IOT BASED AUTOMATIC PET FEEDING SYSTEM

MINOR PROJECT-1 REPORT

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ABSTRACT

Over half of the people in the world intentionally have pets as their companions, But these pets are becoming burden to the pet owners. There is a lot of stress for the owner while feeding their pets. Over the years different automatic pet feeders are available in the market, but none of them are still not able to solve lot of problems like overeating, obesity. This project aims in rectifying the problems caused by existing feeders and designing an efficient automatic pet feeders using internet of things. This Automatic pet feeder uses a Arduino and consists of an interface with DC servo motor, relays and other hardware equipment. A software code is dumped into the Arduino to perform operations like rotating motors and switching relays on and off.

The control unit programmed on the Arduino Uno incorporates logic for scheduling feeding times, adjusting portion sizes based on the pet's dietary requirements, and implementing safety features to prevent overfeeding or food wastage. Additionally, the system can be interfaced with external devices such as smartphones or computers for remote monitoring and control via Bluetooth or Wi-Fi connectivity.

Overall, the Automatic Pet Feeding System presented in this paper offers a practical solution for pet owners seeking to automate the feeding process while ensuring the health and well-being of their pets. The use of Arduino Uno as the core platform demonstrates the feasibility and versatility of utilizing open-source hardware and software for developing smart pet care solutions.So, the pet will receive regular amounts of food and water on a steady feeding schedule.

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

1.1 Introduction to IoT-Based Pet Feeding Systems

In today's fast-paced world, pet owners often find themselves juggling multiple responsibilities, including long work hours and busy schedules. Amidst this hustle and bustle, ensuring the well-being of beloved pets becomes a significant concern. Fortunately, the advent of Internet of Things (IoT) technology has paved the way for innovative solutions to address this challenge. One such solution is the IoT-based pet feeding system, which not only provides convenience for pet owners but also enhances the health and happiness of their furry companions. This comprehensive guide delves into the intricacies of IoT-based pet feeding systems, exploring their functionality, benefits, challenges, and future prospects.

1.1.1 Understanding IoT-Based Pet Feeding Systems

IoT-based pet feeding systems integrate advanced technology to automate the process of feeding pets, offering a seamless solution for pet owners. These systems typically consist of a combination of hardware and software components, including smart feeders, sensors, mobile applications, and cloud platforms. The key components work in harmony to enable remote monitoring and control of pet feeding activities.

a. Smart Feeders: At the core of IoT-based pet feeding systems are smart feeders, which are equipped with features such as portion control, scheduling, and dispensing mechanisms. These feeders are designed to accommodate various types of pet food, including dry kibble, wet food, and treats. Additionally, some advanced smart feeders incorporate features like voice commands and camera monitoring for enhanced functionality and interaction.

b. Sensors: Sensors play a crucial role in IoT-based pet feeding systems by providing real-time data regarding pet behavior, food consumption, and environmental conditions. Commonly used sensors include weight sensors to measure food levels, motion sensors to detect pet activity, and temperature/humidity sensors to ensure optimal storage conditions for pet food.

c. Mobile Applications: Mobile applications serve as the interface between pet owners and the IoT-based pet feeding system. Through these applications, users can remotely monitor their pets, schedule feeding times, adjust portion sizes, and receive notifications/alerts regarding feeding activities. Moreover, some applications offer additional features such as health tracking, dietary recommendations, and social networking for pet enthusiasts.

d. Cloud Platforms: Cloud platforms form the backbone of IoT-based pet feeding systems, facilitating data storage, processing, and analysis. By leveraging cloud infrastructure, pet owners can access their pet's feeding data from anywhere, anytime, using any internet-enabled device. Furthermore, cloud-based analytics enable personalized insights and recommendations based on pet behavior patterns and nutritional requirements.

1.1.2 Functionalities of IoT-Based Pet Feeding Systems

IoT-based pet feeding systems offer a wide range of functionalities aimed at enhancing convenience, flexibility, and pet car:

a. Scheduled Feeding: Pet owners can program feeding schedules based on their pets' dietary needs and routines, ensuring regular and consistent feeding times.

b. Portion Control: These systems enable precise control over portion sizes, helping prevent overeating or underfeeding and promoting healthy eating habits.

c. Remote Monitoring: Pet owners can remotely monitor their pets' feeding activities, food consumption, and food levels in the dispenser through mobile apps or web interfaces.

d. Customization: Users can customize feeding schedules, portion sizes, and food types to accommodate individual pet preferences, dietary restrictions, and health conditions.

e. Notifications: IoT-based pet feeders can send real-time notifications to pet owners' mobile devices, alerting them of feeding times, low food levels, or feeding errors.

f. Activity Tracking: Some advanced systems may include activity tracking features to monitor pets' exercise levels, sleep patterns, and overall health and well-being.

1.2 Types of IoT-Based Pet Feeding Systems

1.2.1 Basic Smart Feeders

Basic smart feeders are entry-level systems designed to automate the feeding process without unnecessary complexity. They typically consist of a programmable timer that dispenses food at scheduled intervals. While lacking advanced features, such as connectivity or portion control, these feeders offer a simple and reliable solution for pet owners seeking basic automation of their pet's feeding routine.

1.2.2 Advanced Smart Feeders:

Advanced smart feeders boast a plethora of features aimed at enhancing the pet feeding experience. These systems often incorporate Wi-Fi connectivity, allowing pet owners to remotely monitor and control feeding schedules via smartphone apps or web interfaces. They may also feature portion control settings, ensuring pets receive accurate meal sizes tailored to their dietary needs. Additionally, advanced smart feeders may include sensors to detect food levels and alert pet owners when refills are necessary, ensuring continuous care even when away from home.

