Opto-Smart Pet Feeder

Senior Design I

Initial Project Document and Group Identification

University of Central Florida

Department of Electrical Engineering and Computer Science

College of Optics and Photonics

Group 9

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Project Narrative

There are many different types of pet feeders on the market today, but few employ the use of electronics to automatically dispense pet food and most of those rely on simple timers and can only serve one pet. With many people going back to the office after the COVID-19 pandemic, pets around the world are suffering due to a sudden change in routine. This product helps mitigate the stress put on the owners and the pets by using optics and electrons to ensure pets are being fed routinely whether or not the owner is present.

Devices that feed pets automatically are already on the market. What makes this product different is the use of optics to better ensure that pets are fed. This device has two parts, a collar tag that the pet wears at all times, and the automatic feeder. The collar functions as the pet's identification tag to the feeder. An LED light that is housed inside of a water-resistant plastic container emits a specific color that the feeder can recognize and dispense the correct amount of food for that pet. For houses with more than one pet, the other pet wears a second collar that emits a different color of light, and then that pet's food is dispensed accordingly.

The feeder contains a compact camera system that monitors the area looking for the predetermined color at the specific time of day that the user picks. At the predetermined time of day, the system will dispense the appropriate amount of food into the corresponding pet's bowl. Once the camera picks up which color LED collar is searching for food, the correct lid will open allowing the pet to eat. Infrared LEDs surrounding the bowl will constantly be giving the photodiodes a signal. Once the animal begins eating, the photodiodes will be blocked, causing the lid to remain open until the pet completely removes its head from the bowl. Once the detectors regain the signal from the infrared LEDs, a countdown starts. If something does not block the signal within the time the user selects, the lid will close.

In order for the device to work properly, there are several lines of functions and methods that need to be written in code. The feeder must be well programmed to be able to identify and distinguish the correctly colored LED light attached to the pet's collar to dispense food for the corresponding pet. The code also needs to be implemented to accurately dispense the fixed amount of food the user desired to feed for that pet. The user can enter in their specifications for the Opto-Smart Pet Feeder using a developed software program. This will directly correlate with how much food is dispensed, as well as the feeding time.

Requirement Specifications

- Camera system must detect at least 3 different colors (RGB)
- Detection range ~ 5 feet
- Power consumption < 100W
- Simple user interface to change settings
- Fast response time ~ 10 seconds
- Fast Dispensing time 30 - 60 seconds
- Collar tag must survive 60 seconds of water spray
- Lid must open when the correct color of LED is detected by the camera
- Lid must close after a set amount of time (approximately 60 seconds) once the pet has left the bowl
- Dispenser must release the desired (user input) amount of food corresponding to each color LED that is in use

