Article 7

Remote Web-based Cat Food Dispenser (DiCatDiHati)

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Abstract
The Remote Web-based cat food dispenser is a design that will help the cat owners to monitor or to feed their cats even without their presence. Currently, most of the cat owner feed their cats manually and sometimes they forgot to feed their cats before leaving home. This attitude can lead their cats for having unbalanced "diet" because beside did not feed their cat, the food that they fill in on the eating plate early in the morning also will be unhealthy. That food will expose to the air and it is not fresh anymore to be eat. The objective of this project are to identify the requirement in building and develop Remote Web-based Cat Food Dispenser that interfaces both smartphone and computer. Remote Web-based Cat Food Dispenser may have multiple function like the cat owners can feed their cats, check the balance of food in the container and set a notification or alarm for them. The waterfall model concept was been used for the software development model. The waterfall model contains some consecutives phases where each phases must be completed before moving to next phase (Bassil, 2012). Two type of testing has been conducted to accomplish the third objective of this project which are User Acceptance Test and Usability Test. Most of the cat owner give high marks on the User Acceptance. This concludes that Remote Web-based Cat Food Dispenser can be implemented by the cat owners in order to help their cat having a balance diet.

Keywords: internet-of-things, iot, notification, cat feeder, remote activation

Introduction
Presently, cats have become one of the popular pet where in the New Zealand, 48% New Zealand's households owning an average of two cat. Cats also need to eat and drink in order to survive but their diet is incompatible with human diet). Besides that, the amount of food that a cat must eat should be enough and not too overly exceed to avoid overweight (Anand&Brobeck, 1951). Through this project, cat owners can avoid the daily routine of remembering to feed their cat and can focus on other things.

Cat food dispenser is a device that helps the cat's owner to feed their cats. The cat food dispenser must have a container, a delivery plate and bottom lid (Lai, 2012). According to Lai (2012), at the bottom hole of the container, it must be covered with the bottom lid and has multiple through holes.

Remote web-based Cat Food Dispenser required numbers of hardware and software. Example of hardware needed in order to develop the Remote Web-based Cat Food Dispenser are LDR sensors, Raspberry Pi, Breadboard, Transistor, Capacitor and Servo Motor. While for software, FileZilla File Transfer, Adobe Dreamweaver and PuTTY are needed. This Remote will allowed the user to feed their cat, detect the level of the food in the container and set a reminder for them. The reminder are consist of three options which are Real time, Timer and Desktop Notification.

Related Works

   i.   Smart Pet Care System using Internet of Things

This article by Natarajan et.al (2016), discusses a new pet care system where the pet owners can feed the pets while the owners are not around and the owners can monitor the pets movement and status whether the pets eat the food or not. It also can control its excretion pad by the owner's smart phones. According to Natarjan et.al (2016), this project used Arduino as a platform since Arduino is cheaper and easier to use for every component. All of the devices are linked in a home network based on WIFI WLAN. The smart phone function is to monitor the status of smart pet care system and the user's smart phone also have to control the setting. In addition, to make the smart pets feeder work, the users need to set the feeding time and the amount of food to feed their cat based on the weight of the amount of single meal. The camera has been implemented with Raspberry Pi server. The other component is mobile web and APP for a smart phone. Users also can set the alarm to alert them about feeding time.

 ii. Pet Food Monitoring Using Raspberry Pi

According to Ag (2016), this project used the image to monitor the amount of the food in the bowl to help the cat owners who love their pet but they are unable to monitor their pets eating habit due to a busy working schedule. As the platform for this project, the researcher used Raspberry Pi due to low power usage. Then, there are four main components that have been used to develop this pet food which is Raspberry Pi model A+, Wi-Pi wireless adapter, Raspberry Pi camera module and lastly Micro SD memory card 32GB. Furthermore, the interaction between the system and the user only occur if there is no food in the bowl. If there is food in the bowl, the system will not interact with the user. The system will send a notification like "NOTICE: food bowl is empty" to the user through email and the notification also can be sent through message (Ag, 2016). Hough Circle Transformation used to find the circle in an image and that circle is used to create a mask. The function of the mask is to detach the food bowl from the rest of the image so that the image analysis will be more accurate.