1.2.3 Customizable DIY Smart Feeders:

DIY smart feeders offer pet owners the flexibility to customize and build their own feeding systems according to their unique requirements. Leveraging platforms like Arduino, Raspberry Pi, or other microcontrollers, pet owners can design and assemble personalized smart feeders with specific features and functionalities. From integrating sensors for precise portion control to implementing advanced scheduling algorithms, DIY smart feeders empower pet owners to create bespoke solutions tailored to their pet's individual needs.

1.2.4 Multi-Pet Smart Feeders:

Multi-pet smart feeders are designed to accommodate households with multiple pets, each with their own dietary requirements and feeding schedules. These systems feature multiple food compartments or feeding stations, allowing pet owners to dispense different types of food or portions for each pet. With customizable settings for each pet, multi-pet smart feeders ensure equitable and hassle-free feeding experiences for all furry family members.

1.2.5 Specialized Smart Feeders:

Specialized smart feeders cater to specific types of pets or unique feeding scenarios. For example, some smart feeders are designed specifically for cats or dogs, incorporating features like anti-jamming mechanisms or slow-feed options to accommodate their eating habits. Others are tailored for small animals, birds, or fish, providing specialized feeding mechanisms and portion sizes optimized for their dietary needs. By addressing the unique requirements of different pets, specialized smart feeders offer tailored solutions for diverse pet care scenarios [1].

1.3 Benefits of IoT-Based Pet Feeding Systems

IoT-based pet feeding systems offer a plethora of benefits for both pet owners and their furry companions. Some of the key advantages include:

1.3.1 Convenience:

One of the primary benefits of IoT-based pet feeding systems is the convenience they offer to pet owners. With remote monitoring and control capabilities, pet owners can manage feeding schedules and portion sizes effortlessly, even when they are away from home.

1.3.2 Health Monitoring:

IoT-based pet feeding systems enable pet owners to monitor their pet's eating habits and detect any irregularities or changes in appetite. By tracking food consumption patterns and behavior trends, pet owners can identify potential health issues early on and take proactive measures to address them.

1.3.3 Customization:

These systems allow for customization of feeding schedules and portion sizes according to the specific needs and preferences of individual pets. Whether it's managing multiple pets with different dietary requirements or accommodating special feeding routines, IoT-based pet feeding systems offer flexibility and customization options[2].

1.3.4 Peace of Mind:

By providing real-time updates and notifications, IoT-based pet feeding systems offer peace of mind to pet owners, knowing that their pets are well-fed and cared for, even in their absence. This alleviates concerns about potential food-related issues or disruptions in feeding routines.

1.3.5 Improved Pet Health:

Consistent and controlled feeding facilitated by IoT-based pet feeding systems contributes to improved pet health and well-being. By ensuring proper nutrition and portion control, these systems help prevent overeating, obesity, and other dietary-related health problems in pets.

CHAPTER 2

LITERTAURE SURVEY

2.1 OVERVIEW

A smart pet feeding system revolutionizes the way pet owners care for their furry companions by leveraging technology to automate and enhance the feeding process. This innovative solution combines hardware and software components to provide convenience, control, and peace of mind to pet owners while ensuring the well-being of their pets.At its core, a smart pet feeding system consists of a programmable feeder device equipped with various features such as portion control, scheduling, and connectivity options. These feeders are typically designed to accommodate different types of pet food, including dry kibble and wet food, and are customizable to meet the specific dietary needs of individual pets.

One of the key advantages of a smart pet feeding system is its ability to automate feeding schedules. Pet owners can easily program the feeder to dispense meals at predetermined times throughout the day, ensuring that their pets are fed consistently and on time, even when they are away from home. This feature is particularly beneficial for busy pet owners who may not always be available to feed their pets manually.

Portion control is another essential feature of smart pet feeders, allowing pet owners to manage their pets' food intake more effectively. By accurately measuring and dispensing precise portions of food, these feeders help prevent overeating and promote healthier eating habits, which can contribute to weight management and overall well-being.

In terms of design, smart pet feeders are typically sleek and modern, blending seamlessly into any home environment. Many models feature durable construction and easy-to-clean components, making maintenance and upkeep hassle-free for pet owners.

Beyond convenience and control, smart pet feeding systems also offer benefits in terms of health monitoring and analytics. By tracking feeding patterns and consumption data over time, these systems can provide valuable insights into pets' eating habits and detect any potential issues or abnormalities that may require attention. This proactive approach to pet care empowers pet owners to take a more active role in managing their pets' health and well-being.

"Intelligent Food Dispenser (IFD)" Hari N Et al.(2019) This food dispenser is controlled using an android application that gives control to the device through a Wi-Fi module to dispense food. The microcontroller FRDM KL25Z is programmed in a way it sets the motor to work. There are two basic parts for dispensing the food. A storage box is used to store the food that has an opening on storage. The storage box has a lid beneath the box. The lid is attached to a DC motor that is interfaced with an FRDM board. The amount of time for openings of both lid and storage box coincide will decide the amount of food dispensed. Once the food is dispensed, the motor is programmed to rotate, thus closing the lid. The android app proved helpful in this case. It can control time for how long the motor stays in the opening position [3].

Digital Image Processing-A Quick Review" - R. Ravikumar Et al.(2019) Images are the evident sources in image processing applications. Image processing will change the human-computer interaction in the future. A huge number of image processing applications, tools, and techniques help to extract complex features in an image. While presently, image processing works beyond multidimensional and check what is actually in an image. Several techniques are being played on images in real-time, but image processing is the core. The image processing applications, tools, and techniques help to extract complex features of an image. Image processing works on the single dimensional image and multi-dimensional image and checks what happens with the image. Image processing is the core for many developing techniques in real-time aspect [4].

