Automated Dog Feeder

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According to Statista, the number of dogs living in households in the United States has reached a high of 89.7 million as of 2017 [1]. Considering that Census Bureau has estimated the United States population to be 325.8 million as of writing, this culminates in roughly 27.5% of the population owning a dog as a pet [2]. Undoubtedly, dogs are an important aspect of many households in the United States, though many individuals find themselves in the daily routine of feeding their dogs, and for many, complications arise when one's occupation separates one from his or her dog for long periods of time each day, or when one owns more than one dog, which requires a different feeding routine than the norm. Two of the three members in our group own at least one dog, with one member owning two dogs, and the other member planning on adopting a dog once shortly after graduation. Thus, several of the solutions to dog ownership that this project addresses is as a direct result of problems encountered by members of our group, and these solutions could certainly be employed in the lives of many other dog owners.

As its name implies, the objectives and goals of the Automated Dog Feeder include a collection of requirements that are meant to ease the burden of pet ownership. One objective is that the Automated Dog Feeder must continually monitor the weight of the food and water supply of both its dispensers, while also holding a minimum quantity of food and water capable of feeding a large dog for an extended period of time, particularly several days. The Automated Dog Feeder must also be able to differentiate between various dogs, and only dispense food to a dog specified by the owner, while simultaneously preventing unauthorized dogs, and other unauthorized pets from obtaining food from the food dispenser. Support for additional functionality of the Automated Dog Feeder will be accomplished using a dedicated IP address designated to a file server, and lastly, the Automated Dog Feeder must employ inexpensive materials and a relatively simple manufacturing process, which must allow it to be priced less than competitive products.

Functionality of the Automated Dog Feeder are derived from the several objectives listed above. The Automated Dog Feeder will dispense food and water in portions of weight and volume, respectively, that will have been specified by the pet's owner, and these portions must be able to be specified from an application on the pet owner's mobile device. Data and general information regarding the dog's eating patterns will be sent to the pet owner's mobile device, also including the ability to stream live footage of the apparatus's environment from a camera located on the apparatus. The ability to differentiate between an authorized pet and unauthorized pets will be accomplished using collar recognition, which is one of the primary features that sets apart the Automated Dog Feeder from its competition. The primary competitor to the Automated Dog Feeder is the Gosh EasyFeed, which is a similar project being funded and advertised on *Kickstarter*[3].

Requirements and Specifications

- The Automated Dog Feeder will store approximately two days worth of food along with filtered water system for a fresh supply of water.

- Collar Recognition using RFID technology will be used so only the dog with the correct tag can access the food.
- Using an app, user can set a profile that will determine the correct amount of food dispensing according to the dog's needs.
- Using a weight scale sensor, food will be dispensed until the cutoff point determined by the app.
- In case of a power outage, a backup battery will be used that will last up to at least a day.
- Using a 3D printer, enclosure will be created to fit metal bowls and drive cost of materials down.
- Mobile app will track how much food is dispensed alerting the user that it will be time to order new food ahead of time.
- Information on how much food will be stored in a database to build analytical history for the user.