Construction of Prototype
A. Develop the Dispenser
This construction phase was more focused on the hardware where the researchers need to develop a container that can be filled with the food. That container was attached to the Raspberry Pi in order to make the servo motor and LDR sensor work. GPIO concept in the Raspberry Pi has been implemented for the interaction toward both servo motor and LDR sensor. All of the interactions between the hardware were using the Python languages.

   i.   Servo motor
Servo motor was placed at the bottom of the container to allow the food flow. Raspberry Pi will connect to the servo motor, this phase need to be careful because servo motor is sensitive. If the

researcher entered wrong amount of power to have control toward servo motor in the Raspberry Pi it will totally blow out the Raspberry Pi and it cannot be used anymore. The researcher need to test one by one the best amount of power needed to make the servo motor move to the right way and right speed (food flow is about 60-90 gram).

ii.   Light Dependent Resistor (LDR) sensor
Four LDR sensors were placed in the food container. The first one represent the 100% level, second one is for 75%, third one for 50% and the fourth is represent 25%. Actually the function of LDR sensor is to detect the intensity of the light, better bright light around it the less intensity occur. So this concept has been applied to represent the food level where create an IF ELSE statement in the source code that state if the first LDR reading intensity is greater than 1500 it mean that the food still at the 100% level and if the LDR reading lower than 1500 it will pass to the second LDR. Same goes to other LDR sensor. Each LDR are connected to the different GPIO and GND. Each of the reading will be save in a txt file in the Raspberry Pi before it can be read through the PHP pages.

B.   Create Interface
The interfaces of the remote were created using the PHP languages. Adobe Dreamweaver CS6 has been used in order to create it. Since this remote is a web-based remote so it is okay to combine the PHP languages and the Python Languages. Besides having PHP languages, some pages were developed using Java Script Languages, for example, the reminder page that use the google API format. After all of the interfaces were created, the file was transferred into the Raspberry Pi using the FileZilla File Transfer. Researcher only needs to pin the laptop with the Raspberry Pi IP Address, port number and the password of the Raspberry Pi in order to connect to it. Then, the researcher just needs to drag the file into the /var/www directory so the website can be publish through the internet.

C.   Create interaction between button in the web-page and hardware on the dispenser
The interaction over the button in order to have control of the hardware on the dispenser was created using the Python languages. For example, when the "FEED" button on the web-pages pressed it will make the motor move and allow the food flow. Same goes to the "FOOD LEVEL" button where it can return the LDR reading that already stored in the txt file of the Raspberry Pi. Each of the page that relate to the interaction must have "#!/usr/bin/env python" at the top of the page.

Testing and Evaluation
There are two types of testing that was conducted for this project, which are the Usability and User Acceptance tests. 25 respondents all together were selected by the researcher in order to test the Remote Web-based Cat Food Dispenser, 10 of them were tested under the Usability Test and the others 15 under the User Acceptance test.

Usability test was conducted to observe usability of Remote Web-based Cat Food Dispenser. There were no detail explanations about the function of this remote before the cat owners test the remote. A set of task was given to the cat owners based on the navigation, interaction and design of the remote.

While for the User Acceptance test, ten out of 15 of cat owners were the respondents who already done the usability test while the others are the new respondents. For the new respondents, developer has explained about the function of the remote and how it will work before the evaluation session begun. Then, for those who already did the usability test, they were able to explore the whole Remote Web-based Cat Food Dispenser. The content of the survey was divided into 4 parts, which are to test the Compatibility, Function, Navigation and Interface Design and General Feedback.