"A Remote Pet Feeder Control System via MQTT Protocol" - Wen-Chuan Wu Et al.(2018) At present, most commercial pet feeders are stationary systems. The owner can control the feeder to dispense food to their pet in a remote mode using smartphones. Few feeders have a camera function that allows the owner to observe pets at home. Anyhow, these machines are stationary and cannot move. The photos are also in a fixed shoot angle, while pets can move around the house. Henceforth, this paper will design a remote control system on a toy car equipped with a camera, feeding food and water. It allows the owner not only to receive an image by the remote Camera through an android device but also to control its movement through MQTT protocol to achieve the purpose of pet food and water supplement [5].

"Automatic Pet feeder" - AasavariKank Et al.(2018)) Different sensors are employed for this system of pet feeders to work efficiently. A proximity sensor is going to be connected to an Arduino. Once the pet is detected in the feeder's surroundings, the food from a container is put in a food bowl. Whenever the sensor detects motion at a distance from the feeder, once the pet comes near to the food bowl, the food will be served. A servo motor is employed in the system for locking purposes. Together, all these components will determine the efficiency of the feeder [9].

"Pet feeding Dispenser using Arduino and GSM Technology" - Smruthi Kumar Et al. (2018)) This paper focuses on the topic where the pet owners can feed their pet in their absence by sending a message to a system through a Mobile phone. GSM technology is adopted in this system to receive a text from the owner. The solenoid valve and servo motor are activated once the message is received.

This causes the servo motor to rotate in order to dispense the food. Also, water to be free-flowing, the valve will be open. Once the feeding process is done, the owner will receive a message. This concept is for the family that has a busy schedule and who are not able to feed the pet [6].

"Automatic Pet Monitoring and Feeding System Using IoT" – Subaashri S Et al. IoT is a platform that can embed hardware as well as software. IoT is an efficient way for data access. SOAP dependant mechanism with web service is used to manage diversified devices in the home environment. Numerous sensors are employed to monitor various pet activities, like the presence of food in the plate is monitored using an IR sensor. To enable the transmission of the pet's identity, an RFID tag is used in the pet collar. Arduino acts as a gateway for sending a piece of information collected to cloud storage, where the data can be accessed and retrieved using a smartphone. The whole network will be wireless; therefore, the loss cannot be found. To realize, two smartphones based SDR prototype nvolving IEEE 802.15.4 and IEEE 802.11. For 802.11p, the min. The required sampling rate is 10MS/s; thus, we use PBSK and QPSK, each is 4bytes. The work can further be improved by adding RTC to the feeder [7].

"Remote Controlled and GSM Based Automated Pet Feeder" - Prashant Singh Et al.(2015) In the paper, a new design has been proposed to be controlled using an interactive remote controller that helps eliminate the manual settings of previous versions of the pet feeder. This design contains a lot of new features as compared to previous versions. In this design, users can adjust feed time, the time gap between consecutive pet feeds, and the quantity of food that is served. This design also contains the call for the pet at feed time, pet food refill alert, dual power supply with battery charger, Message alert system to an owner in case of the pet not getting fed, safety lock for the food container, a sensor-based system in order to serve previously served feed in case of leftovers and it is a priority feeder with a dual option to serve as the owner can opt for a multi-time and pet can opt for 1 time between feed time gap [8].

"Automatic Pet Feeder" - Manoj M Et al. (2015) This is a system in which food is fed at regular intervals. The timings will be pre-programmed using a microcontroller. The system consists of two knobs along with a dc motor. Whereas one knob is to control the interval of time in which the food is to be fed, and the other knob is to control the opening time and the closing time of an outlet of food. A dc motor controls the opening and closing of the food outlet. A buzzer is employed to indicate the food that is being fed. There might be chances of food getting stuck on the way, in order to avoid this problem a vibrating dc motor will be used. At first, food has to be loaded into a feeder column, a microcontroller is to be reset, and the timing required in both knobs is to be selected. Once the microcontroller is reset, depending on the timing of two knobs, the food will be dispensed [9].

"Smart Dog Feeder Design Using Wireless Communication, MQTT and Android Client" - Vania Et al. (2016)this device can provide regular feeding without disturbing the work of an owner. The process can be monitored by users using their smartphones remotely. It can provide RFID authentication, setting feed time, and serving portion through a smartphone. It can also send feeding reports and the arrival of the dog during the feed time. All settings about feed time, portion, stock, and waiting time

will be set on an Android Phone. SDK 18 will be installed using the Appliance Hub application. The feeder has stock information and the feed schedule, waiting for the time and name of the owner from a server using MQTT protocol[10].

“Programmable Pet Feeder” - TessemaGelilaBerhan Et al. Pet feeders are automatic devices that dispense food at an already set time. The system is mainly time- based systems and dispenses a specified amount of food at specified times. This is a programmable system that is controlled using a microcontroller. It employs an LCD screen for displaying the input; a buzzer is used to alert the pet at mealtime. A stepper motor is used to control the speed, and a turntable is divided into different sections to place different food. The owner can select the food that has to be dispensed out at the specified time.he purpose of the literature survey is to investigate the topic of “Automatic Pet Food Dispenser using DIP.” The following section explores different references that discuss various topics related to our project [11].

