	Relay Module	27
4.7	Water Pump	27
5.1	Blynk App	28
7.1	Creating Dashboard	30
7.2	Working of two dispensers	31
7.3	Live Streaming Video	32

LIST OF TABLES

Table. No.	Table. Name	Page No.
6.1	Cost Estimation	29

ABBREVIATIONS

ESP	:	Electronic Stability Program
IoT	:	Internet of Things

CONTENTS

		Page No
Chapter 1	**INTRODUCTION**	11
Chapter 2	**LITERATURE SURVEY**	13
2.1	**RFID based Smart Feeder for Hummingbirds**	
2.2	**Smart Dog Feeder**	
2.3	**Automatic Fish Feeder**	
2.4	**Smart Feeder Monitoring Devices**	
Chapter 3		
3.1	**Block Diagram**	17
3.2	**Circuit Diagram**	21
Chapter 4	**COMPONENTS**	23
4.1	**ESP8266 Wi-Fi Module**	
4.2	**Servo Motor**	
4.3	**Ultrasonic Sensor**	
4.4	**Load cell**	
4.5	**ESP32-CAM Module**	

Chapter 5

5.1 Software 28

Chapter 6 COST ESTIMATION 29

Chapter 7 RESULT 30

Chapter 8 APPLICATIONS 33

Chapter 9 CONCLUSION 34

Chapter 10 REFERENCES 35

Chapter 1
INTRODUCTION

In today's fast-paced world, pet ownership comes with its own set of challenges, particularly for individuals with demanding schedules or frequent travel commitments. Ensuring that pets receive regular and timely meals can be a logistical hurdle for such owners. To address this issue, we introduce the Smart Pet Feeder project, a revolutionary solution designed to alleviate the stress of pet feeding for busy pet owners.

The Smart Pet Feeder is a comprehensive system that enables pet owners to remotely and accurately manage their pet's feeding schedule through their mobile devices or computer systems. By leveraging the power of IoT (Internet of Things) technology, this project offers a seamless and intuitive feeding experience for both pets and their owners.

At the heart of the Smart Pet Feeder lies its remote control functionality, which empowers pet owners to manage feeding schedules and monitor their pets' well-being from anywhere in the world. With the simple press of a button on their smartphone application, owners can dispense food and water to their pets, ensuring they receive nourishment even in their absence. Real-time notifications provide peace of mind, alerting owners when their pets have been fed and allowing them to stay connected with their furry companions at all times.

The Smart Pet Feeder's control system is powered by an ESP8266 microcontroller, orchestrating the operation of the dispensers, sensors, and cleaning mechanisms. Servo motors facilitate the precise opening of the dispensers, while a water pump and valve system enable effortless bowl cleaning

at the touch of a button.

We have connected servo motors at both the dispensers for the opening mechanisms, so when the button for food or water is turned on then the servo works and opens the corresponding dispenser. Also after having food by the pet the owner will receive notification.In addition to nourishing pets, the Smart Pet Feeder takes a proactive approach to waste management, promoting cleanliness and hygiene within the feeding area. By integrating a rotating bowl mechanism, the feeder effectively dispenses leftover food waste, ensuring that the feeding environment remains sanitary and free of contaminants. With the simple flick of a switch, pet owners can initiate the cleaning process, maintaining a healthy and hygienic space for their pets to dine.

Beyond its functionality as a feeding apparatus, the Smart Pet Feeder doubles as a surveillance system, providing owners with live video streaming capabilities through the integration of the ESP32-CAM module. This innovative feature allows pet owners to peek into their pet's world in real-time, offering reassurance and peace of mind, especially when they're away from home. Whether checking in during the workday or traveling abroad, owners can stay connected with their pets and ensure their well-being at all times.

The Smart Pet Feeder represents a quantum leap forward in the realm of pet care, blending cutting-edge technology with compassion and empathy to create a truly transformative experience for both pets and their owners. By harnessing the power of remote control functionality, waste management, and live video streaming capabilities, this project embodies the future of pet care, where innovation and love converge to create happier, healthier lives for our beloved companions. Join us on this journey as we pave the way for a brighter future in pet care with the Smart Pet Feeder.