Table 1: Measurement Criteria for User Acceptance test

Stongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

Results and Discussion

a) Usability Test

Figure 1 shows that only three out of ten tasks were not completed by the user. For task 7, only four users successfully completed the task and six more users have successfully completed task 8. Both tasks are option for the reminder whether they want to use the Real time or timer notification.
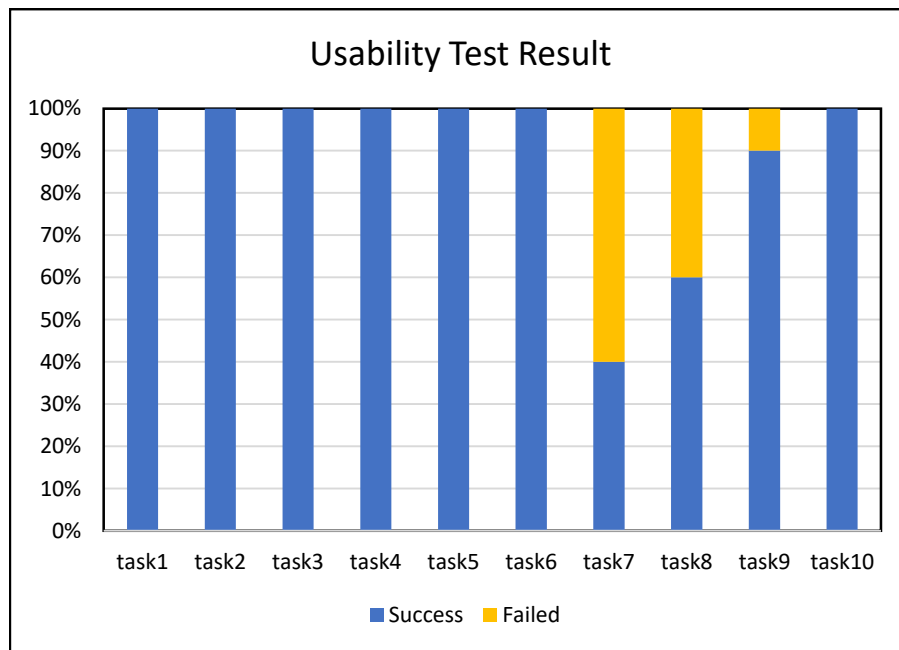

Figure 1: Graph base on Usability Test

b) Mean of User Acceptance Test

User Acceptance test with cat owners scored was 4.38. This means that the cat owners agreed to use the remote web-based cat food dispenser to help them to feed their cats. Mean score for each of the session can be referred to Table 2.

Table 2: Mean Score for User Acceptance Test

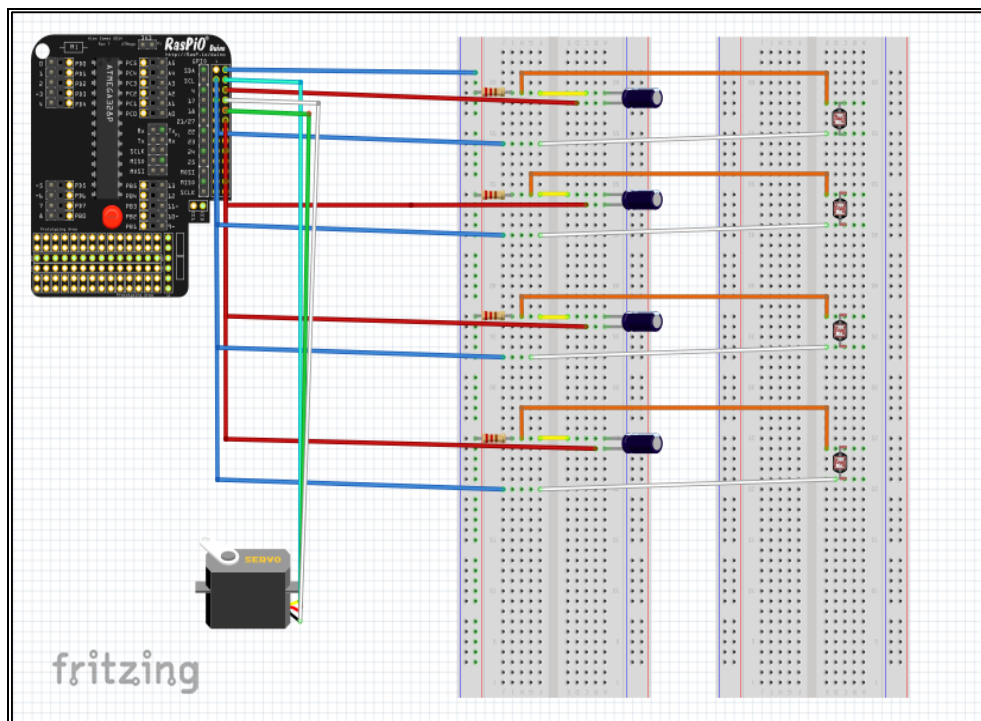| Criteria	Mean
Compatibility (C)	4.22
Function (F)	4.25
Navigation and Interface design Results (NID)	4.31
General Feedback (GF)	4.74

Prototype Circuit

Figure 2: Figure of Prototype Circuit

Figure 3: Images of the Prototype

Conclusion

Remote Web-based Cat Food Dispenser's objective was to identify the requirement in building and develop Remote Web-based Cat Food Dispenser that interfaces both smartphone and computer which can help the cat owners to feed their cat and detect the level of the food in the cointainer. Based on the observation and testing that was discussed it can be concluded that the main objective of this project is achieved.

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