Block Diagram

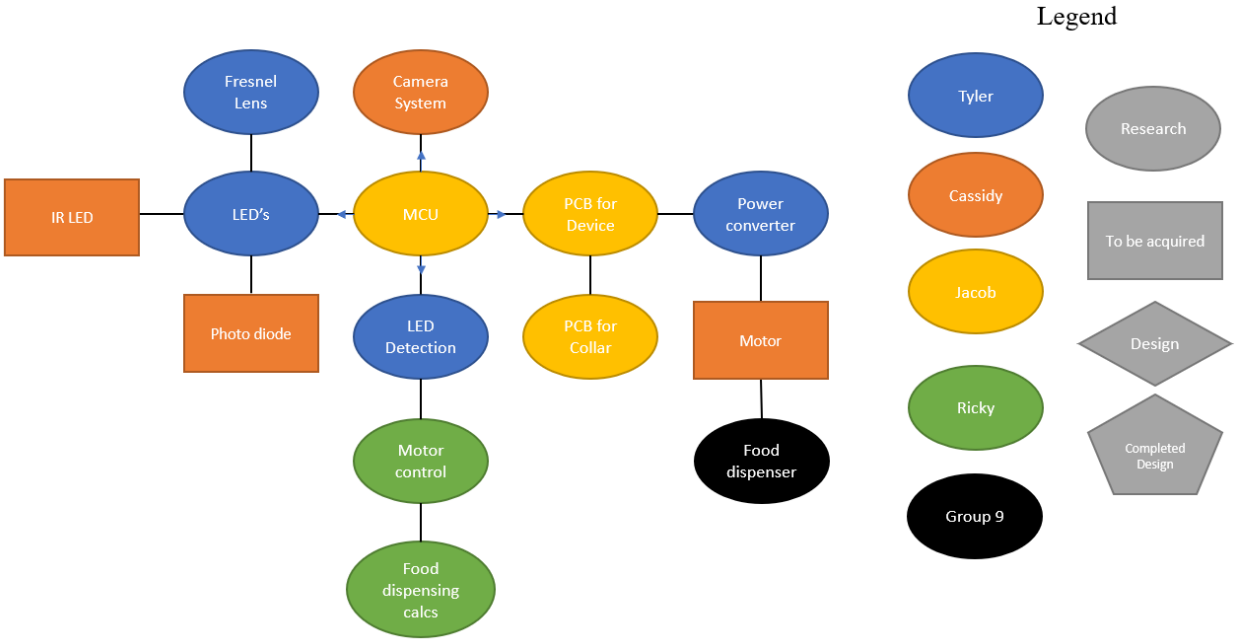
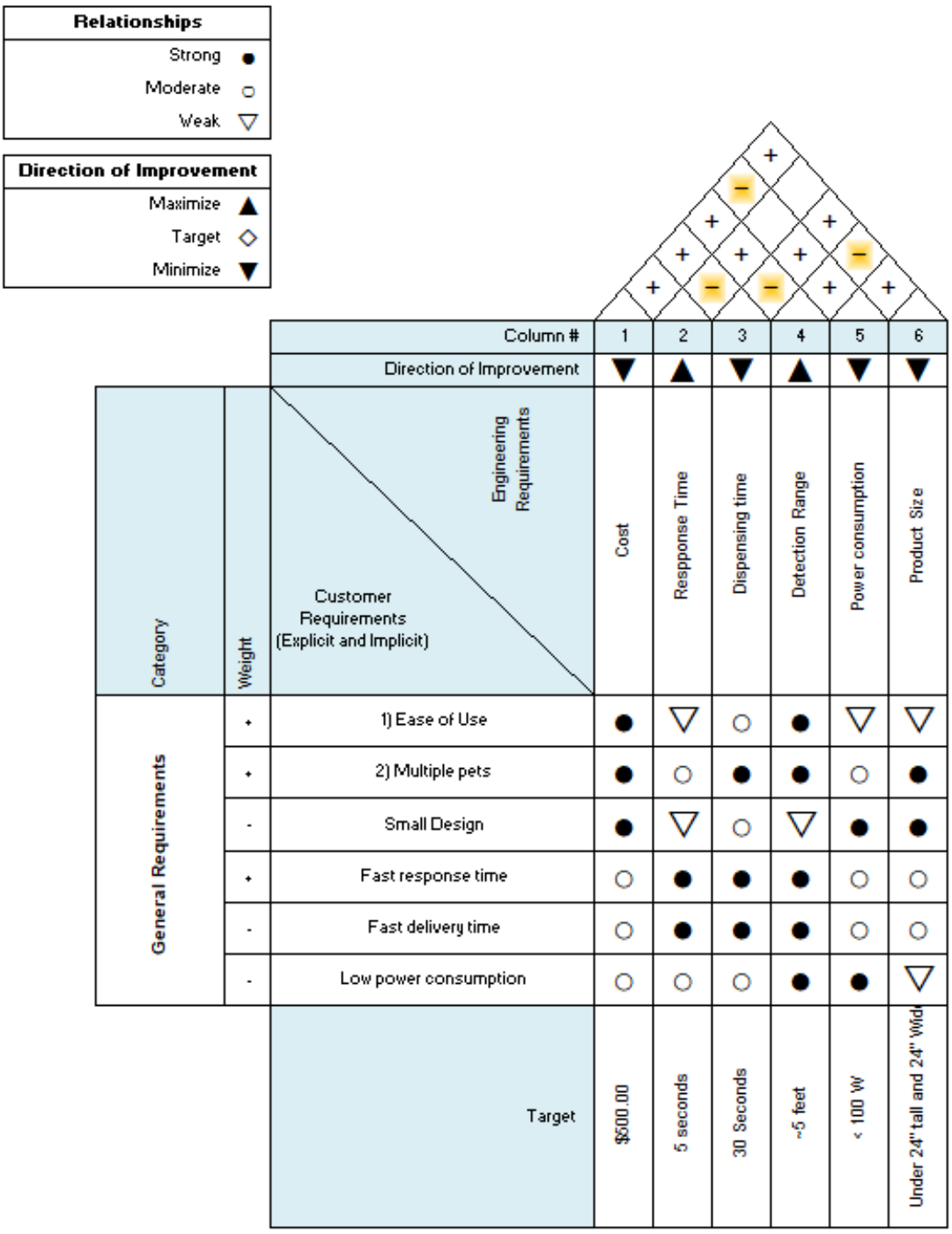