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CHAPTER 3

METHODOLOGY

3.1 Existing system

One existing method for Iot based automatic pet feeding system involoves use of microcontroller node MCU ,will feed the pet when ever owner wishes and here's the outline of ho it works:
1.Hardware Selection: For a basic system, NodeMCU development board (ESP8266) can be used,And the servo motor or a stepper motor for dispensing food, power supply, food container, and some basic electronic components like resistors and jumper wires.
2.Prototype Design: Create a prototype of pet feeding system. This can involve using a breadboard to connect NodeMCU board, motor, and any other components. Test the motor control using simple code to ensure it can dispense food reliably.
3.Connect to Wi-Fi: NodeMCU is capable of connecting to Wi-Fi networks. Utilize the appropriate libraries and code to establish a connection to local Wi-Fi network. This will enable pet feeding system to communicate with the internet and receive commands remotely.
4.Cloud Platform Integration: Choose a cloud platform for IoT system. Platforms like AWS IoT, Google Cloud IoT, or Adafruit IO can be used for data storage, monitoring, and remote control. Integrate NodeMCU with the chosen platform by using the appropriate APIs or libraries.
5.Web or Mobile Interface: Develop a web or mobile interface to control the pet feeding system remotely. This interface will allow users to schedule feeding times, adjust portion sizes, and monitor feeding activity.
6.Security Implementation: Implement security measures to protect IoT system from unauthorized access. Use encryption protocols like HTTPS for communication between the device and the cloud platform, and implement user authentication mechanisms in web or mobile interface.
7.Testing and Optimization: Test pet feeding system thoroughly to ensure its reliability and functionality. Optimize the system for power efficiency, responsiveness, and accuracy in food dispensing.
8.Documentation and Deployment: Documentinf the project including schematics, code, and setup instructions. Once everything is working correctly, deploy pet feeding system in home environment.
This method leverages node MCU capability which feeds the pet at the time when owner wishes.

3.2 Proposed solution

Our proposed solution involves the creation of iot based automatic pet feeding system using aurduino uno,dc motor,rtc time module.4*4 matrix keypad,bread board,connecting wires and resistors

3.3 Technical Feasibility

Hardware Construction: Develop the connections based on the block diagram.

3.4 Components

1. Arduino UNO:- The Arduino Uno is a popular microcontroller board renowned for its versatility and ease of use in electronics projects. It's based on the ATmega328P microcontroller and features a simple design with digital and analog input/output pins, making it suitable for beginners and advanced users alike. With a thriving community and extensive documentation, it's a go-to choice for makers, hobbyists, and professionals for prototyping and creating a wide range of projects, from simple LED blinkers to complex robots and IoT devices.

2. 4*4 Matrix keypad:-A 4x4 matrix keypad is a common input device used in electronics projects to provide user interaction. It consists of 16 buttons arranged in a grid of 4 rows and 4 columns. Each button press corresponds to a unique row-column intersection, allowing for easy identification of key presses. These keypads are often interfaced with microcontrollers like Arduino using a matrix scanning technique, where each row and column is scanned sequentially to detect button presses. They are widely used in applications such as security systems, access control, and menu navigation in embedded systems.

3. 16*2 LCD:-A 16x2 LCD (Liquid Crystal Display) is a commonly used alphanumeric display module that can show 16 characters per line and 2 lines of text. Each character position consists of a grid of 5x8 pixels. These displays are widely used in electronics projects to provide visual feedback or information display. They are compatible with microcontrollers like Arduino and can be easily interfaced using parallel or serial communication protocols. With their compact size and low power consumption, 16x2 LCDs find applications in various fields including consumer electronics, instrumentation, and DIY projects such as digital clocks, temperature displays, and menu interfaces.

4. DS3231 RTC Module:-The DS3231 RTC (Real-Time Clock) module is a highly accurate timekeeping device commonly used in electronics projects to provide precise time and date information. It features a built-in temperature-compensated crystal oscillator (TCXO) that ensures accurate timekeeping even in varying environmental conditions. The DS3231 module communicates with microcontrollers like Arduino via I2C (Inter-Integrated Circuit) protocol, making it easy to integrate into projects. It can store time and date information even when the main power is disconnected, thanks to its onboard battery backup. With its reliability and ease of use, the DS3231 RTC module is ideal for applications

requiring accurate timekeeping, such as data logging, scheduling, and timing critical operations.

5. Push Button:- A push button, also known as a momentary switch, is a simple yet versatile input device used in electronics projects for user interaction. It consists of a button that makes or breaks electrical contact when pressed and released. Push buttons are available in various configurations, including normally open (NO) and normally closed (NC), and they come in different sizes and shapes to suit different applications.

6. Servo Motor:- A servo motor is a type of rotary actuator that allows for precise control of angular position. It consists of a motor coupled with a feedback system that continuously monitors and adjusts the position of the motor shaft to achieve the desired position. Servo motors are commonly used in various applications, including robotics, remote-controlled vehicles, industrial automation, and hobbyist projects.

7. Resistor:- A resistor is a passive two-terminal electrical component that limits or controls the flow of electric current in a circuit. It is commonly used to create precise voltage and current levels, divide voltages, bias active elements, terminate transmission lines, and adjust signal levels. Resistors are available in various types, including fixed resistors (such as carbon film, metal film, and wirewound) and variable resistors (such as potentiometers and rheostats).

8. Breadboard:- A breadboard is a fundamental tool used in electronics prototyping and experimentation. It provides a platform for building temporary circuits without the need for soldering. A typical breadboard consists of a plastic board with a grid of holes arranged in rows and columns, with conductive metal strips running underneath the surface to connect the holes in certain patterns.