Chapter 2

LITERATURE SURVEY

2.1 RFID based smart feeder for hummingbirds

Vicente Ibarra, Marcelo Araya-Salas, Yu-ping Tang, Charlie Park, Anthony Hyde, Timothy F Wright, Wei Tang

Sensors 15(12), 31751-31761, 2015

The project is an effort to record feeding behaviours and control the diet of a hummingbird by developing RFID based smart feeder. The system contains RFID reader, a microcontroller, and a servo-controlled hummingbird feeder opener. The system is presented as a tool for studying the cognitive ability of the LBH species. When equipped with glass capsule RFID tags the smart feeder can provide specific diets for predetermined set of hummingbirds at the discretion of biologists. This is done by reading the unique RFID tags on the hummingbirds and comparing the ID number with the pre-programmed ID numbers stored in the smart feeder. The smart feeder records the time and ID of each hummingbird visit. The system data stored in readily available SD cards.

2.2 Smart Dog Feeder using wireless communication, MQTT and Android client

Kanisius Karyono, I Hargo Tri Nugroho

2016 International Conference on Computer, Control, Informatics and its Applications (IC31NA), 191-196, 2016

Regular feeding is one of the problem in dog maintenance. Owners often forgot to feed their pets because of their work. Smart dog feeder is the answer to these problems. This device can provide regular feeding without disrupting owners work. Owners can monitor feeding process with their Android smartphones virtually. Smart Dog Feeder can give authentication with RFID, set feeding time and portion per serving through Android smartphones, send feeding report and dog arrival when the feeding time, portion, stock and waiting time will be set on Android with minimum requirement of Jelly Bean version, SDK 18 and has been installed with Application Hub application. Smart Dog Feeder has stock information, feedschedule, waiting time and owners name from server uses MQTT protocol. All information will be sent in JSON format and will be processed by smart feeder. Food will be served based on users setting and be measured by load cell. Experiments done by seeing punctuality, portion congruence, delivery of settings and notification within devices.

2.3 Smart Automatic fish feeder

K Premalatha, P Maithili, JJ Nandhini

International Journal of Computer Sciences and Engineering 5(7), 92-95, 2017

This paper deals with the design of smart fish feeder system for the application of home aquarium. An automatic fish feeder is a device/product which provides the right amount of fish food at a predetermined time and it helps the aquarist to feed their pet fish when on a vacation or too busy to maintain a regular feeding schedule. It also ensures their pet fishes are fed in healthy way on time. The aquarist can set the daily feeding time, feeding amount, number of repetition with the time delay and also other optional limits. The system smartly monitor the feed level and details are send to the aquarist via short message service.

2.4 Smart Feeder Monitoring Device

Nur Dalila Abdullah, Norfadila Kamarudin, Nurul Ayu Natrah Masuri, Nuwara Natasha Ibrahim

Journal of Design for Sustainable and Environment 1(1), 2019

This paper deals with an internet of things (IoT) system that has real data sensor, capture data and analysis the pellet consumption. Smart feeder monitoring is designed to feed fish automatically depending on the time set by the entrepreneur and it has the function to manually feed the fish according to the needs. The development of this project is to focus on the small industrial entrepreneur breeder where they are having difficulties of shortage of man power and no centralize data on the monthly consumption on the fish pellets. The methodology used for the development of agile method and Arduino UNO is used for main component to build the hardware and Firebase as the database. This paper is to address the effectiveness of having the Smart Feeder Monitoring over the manual ways to feed and to store data.