Figure 1: Opto-smart Role Assignment Block Diagram

House of Quality Diagram

This diagram shows the relationship between the engineering challenges and the customer specifications for the Opto-Smart Pet feeder projects.



Functional Diagrams

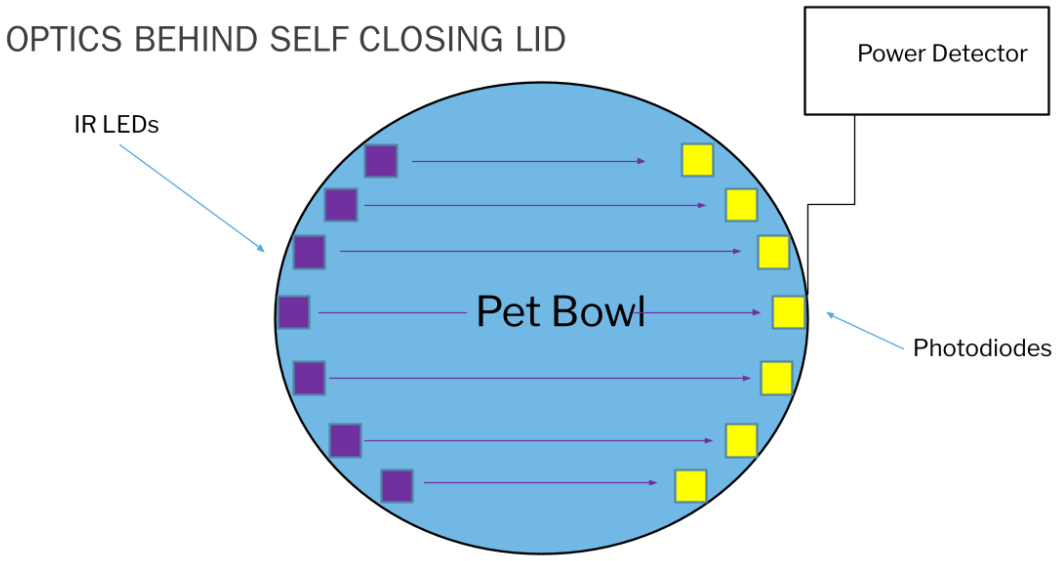


Figure 2: OptoSmart Self Closing Lid Block Diagram

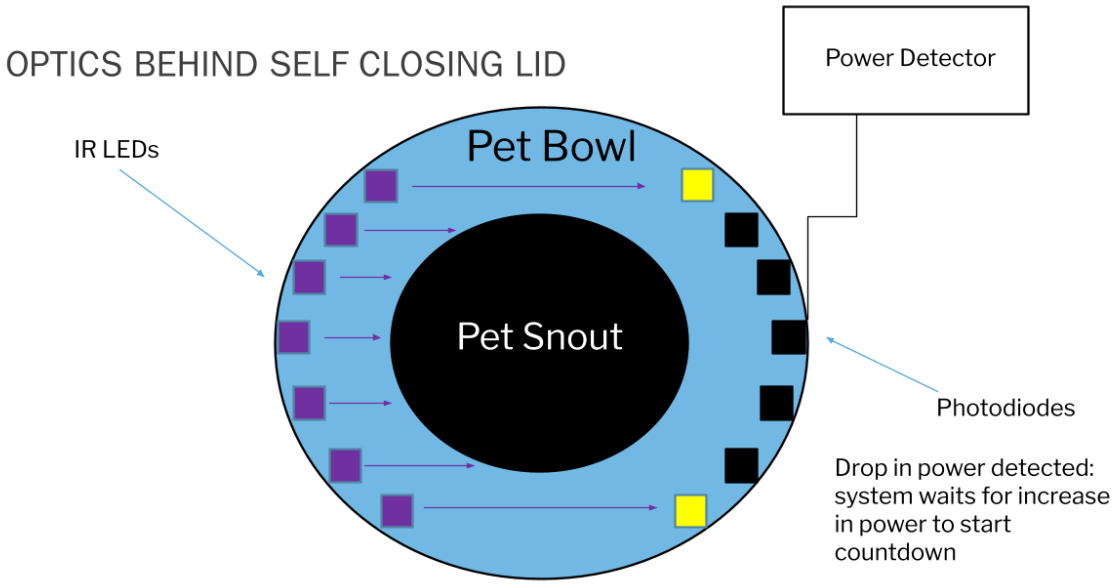


Figure 3: OptoSmart Lid in Open Position, Activated by Pet

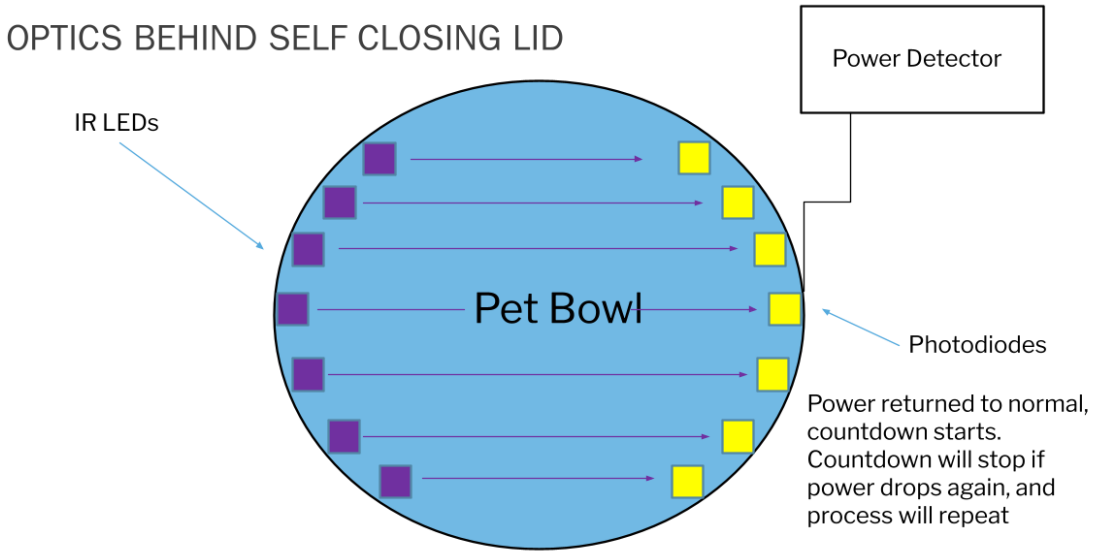


Figure 4: OptoSmart Lid in Preparing to Close, No longer Activated by Pet

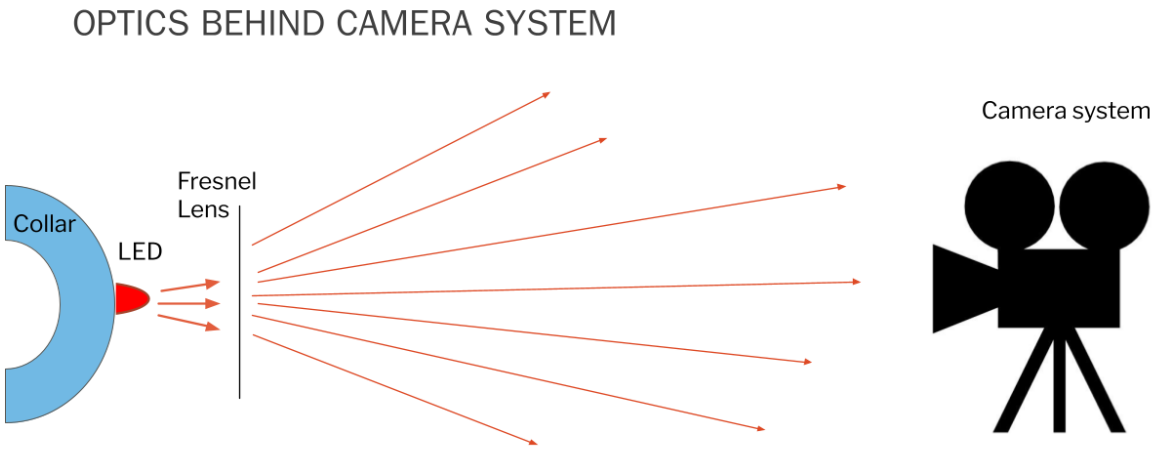


Figure 5: OptoSmart Camera and Collar System

Financial Considerations

Component	Quantity	Total Cost Estimate
LED	1	$6.99
Fresnel Lens	1	$8
Camera	1	$20
Photodiodes	6	$105
IR LEDs	6	$5.28
Power Meter	1	TBD
PCB Prototypes	TBD	TBD
Microcontroller	1	$20
Dispenser Motor	1	$20
Battery (2032)	2	$4
Mechanical Dispensing Parts	TBD	TBD
