GSM CONTROLLED DOG FEEDER AND AUTOMATIC WATER DISPENSER USING RASPBERRY PI

Mark Christian G. Cabaltera, Kurt C. Cuaresma, Allen B. Flores, and Dr. Neil P. Balba

ABSTRACT

The proponents made a system that can monitor the amount of food and water in reservoir and in bowl. The system can automatically refill the water bowl of the dog by using water pump and load cell sensor. The system can also refill the food bowl of dog depending on the input of user by using GSM module, and the DIY food mechanism. The proponents used Raspberry pi computer to act as the main controller that is responsible for running the program and controls all the module needed for the system to work, all the sensors needed HX711 to convert the analog signal given by the sensor to a digital signal that can be recognize by the raspberry pi computer. The proponents used relay module to act as a switch for the water pump which has an AC supply. The proponents interviewed veterinarian to know the amount of food the dog needs based on its size. The system can make the lives of dog owners, who are too busy to feed their pet, more convenient.

Keywords: *Pet Feeder; Automatic Water Dispenser; Raspberry Pi; GSM; Load cell Sensor; Relay module*

INTRODUCTION

20th century brought us new technologies especially those that are based on communications. Technology started to change the lifestyle of every person in the world. Through technology, the innovation of devices was boundless having the capabilities a device must contain. The biggest change has begun by the development of cellular phone or smartphone. Phones make a big difference in our lives providing wireless communication through the use of signals. Most people use analog phones in past years, which can provide communication but has fewer capabilities. In the 20th century, digital

technology becomes a universal method having the ability to meet capacity demands.

With the ideas and technologies mentioned, a new concept of service could be implemented easily around our lives. Currently, in the Philippines, there is an increasing number of dog owners. According to Pet Secure, the Philippines has been on the top 6 of most dog populated countries, having 11,600,000 dogs. [1]

Taking good care of dogs takes a lot of responsibilities. This includes keeping them safe, showing concern, and feeding them on the right time. Most pet owners have a hard time feeding their pet, especially when no one is at home. Even though pet services can be found around the area, it requires more money and trust.

In this paper, the researchers proposed a new pet feeding system that can feed pets while owners are absent at their homes. Through the use of GSM module, owners can send message to the system for the bowl to be refilled. Also, GSM module sends notification to the owner when there's critical level on storages and the bowls. Load cell sensor was used for monitoring the weight of the food bowl and water bowl to monitor if it is on a critical level.

Objectives of the Study

This study aimed to develop a pet feeder that will monitor the food and water, and refill the food and water through a GSM module with the use of sensors. Specifically, the objectives of the study were to test the functionality of the system, to utilize GSM module technology to notify the user and control the system, and to test the accuracy of the system.

Significance of the Study

This study focused on developing a pet feeder which can automatically monitor and refill the food and water through load cell sensors and GSM Module. The main purpose of this project was for the owners who always leave their pets alone at home. This project will help the owners to monitor and feed their dogs while they are busy at

work. The project is user-friendly. It used a GSM Module to keep the owners notified whether there are foods left.

REVIEW OF RELATED LITERATURE

According to the research paper entitled Arduino based Food and Water Dispenser for Pets with GSM Technology Control, GSM is used to receive signal from the owner's phone. When the owner sends a message to the device at home, servo motor and solenoid valve will be activated. Servo motor will rotate and valve will be opened for the food and water to be dispersed. After the process is done, a text message will be sent to the owner, informing the successful feeding. The idea was to help people with busy schedules to feed their pets.[2]

Accoding to the research paper entitled Pet Feeding System Using Raspberry Pi and GSM, the concept came from pet owners that is not always at home. One main responsibility a pet owner must do is the pet's health. Make sure that the pet does not starve when the owner is not at home. By using a Raspberry Pi and GSM Technology, a pet feeding system was developed. Using a GSM is one of the useful features of the device, it is used to receive data coming from the owner. Most pet feeders used GSM rather than Wi-Fi because GSM is more convenient and reliable to used.[3]

According to research paper entitled Raspberry Pi controlled SMS-Update-Notification (SUN) system, the proponents used SMS as the module that notifies the user because it is cheap and the best way for sending information through mobile. The idea of SUN is to use GSM module and raspberry pi to receive SMS from anywhere from the authorized person that sends command.[4]

According to the research paper entitled Smart Fish Feeder, the system uses a GSM module as a receiver of command from the user to clean the fish tank once the water becomes dirty. The system act as to maintain the fishes easily even without the physical presence of the owner. The owner sends command from mobile to the microcontroller, then executes the command given by the user.[5]