Figure 1 - Hardware Block Diagram

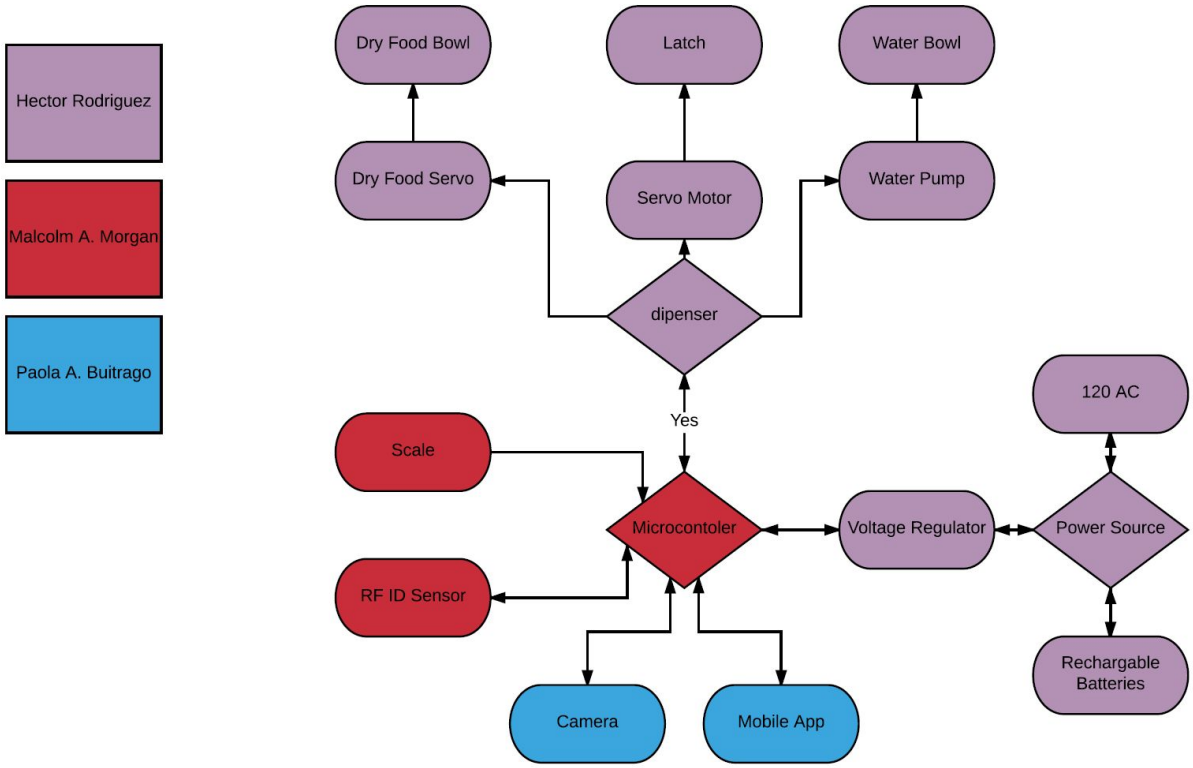

Figure 2 - Software Block Diagram

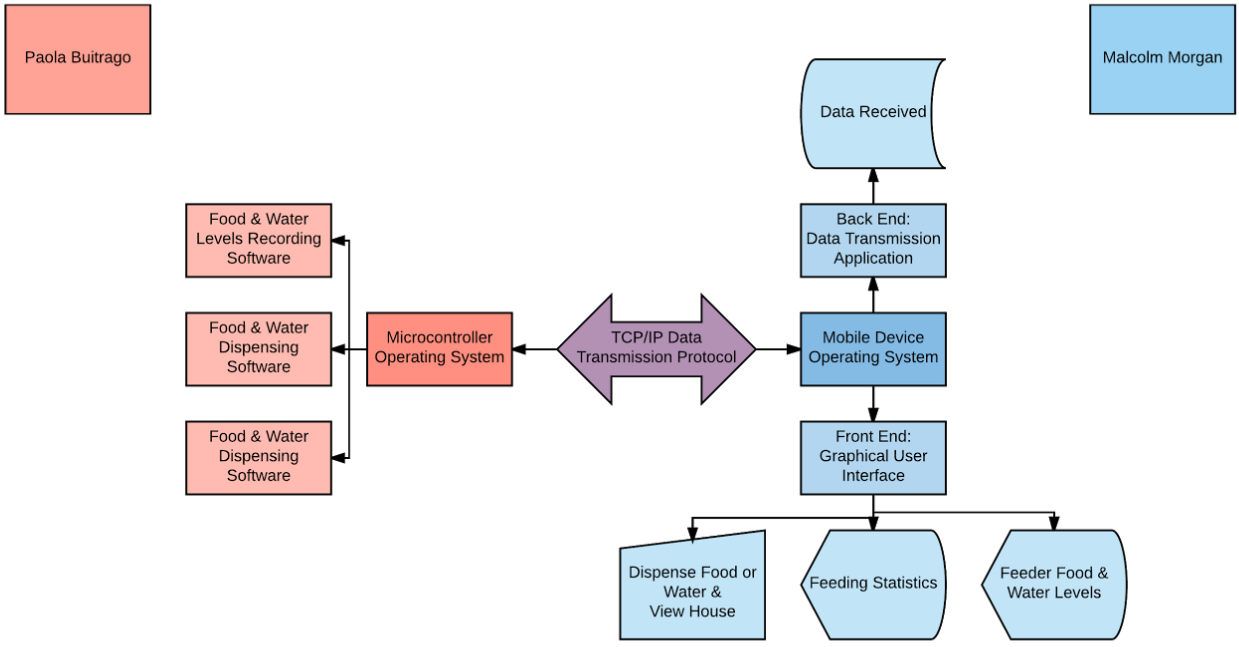

Figure 3 - House of Quality

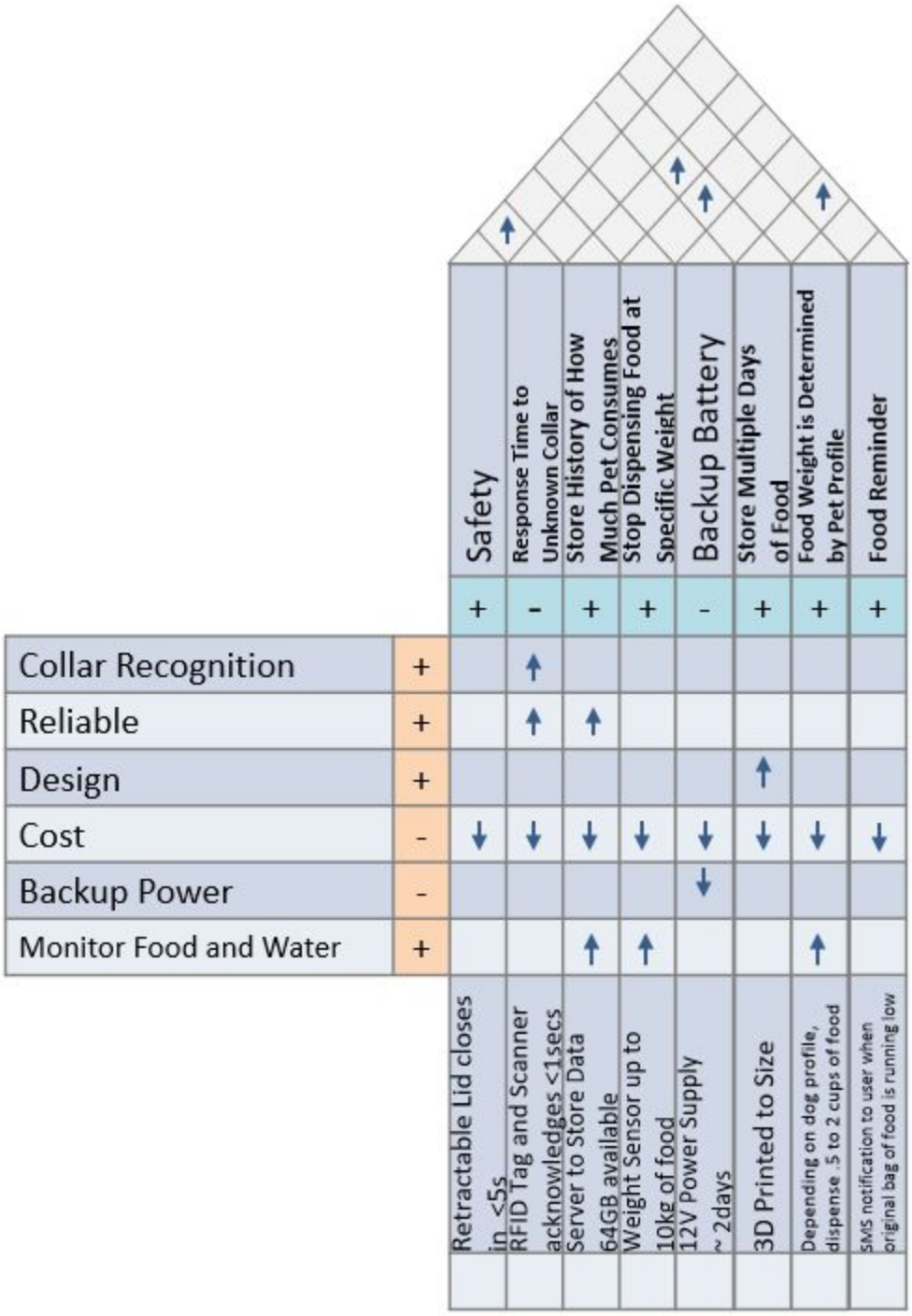

Table 1 - Budget and Financing

Item	Quantity	Price	Total Cost
3D Printer	1	N/A (owned)	N/A (owned)
Water Pump	1	$16	$16
PCB	1 (one pack = 30)	$13	$13
Controller	1	$35	$35
Weight Scale	1	$6 - $15	$15 (worst case)
Rubber Rotor Paddle	1	$35	$35
Metal Bowl	1	$7 - $10	$10 (worst case)
Power Supply	1	$25	$25
LED Lights	1 (pack)	$5	$5
Total:			$154

Table 2 - Fall Project Milestones

Deliverable	Customer	Due Date/Milestone	Length of Time to Complete?	Steps to Completion
10 Page Paper	SD Advisors	9-22-2017	2 - Weeks	Divide and Conquer
Material List	SD Advisors	9-29-2017	1 - Week	Research What is Needed