Chapter 3

3.1 BLOCK DIAGRAM

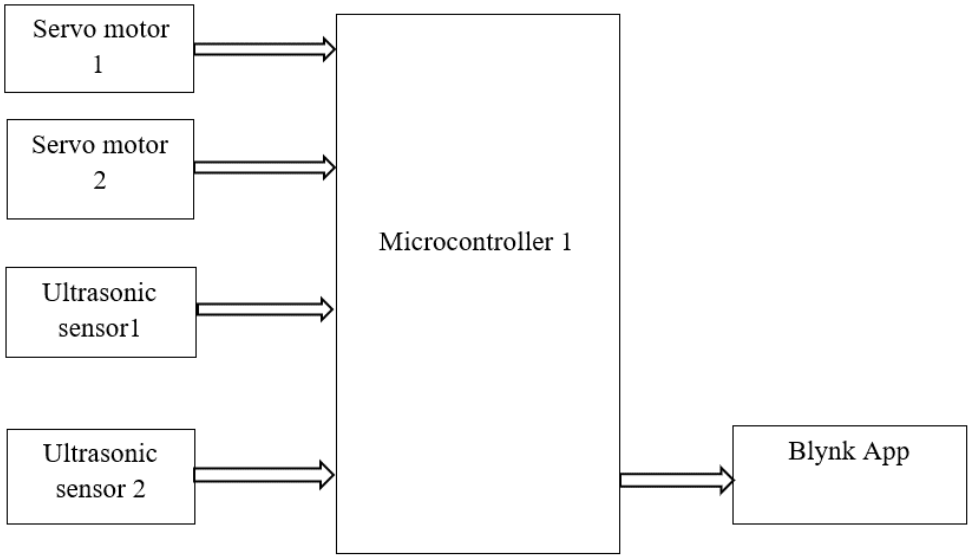

Fig 3.1 a. Block Diagram

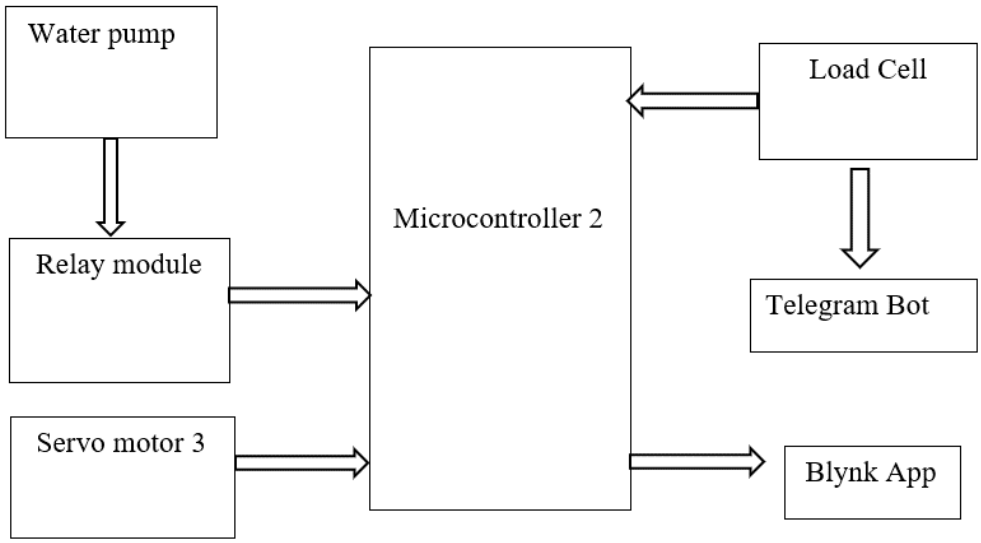

Fig 3.2 b. Block Diagram

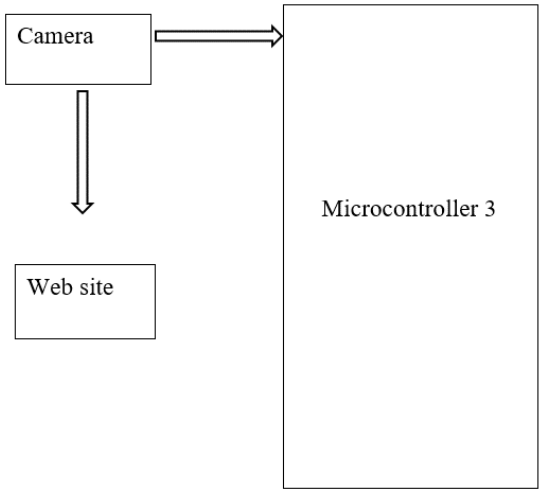

Fig 3.2 c. Block Diagram

The main part of our project is the microcontroller to which the other components are connected. In the Fig 3.1 a, Our project integrates servo motors, ultrasonic sensors, and a microcontroller (specifically ESP8266) to automate the feeding and watering of pets. The microcontroller is linked to the Blynk app, enabling remote control and monitoring. When the food switch is toggled on the app, servo motor 1 is activated. This motor controls the food dispenser, opening it to release food for the pet. Similarly, when the water switch is activated, servo motor 2 is triggered to open the water dispenser, ensuring the pet has access to water. To maintain efficient usage, ultrasonic sensors are mounted on both dispensers. These sensors continuously monitor the levels of food and water. When levels drop below a certain threshold, the sensors send signals to the microcontroller, which can alert the user through the Blynk app. This setup provides pet owners with real-time control over feeding and watering, regardless of their physical location.

Additionally, the monitoring feature ensures that pets always have access to food and water, enhancing their well-being and easing the responsibilities of pet care for owners. In the Fig 3.1 b When the designated button in the Blynk app is pressed, the water pump activates, spraying water into the food bowl to keep it moist. Upon pressing the subsequent button, the servo motor initiates, causing