Total		**$189.27**

With a current budget of about $500, we have approximately $300 left for further development of the OptoSmart pet bowl. The prices listed above are estimated using online research. They may be adjusted slightly as the project gets closer to being produced. The final cost of the product will be evenly split between all of the group members.

Project Milestones

Senior Design I	**Who is completing the task**	**Start Date**	**Due Date**	**Status**
Understanding the scope of the project	Group 9	8/26/2021	9/3/2021	Completed
Role assignments	Group 9	9/3/2021	9/3/2021	Completed
Identify parts	Group 9	9/10/2021	12/3/2021	In Progress
Project report				
Initial Document	Group 9	9/10/2021	9/17/2021	Completed
Updated initial document	Group 9	9/17/2021	8/1/2021	In Progress
First draft	Group 9	8/1/2021	11/5/2021	In Progress
Final draft	Group 9	11/5/2021	11/19/2021	In Progress
Final document	Group 9	11/19/2021	12/7/2021	In Progress
Research, documentation, and design				
Microcontroller	Ricky	9/17/2021	12/3/2021	Researching
Lens design	Tyler	9/17/2021	12/3/2021	Researching
Circuitry	Jacob	9/17/2021	12/3/2021	Researching
PCB	Jacob	9/17/2021	12/3/2021	Researching
Schematics	Jacob/Ricky	9/17/2021	12/3/2021	Researching
LEDs	Cassidy	9/17/2021	12/3/2021	Researching
Cameras	Tyler	9/17/2021	12/3/2021	Researching
Motors	Tyler	9/17/2021	12/3/2021	Researching
Dispensers	Jacob	9/17/2021	12/3/2021	Researching
Housing for electronics	Jacob	9/17/2021	12/3/2021	Researching
Photodiode	Cassidy	9/17/2021	12/3/2021	Researching

Gear Mechanisms	Jacob/Tyler	9/17/2021	12/3/2021	Researching
Code used for project	Ricky	9/17/2021	12/3/2021	Researching
Order and test parts	Group 9			
Senior Design II				
Build prototype		TBD	TBD	
Testing and redesign		TBD	TBD	
Finalize prototype		TBD	TBD	
Practice presentation		TBD	TBD	
Final Report		TBD	TBD	
Final Presentation		TBD	TBD	