Prototype Draft	Team	9-29-2017	1 - Week	Each Member Design a Draft
Budget Draft	Team/SD Advisors	9-22-2017	2 - Weeks	Compare Similar Items
Schematic	Team/SD Advisors	10-6-2017	2 - Weeks	Solidworks
App Options	Team/SD Advisors	11-17-2017	6 - Weeks	Research SW Options
Buy Materials	Team/SD Advisors	10-13-2017	1 - Week	Order Parts
Finish 90 Page Report	Advisors	12-01-2017	12 - Weeks	Divide and Conquer

Table 3 - Spring Project Milestones

Deliverable	Customer	Due Date/Milestone	Length of Time to Complete?	Steps to Completion
Finalize Parts for Prototype	Team	01-19-2018	2 - Weeks	Make Sure Parts are Compatible
Assembled Hardware	Team	02-02-2018	2 - Week	Gather Tools for Assembly
Software for Microcontroller	Team	02-02-2018	1 - Week	Research Freeware
Software for Mobile Device	Team	02-23-2018	2 - Weeks	Research Freeware
Integrate SW & HW	Team	03-09-2018	2 - Week	Team Integration Sessions
Finalize External Enclosure	Team	03-16-2018	1 - Week	Tweek Schematic
Print Enclosure & Assemble	Team	03-30-2018	2 - Weeks	Make Final Adjustment
Have Working Project	SD Advisors	04-06-2018	1 - Week	Make it Look Pretty

References

[1] Number of dogs in the U.S. Retrieved September 21, 2017, from https://www.statista.com/statistics/198100/dogs-in-the-united-states-since-2000/

[2] U.S. and World Population Clock Tell us what you think. (n.d.). Retrieved September 22, 2017, from https://www.census.gov/popclock/

[3] EasyFeed Automatic Pet Feeder w/ Webcam and Amazon Delivery. (n.d.). Retrieved September 22, 2017, from https://www.kickstarter.com/projects/1214906246/gosh-easyfeed-the-100-hassle-free-automatic-pet-fe