According to a paper entitled Raspberry Pi for Automation of Water Treatment Plant, the idea is that a clean drinking water is a need for a human. The proponents used Raspberry Pi as an effective

replacement for a PLC for the use of automation of small water treatment plants. They used Raspberry Pi as a controller for the system, as well as the microcontroller that monitors the water treatment plant.[6]

According to a paper entitled NuriPet: A smart pet feeding machine for SNS, the idea is for pets to post in social media with the use of camera, pedal, and an internet connection. These are all connected and controlled by raspberry pi that connects to the internet and upload data given by the camera and the pedal.[7]

According to a paper entitled Using raspberry Pi and GSM survey on home automation, the idea was to make a home automation system that can be controlled by smart phones. The proponents used raspberry pi as a system that connects smartphones as input and motors as output. The motors can be controlled whether the motors will be on or off, which will vary by the user or owners command using the smart phone.[8]

According to a paper entitled Mobile phone controlled farm management aider, in India, there are lack of proper monitoring and efficient control in farming. The proponents used Raspberry Pi, GSM, and sensors to make a cost effective prototype to make the farming and understanding of specific concerns more easily. They used Raspberry pi as a monitoring system with the use of sensors which gathered data sent to raspberry pi. The GSM will send information to the users of the farm.[9]

According to a paper entitled Wireless sensor network system using Raspberry Pi and Zigbee for environmental monitoring applications, the proponents used raspberry pi as a base station that connects the sensors via Zigbee protocol. The Zigbee protocol collects the data gathered by sensors and also send the data again from sensor to raspberry pi. The raspberry pi can send and collect multiple data given by the sensor and can supply multi –clients.[10]

Conceptual Framework

The study aimed to develop and implement a system that is capable of GSM Controlled Dog Feeder and Automatic Water Dispenser using Raspberry Pi. The considered primary major tool in this research was the GSM module which was the core of the system.

All things in the system were connected in the GSM module, it served as a medium of connection between user and the system. The GSM module can give notification to user if any of the reservoirs is in critical level or is empty. Presented in Figure 1 is the Block Diagram of the system.

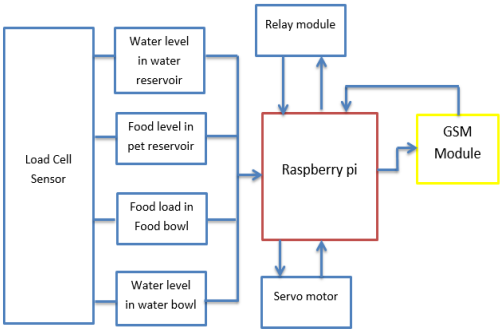

Figure 1. Block Diagram of the System

Figure 1 shows the Block Diagram of the system. The Raspberry pi computer was the one who controlled and processed the whole system. The inputs sent the signal that went to the Raspberry pi and the data were transmitted via SMS using GSM module. The Raspberry pi got a signal through the load cell sensor and control the water pump to automatically refill the water if the water reached its critical level. Also, the raspberry pi controlled the relay modules to regulate the water flow in in the water reserve. Also, this controlled the DIY switch for opening and closing of the cover for the food reservoir to refill the food bowl.

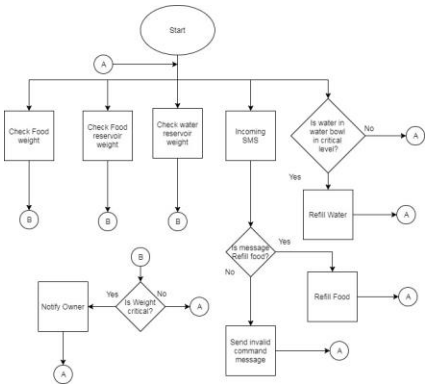

Figure 2. Flowchart of the System

Figure 2 shows the flowchart of the system. It discusses the process of the system. In the system, there was only one kind of sensor, load cell sensors, used to know if any of the reservoirs or bowls were in critical level. So the system was monitoring the amount of food and water inside the reservoir and bowl.

INPUT	PROCESS	OUTPUT
Load cell sensor	Will trigger if the food inside the food bowl is in critical level	The owner will receive a notification through SMS
SMS	Will send a signal to the system so that the system will know which specific command will it run	The owner can refill the bowl by sending SMS to the system

Figure 3. IPO Chart if the System

Figure 3 shows the IPO chart. It describes the flow and application of the system. The first input is the load cell sensor. This will trigger if the food inside the food bowl reaches its critical point. If the food bowl is in critical level or if empty, the owner's phone will receive a notification via SMS that the food bowl is empty. The system will wait for the owner to reply for the value of the food that should be refilled.