the bowl to rotate, ensuring even distribution of the moistened food. Key components of our setup include a relay module to control the water pump, a water submarine pump for spraying water, and a servo motor for bowl rotation. Additionally, we've incorporated a load cell and load amplifier into the system. The load cell, when detecting a weight exceeding the capacity of the bowl, triggers an alert message to be sent via the Telegram bot. This alert notifies the user that the bowl needs refilling, ensuring timely care for the pet.

In the Fig 3.1 c With the ESP32-CAM module, we've implemented a versatile solution for live video streaming and image capture, accessible via a dedicated website. This module facilitates real-time monitoring of activities, enabling users to view live video feeds and capture images remotely. By integrating the ESP32-CAM module with our system, users can access the live video stream from anywhere, at any time, simply by visiting the designated

website. This level of accessibility ensures that users can keep an eye on their surroundings or monitor specific areas of interest conveniently and effortlessly. In addition to live streaming, the ESP32-CAM module allows users to capture images of ongoing activities. Whether it's for security purposes, documenting events, or simply capturing memorable moments, users have the flexibility to take snapshots remotely through the website interface. The website serves as a centralized platform for accessing live video feeds and viewing captured images. Its intuitive interface ensures ease of navigation, allowing users to seamlessly switch between live streaming and image capture functionalities.