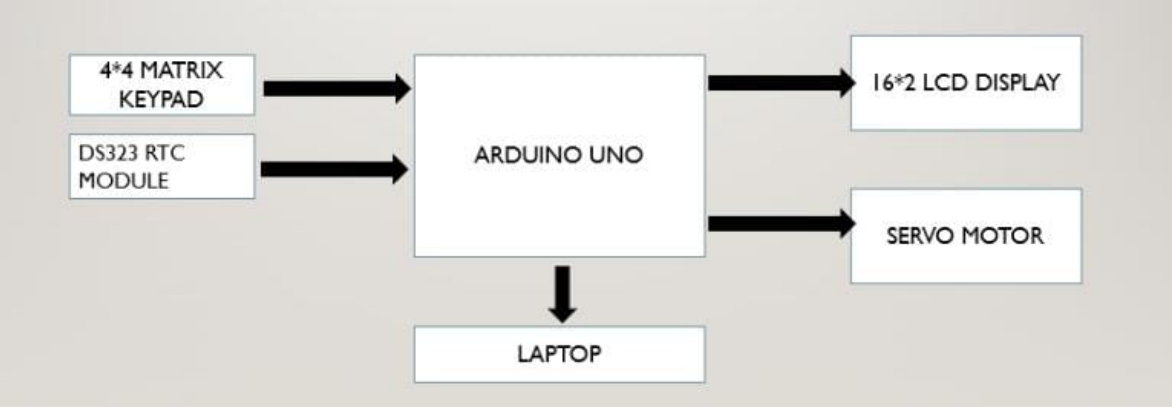

Figure 3.1: Block Diagram

3.5 Block Diagram

Figure 3.1 shows the block diagram of our proposed work.To create an automatic pet feeding system using components Arduino Uno, a 4x4 matrix keypad, a 16x2 LCD display, a DS3231 RTC module, a servo motor, and a breadboard, you can follow these general steps:

1. Planning and Design:

- Define the feeding schedule for your pet, including feeding times and portion sizes.
- Determine the user interface for setting the feeding schedule, such as using the keypad and LCD display.
- Plan the mechanical design for dispensing the pet food, considering the servo motor's movement and the food container's placement.

2. Component Integration:

- Connect the Arduino Uno to the breadboard.
- Connect the 4x4 matrix keypad and the 16x2 LCD display to the Arduino using appropriate wiring.
- Connect the DS3231 RTC module to the Arduino for timekeeping.
- Connect the servo motor to the Arduino for controlling the food dispensing mechanism.

3. Programming:

- Write Arduino code to initialize and communicate with the components (keypad, LCD, RTC, servo motor).
- Implement functions to set and read the feeding schedule from the user via the keypad and display.
- Develop logic to compare the current time from the RTC with the scheduled feeding times and trigger the servo motor to dispense food accordingly.
- Ensure error handling and user feedback mechanisms are in place, such as displaying messages on the LCD for invalid inputs or low food levels.

4. Testing and Calibration:

- Test each component individually to ensure proper functionality.
- Assemble the components on the breadboard and test the entire system together.

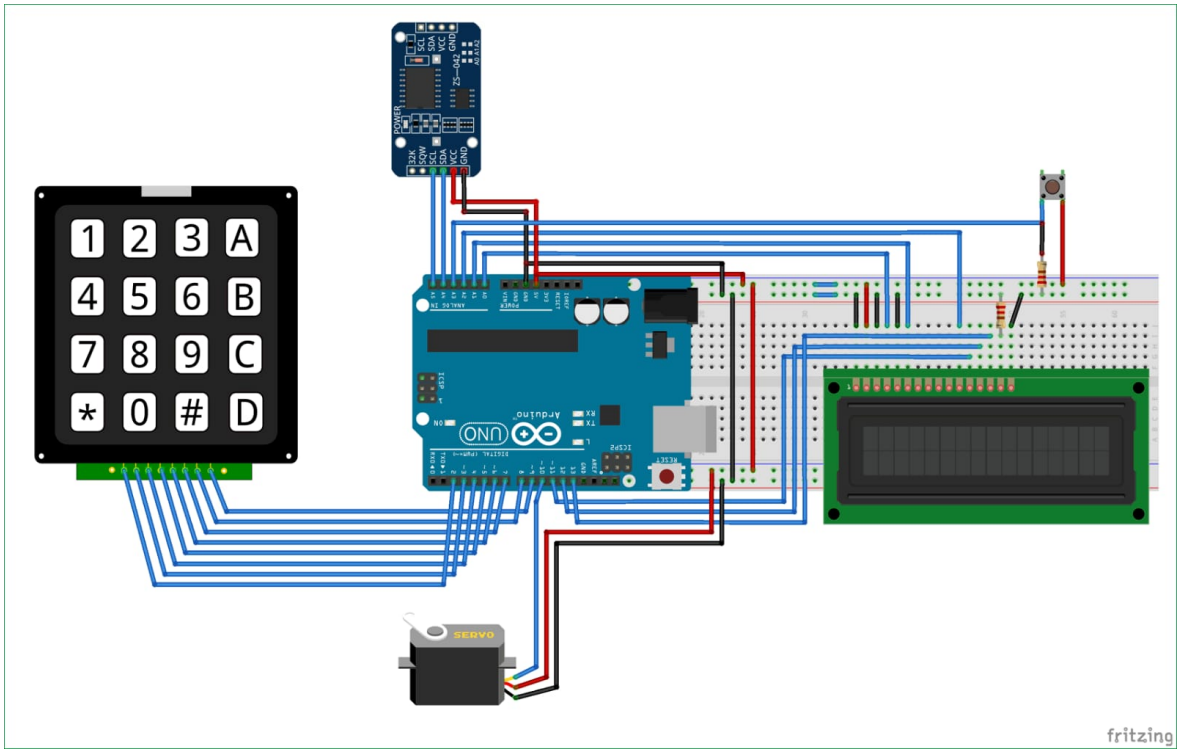

Figure 3.2: Circuit Diagram

- Calibrate the servo motor to dispense the correct amount of food based on the specified portion size.