There are three kinds of choices that the owner can choose which depends on what the size of the dog the owner has as his/her pet. Load cell sensor is also the one that senses if the water in the water bowl is in critical level or point or is empty; it will automatically refill the water bowl. Load cell sensor is also responsible for checking if the food and water in the reserve is in critical level or not. If the water or food in the reserve is in critical level, the raspberry pi will send a SMS message to the owner's phone to notify them. Second input is SMS. The owner has an option to manually refill the food bowl if the food bowl is in critical level via SMS.

System Architecture

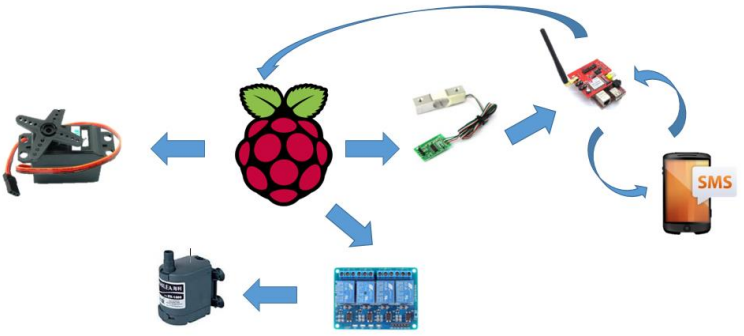

Figure 4. Project Design

In this study, the researchers aimed to design a system that is capable of being a dog feeder and water dispenser. In figure 4, it shows the actual research design of the Dog Feeder and Water Dispenser. Here, the tools that the researchers used in building the system are described as it follows:

- Raspberry Pi
- GSM module
- Load cell amplifier
- Load cell sensor
- Servo motor
- Water pump
- Relay module

RESULTS AND ANALYSIS

Refill food small				
Test	Time delay	Desired output	Actual output	within range
1	20	255g-340 g	293	ok
2	25.5	255g-340 g	190	error
3	26.4	255g-340 g	292	ok
4	28.6	255g-340 g	296	ok
5	26.5	255g-340 g	293	ok
6	30.1	255g-340 g	249	ok
7	31	255g-340 g	251	ok
8	27.3	255g-340 g	267	ok
9	28.1	255g-340 g	310	ok
10	29.5	255g-340 g	267	ok
Average	27.3	255g-340 g		

Refill food medium				
Test	Time delay	Desired output	Actual output	within range
1	27.5	340g-680g	567	ok
2	27.4	340g-680g	416	ok
3	29.6	340g-680g	395	ok
4	30.1	340g-680g	398	ok
5	31.7	340g-680g	396	ok
6	28	340g-680g	567	ok
7	32.5	340g-680g	356	ok
8	29.2	340g-680g	365	ok
9	27.5	340g-680g	455	ok
10	30.2	340g-680g	462	ok
Average	28.73			

Test	Time delay	Desired output	Actual output	within range
1	27	680g-1020g	739	ok
2	28.3	680g-1020g	686	ok
3	29.5	680g-1020g	841	ok
4	30.4	680g-1020g	833	ok
5	33	680g-1020g	855	ok
6	34.6	680g-1020g	823	ok
7	29	680g-1020g	811	ok
8	28	680g-1020g	783	ok
9	27.1	680g-1020g	767	ok
10	28.7	680g-1020g	783	ok
Average	29.56	680g-1020g		

Automatic water refill			
Test	Amount below Critical Level	Amount after refill	Status
1	35	58	Done
2	26	53	Done
3	17	58	Done
4	19	58	Done
5	26	53	Done
6	34	52	Done
7	30	58	Done
8	34	58	Done
9	35	52	Done
10	25	58	Done

CONCLUSION

After trying the functionality of the system, the proponents concluded that the system ran perfectly well, and it was able to utilize GSM module technology and to identify the bowls if it has enough food and water inside it. Using load cell sensors, the system was able to measure the weight of the containers and bowls. The functionality of the system was tested and met all the requirements. The performance of the Raspberry Pi was exceptional and can guarantee accurate result based on the series of experiments. The proponents made some improvements in the system and after some tests, the system is able to meet the objectives.

RECOMMENDATIONS

The proponents recommend to the future researchers to add a database of outputs inside raspberry pi. Also, the system will be more easy to use if the future researchers added an android application to control and monitor the readings of sensor in the system. The future proponents can use WIFI as the model for the connection between user and the system for the device to test which is more efficient for this project. The future proponents can use different sensors in sensing critical level of reservoir and food and water bowl and also add a battery to act as a secondary power source.

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