3.2 CIRCUIT DIAGRAM

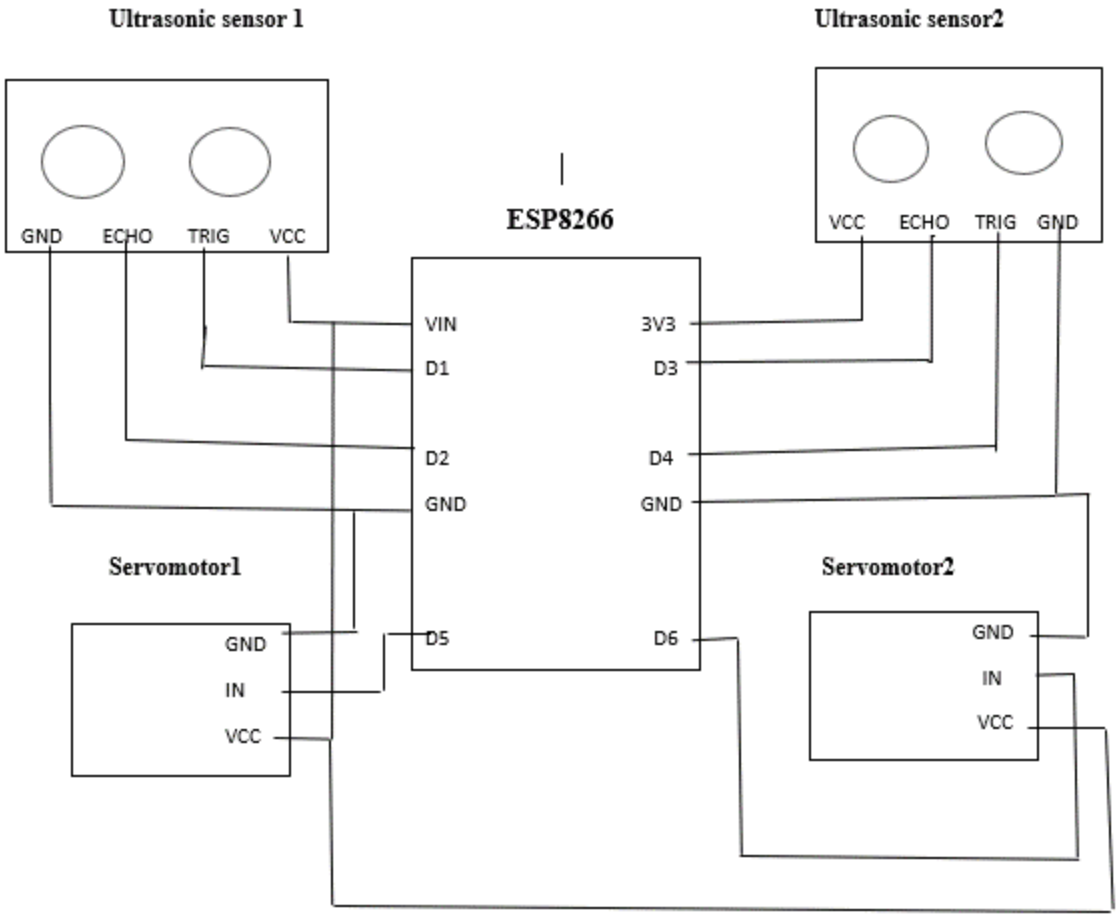

Fig 3.2.a 1st ESP8266 Circuit diagram

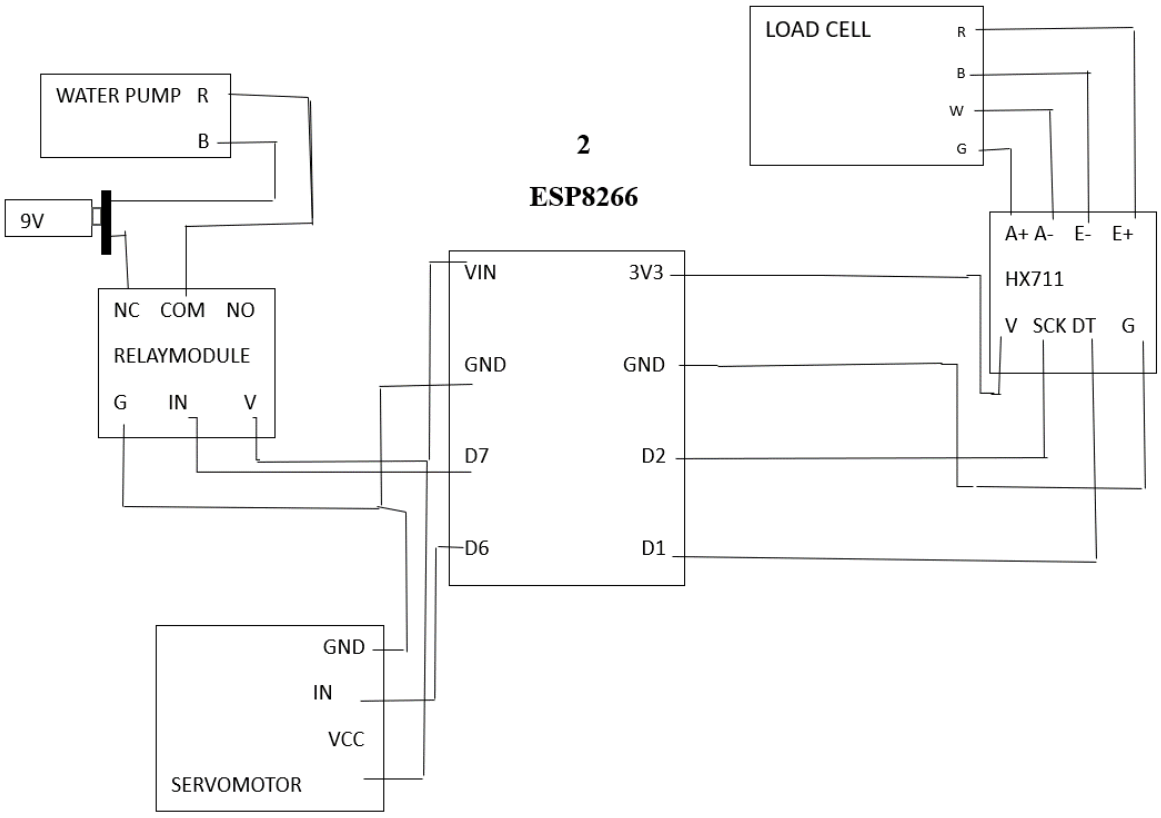

Fig 3.2.b 2nd ESP8266 Circuit diagram

Chapter 4

COMPONENTS

4.1 ESP8266-WIFI module: An ESP8266 Wi-Fi module is a SOC microchip mainly used for the development of the end-point IoT applications. It is referred to as standalone wireless transceiver, available at a very low price. It is used to enable the internet connections to various applications of embedded systems. The ESP8266 Wi-Fi Module is highly integrated with RF balun, power modules, RF transmitter and receiver, analog transmitter and receiver, amplifiers, filters, digital baseband, external circuitry, and other necessary components.

Fig 4.1 ESP8266 Wi-Fi Module

4.2 Servo motor: A servo motor is a self-contained electrical device that rotates parts of a machine with high efficiency and with great precision. The output shaft of this motor can be moved to a particular angle, position and velocity that a regular motor does not have. The Servo utilizes a regular motor and couples it with a sensor for

positional feedback. The controller is the most important part of the Servo Motor designed and used specifically for this purpose.

Fig 4.2 Servo motor

4.3 Ultrasonic Sensor: An ultrasonic sensor is an electronic device that measures the distance of a target object by emitting ultrasonic sound waves, and converts the reflected sound into an electrical signal. Ultrasonic waves travel faster than the speed of audible sound. Ultrasonic sensors have two main components: the transmitter (which emit sound using piezoelectric crystals) and the receiver (which encounters the sound after it has travelled to and from the target).

Fig 4.3 Ultrasonic sensor

4.4 Load cell: A Load cell is a transducer which converts force into a measurable electrical output. Although there are many varieties of load cell, strain gage load cells are the most commonly used type. A load cell converts a force such as tension, compression, pressure, or torque into a signal that can be measured and standardized. As force applied to the load cell increases, the signal changes proportionally.