5. Mechanical Assembly:

- Design and construct the physical housing for the automatic pet feeding system, considering factors such as pet accessibility and food storage.

- Install the servo motor and food container in the housing, ensuring proper alignment and movement.

6. Final Testing and Deployment:

- Perform final testing of the fully assembled system to verify its reliability and accuracy in dispensing food.

- Make any necessary adjustments to the code or mechanical components based on testing results.

- Once satisfied with the performance, deploy the automatic pet feeding system in your pet's environment and monitor its operation over time.

By following these steps, The automatic pet feeding system using the specified components, providing a convenient and reliable solution for feeding your pet can be Designed.

3.6 Code

Arduino have default libraries for using the Servo motor and LCD 16*2 with it. But for using DS3231 RTC Module and 4*4 Matrix Keypad with the Arduino, you have to download and install the libraries.

include ¡DS3231.h¿

include ¡Servo.h¿

include ¡LiquidCrystal.h¿

include ¡Keypad.h¿

const byte ROWS = 4; // Four rows

const byte COLS = 4; // Three columns

// Define the Keymap

char keys[ROWS][COLS] =

'1','2','3','A',

'4','5','6','B',

'7','8','9','C',

'*','0','','D'

;

// Connect keypad ROW0, ROW1, ROW2 and ROW3 to these Arduino pins.

byte rowPins[ROWS] = 2, 3, 4, 5 ;

// Connect keypad COL0, COL1 and COL2 to these Arduino pins.

byte colPins[COLS] = 6, 7, 8, 9 ;

// Create the Keypad Keypad kpd = Keypad(makeKeymap(keys), rowPins, colPins, ROWS, COLS); DS3231 rtc(A4, A5);

Servo $servo_test$; $//initializeaservoobjectfortheconnectedservo$

LiquidCrystal lcd(A0, A1, A2, 11, 12, 13); // Creates an LC object. Parameters: (rs, enable, d4, d5, d6, d7)

//int angle = 0;

// int potentio = A0; // initialize the A0analog pin for potentiometer

int t1, t2, t3, t4, t5, t6;

boolean feed = true; // condition for alarm

char key;

int r[6];

void setup()

$servo_test.attach(10); //attachthesignalpinofservotopin9ofarduino$

rtc.begin();

lcd.begin(16,2);

$servo_test.write(55)$;

Serial.begin(9600);

pinMode(A0, OUTPUT);

pinMode(A1, OUTPUT);

pinMode(A2, OUTPUT);

void loop()

lcd.setCursor(0,0);

int buttonPress;

```
buttonPress = digitalRead(A3);
if (buttonPress==1)
setFeedingTime();
//Serial.println(buttonPress);
lcd.print("Time: ");
String t = "";
t = rtc.getTimeStr();
t1 = t.charAt(0)-48;
t2 = t.charAt(1)-48;
t3 = t.charAt(3)-48;
t4 = t.charAt(4)-48;
t5 = t.charAt(6)-48;
t6 = t.charAt(7)-48;
lcd.print(rtc.getTimeStr());
lcd.setCursor(0,1);
lcd.print("Date: ");
lcd.print(rtc.getDateStr());
if (t1==r[0]  t2==r[1]  t3==r[2]  t4==r[3] t5¡1  t6¡3  feed==true)
servo_test.write(100); //commandtorotatetheservotothespecifiedangle
delay(400);
servo_test.write(55);
feed=false;
void setFeedingTime()
feed = true;
int i=0;
lcd.clear();
lcd.setCursor(0,0);
lcd.print("Set feeding Time");
lcd.clear();
lcd.print("HH:MM");
lcd.setCursor(0,1);
while(1)
key = kpd.getKey();
char j;
if(key!=NO_KEY)
lcd.setCursor(j,1);
lcd.print(key);
r[i] = key-48;
```

```
i++;
j++;
if (j==2)
lcd.print(":"); j++;
delay(500);
if (key == 'D')
key=0; break;
```

3.7 Advantages

While there are challenges to overcome, such as reliability and security concerns, ongoing advancements in technology hold promise for addressing these issues With further research and development, IoT pet feeding systems have the potential to become more accessible, reliable, and integrated into the lives of pet owners, improving the well-being of both pets and their owners.

Convenience: IoT-enabled pet feeding systems offer convenience to pet owners by allowing them to remotely feed their pets.

Customization: These systems can be programmed to dispense specific portions of food at designated times, catering to the individual needs of each pet.

Monitoring: Some systems come with monitoring capabilities, allowing owners to track their pet's feeding habits and adjust accordingly.

Peace of Mind: Owners can have peace of mind knowing that their pets are being fed even when they are away from home.

Reliability: The reliability of IoT devices and internet connectivity can be a concern, leading to potential issues with food dispensing or system malfunctions.

Security: Ensuring the security of IoT devices to prevent unauthorized access or hacking is crucial, especially when they are connected to a home network.

Maintenance: Regular maintenance and updates are necessary to keep the system functioning optimally, which can be a burden for some users.

Cost: The initial cost of purchasing and installing an IoT-based pet feeding system may be prohibitive for some pet owners.

Future Directions:

Improved Connectivity: Advancements in IoT technology should focus on enhancing connectivity and reliability to minimize potential disruptions.

Enhanced Security Measures: Continued efforts to bolster security measures will be essential to protect user data and prevent unauthorized access.

User-Friendly Design: Simplifying setup and maintenance processes can encourage wider adoption of IoT pet feeding systems.

Health Monitoring Integration: Integrating health monitoring features, such as weight sensors or activity trackers, could provide additional benefits for pet owners.