Fig 4.4 Load cell

4.5 ESP32 CAM Module: The ESP32-CAM is a low-cost ESP32 development board with an on- board camera. This is an ideal solution for IoT applications, prototype constructions and DIY projects. Wi-Fi and low power BLE are integrated on the board, as well as two high-performance 32-bit LX6 CPUs. In addition to AI applications, the ESP32-CAM board can also be used for other kinds of robotics applications. It is capable of low latency video streaming to smart phones and PCs while maintaining a relatively low power consumption as well.

Fig 4.5 ESP32-CAM

4.6 Relay Module: Relay is one kind of electro-mechanical component that functions as a switch. The relay coil is energized by DC so that contact switches can be opened or closed. A single channel 5V relay module generally includes a coil, and two contacts like normally open (NO) and normally closed (NC). The relay uses the current supply for opening or closing switch contacts. Usually, this can be done through a coil to magnetize the switch contacts & drags them jointly once activated. A spring drives them separately once the coil is not strengthened. By using this system, there are mainly two benefits, the first one is, the required current for activating the relay is less as compared to the current used by relay contacts for switching. The other benefit is, both the contacts & the coil are isolated galvanically, which means there is no electrical connection among them.

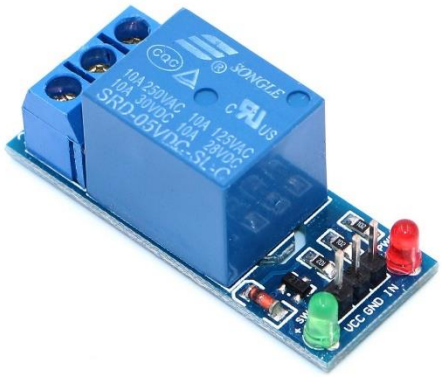

Fig 4.6 Relay Module

4.7 Water Pump: The DC 3-6 V Mini Micro Submersible Water Pump is a low cost, small size Submersible Pump Motor which can be operated from a 2.5 ~ 6V power supply. It can take up to 120 liters per hour with a very low current consumption of 220mA. Just connect tube pipe to the motor outlet, submerge it in water and power it.