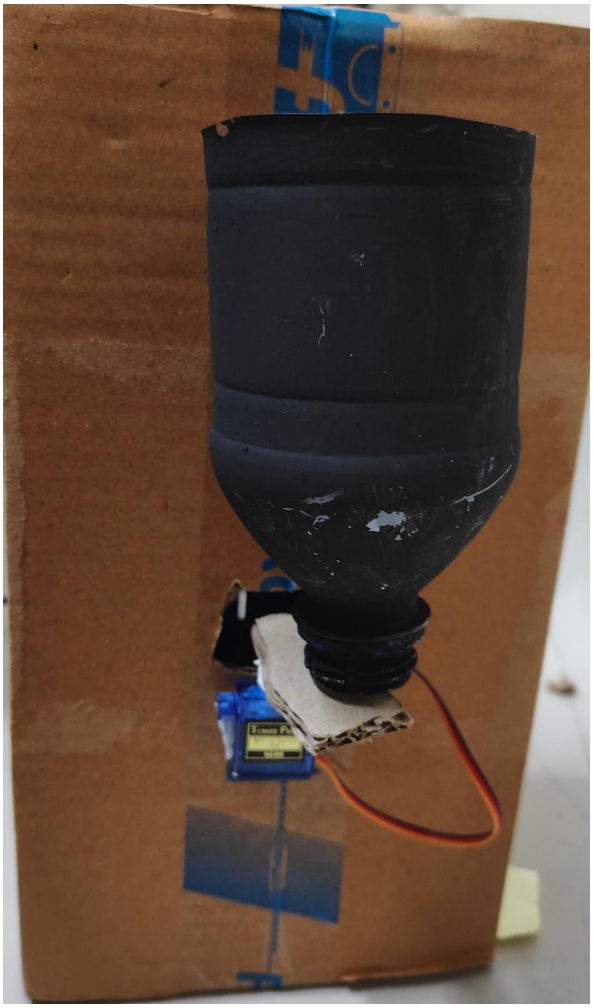

Figure 3.3: Prototype

Figure 3.3 shows the prototype of the designed system

3.8 Result

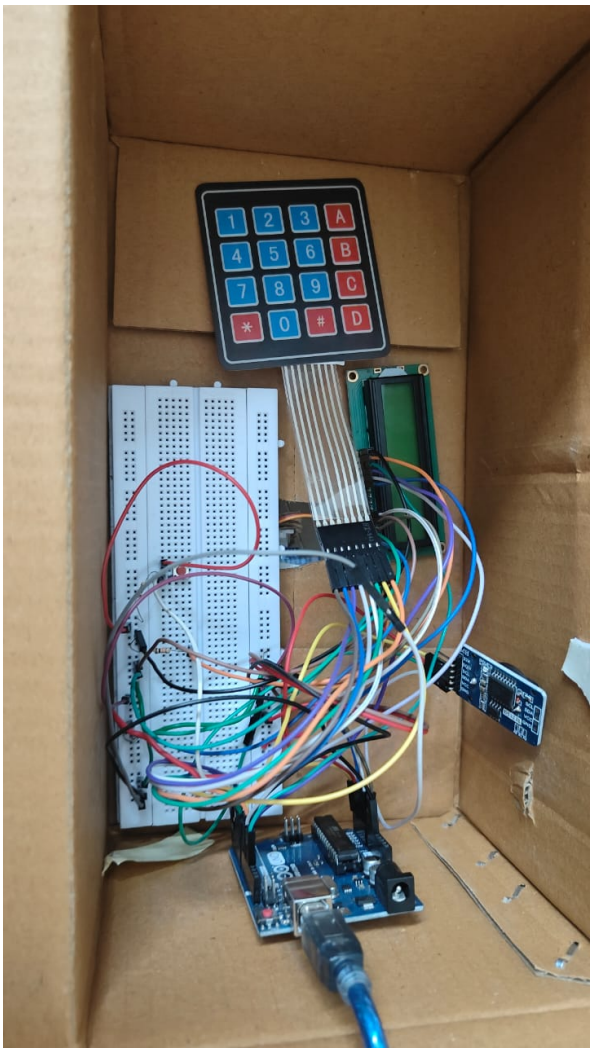

Figure 3.4: Connections

Figure 3.4 shows the hardware connections of the proposed system

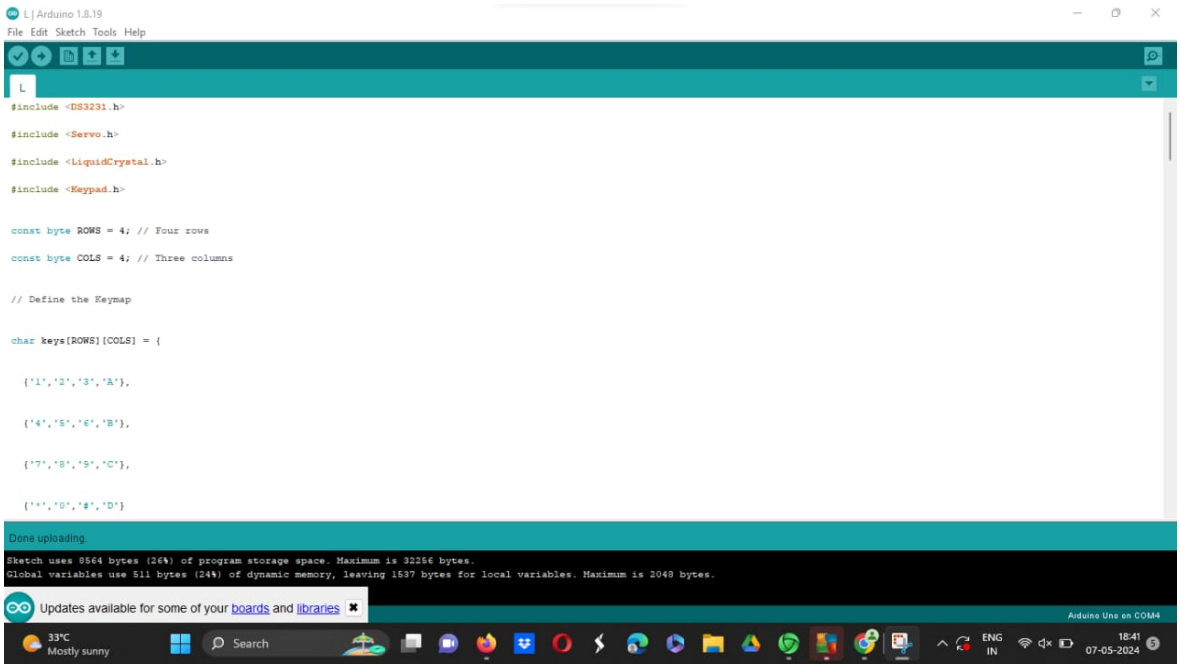

Figure 3.5: Arduino Output

Figure 3.5 shows the software output of the proposed system in Arduino

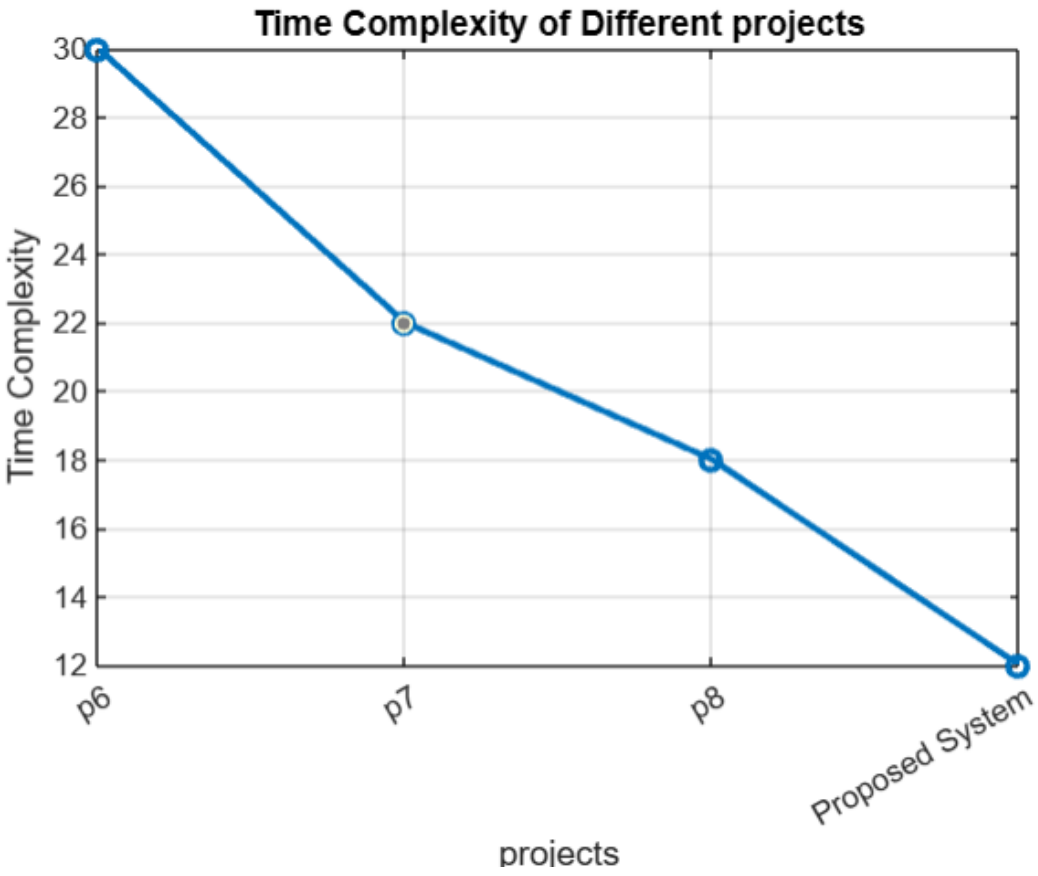

Figure 3.6: Analysis

Figure 3.6 shows the accuracy of time complexity of different proposed systems and our proposed system

CHAPTER 4

CONCLUSION

The conclusion of an IoT-based pet feeding systems offer a convenient solution for pet owners to ensure their pets are fed properly, even when they are not at home.The proposed Automatic Pet Feeding System represents a comprehensive and innovative solution for pet owners seeking to optimize the feeding process for their beloved companions. By leveraging advanced technology and carefully selected components, this system offers convenience, precision, and peace of mind to pet owners while promoting the health and well-being of their pets. With its user-friendly interface, accurate timekeeping capabilities, and reliable feeding mechanism, the Automatic Pet Feeding System embodies the future of pet care, forging stronger bonds between pets and their human caregivers while ensuring their nutritional needs are met with efficiency and care.the proposed Automatic Pet Feeding System represents a comprehensive and innovative solution for pet owners seeking to optimize the feeding process for their beloved companions. By leveraging advanced technology and carefully selected components, this system offers convenience, precision, and peace of mind to pet owners while promoting the health and well-being of their pets. With its user-friendly interface, accu- rate timekeeping capabilities, and reliable feeding mechanism, the Automatic Pet Feeding System embodies the future of pet care, forging stronger bonds between pets and their human caregivers while ensuring their nutritional needs are met with efficiency and care.

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