Fig 4.7 Water Pump

Chapter 5

SOFTWARE

5.1 Blynk App: Blynk App is a versatile native iOS and Android mobile application that serves these major functions:

1. Remote monitoring and control of connected devices that work with Blynk platform.
2. Configure of the mobile UI during prototyping and production stages.
3. Automation of connected device operations.

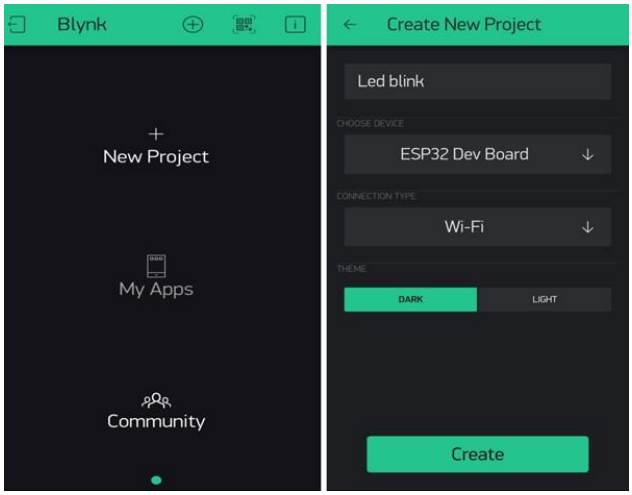

Fig 5.1 Blynk App

Chapter 6

COST ESTIMATION

Table 6.1 Cost Estimation

NAME OF THE COMPONENTS	**QUANTITY**	**COST**
ESP8266 Wi-Fi Module	2	856
ESP32-CAM Module	1	992
Servo motor	3	747
Ultrasonic sensor	2	138
Load cell	1	242
Total		2975

Chapter 7

RESULT

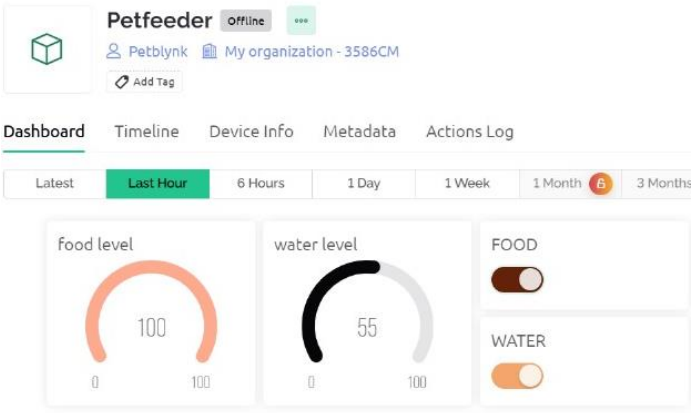

Fig 7.1 Creating Dashboard

This is the working space in which we selected the buttons and level gauge for creating our dashboard. All necessary control switches needed are created here.

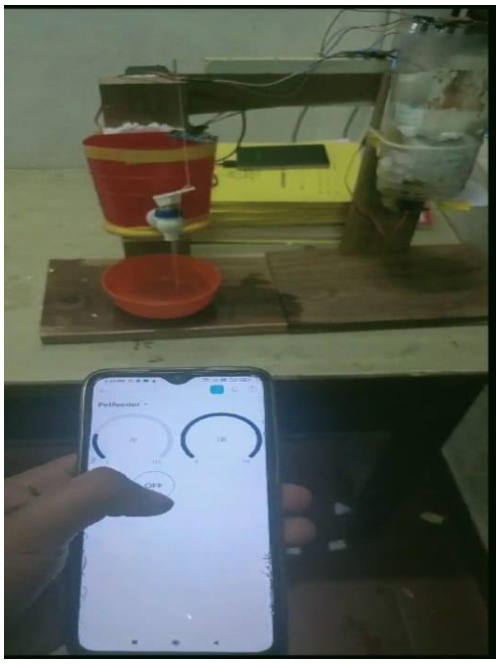

Fig 7.2 Working of two dispensers

The level of food and water are constantly monitored. Also when the switch for food in turned on the food will be dispensed in the bowl. Similarly, when the switch for water is turned on the water will be dispensed. Also the area is constantly monitored by a camera. There are two ultrasonic sensors that constantly monitors the level of food and water in food and water dispensers respectively.

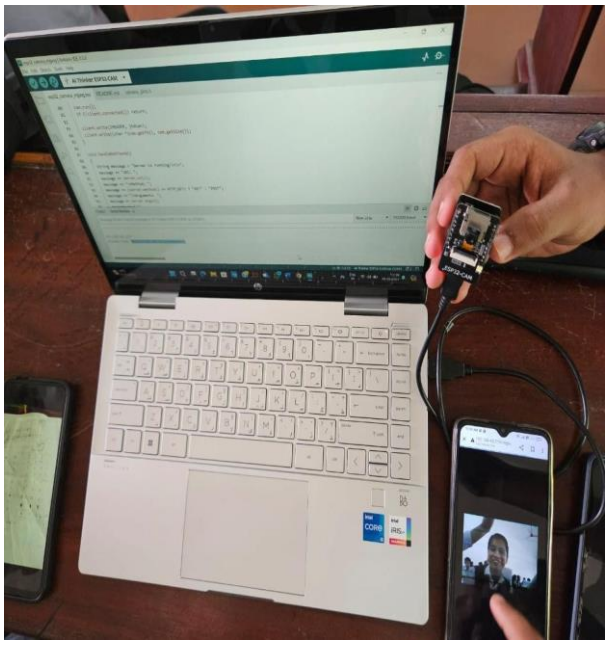

Fig 7.3 Live streaming Video

This is the camera monitoring part. Camera constantly monitors the area. Thus the pet owner can see his or her pet whenever he likes. Users can access the live video stream from anywhere, at any time, simply by visiting the designated website. This level of accessibility ensures that users can keep an eye on their surroundings or monitor specific areas of interest conveniently and effortlessly. In addition to live streaming, the ESP32-CAM module allows users to capture images of ongoing activities.

Chapter 8

APPLICATIONS

Smart Pet Feeder project offer several applications that enhance the care and well-being of the pets while providing convenience for the pet owners.

- **Portion Control:** The project come with proportion control allowing pet owners to ensure that their pets receive the right amount of food at each feeding.
- **Remote Feeding:** This can be controlled remotely via smartphone app. This means the pet owners can feed their pets even when they are not at home. This feature is particularly useful for pet owners who travel frequently or have unpredictable schedules.
- **Monitoring:** The project come with monitoring features that allow pet owners to keep track to their pets feeding habits. This include notification about their food completion and an integrated camera which provide live videos of the area.

Chapter 9
CONCLUSION

The conclusion for this project is that it has implemented a feeding system for pets when their owners are not at home. This allows pet owners who are away from home or travelling frequently to look after their pets feeding. By integrating servo motors, load cells, ultrasonic sensors, and a water pump with the Blynk app, we have developed a system that offers several benefits for both pets and their owners.

Firstly, the automation provided by the servo motors controlled via Blynk app allows pet owners to remotely dispense food and water, ensuring that their pets are fed even when they are away from home. The use of load cells adds an extra layer of monitoring, notifying the owner when the food levels are low when the pet has finished eating, promoting responsible feeding practices and pet health.

The incorporation of ultrasonic sensors to monitor food and water levels enhances the systems efficiency by providing real-time data on supply levels, ensuring that pets always have access to fresh food and water. Additionally, the automated cleaning feature, utilizing a water pump and rotating, mechanism, maintains hygiene and cleanliness in the feeding area, reducing the risk of contamination and promoting the pet's health.

Overall, our project addresses several key aspects of pet care, including feeding, monitoring, and cleanliness, while also leveraging IoT technology to provide remote access and control. By combining functionality with convenience, our smart pet feeder offers a practical solution for pet owners, enhancing the well-being of both pets and their caregivers.

Chapter 10

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