Design Presentation

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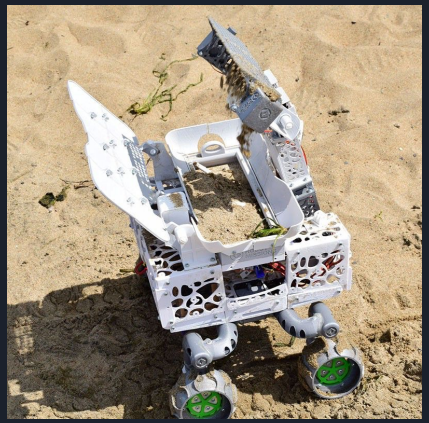
Empathize

- Our client is Erin Kennedy of Robot Missions.
- Robot Missions is an environmentally focused technology company known for their innovative use of using autonomous robots to help the environment.
- Bowie is a small-sized, lightweight, semi-autonomous, low-cost robot whose sole purpose is to observe, clean, and restore the parks and beaches of Ottawa, Ontario.

Issues observed

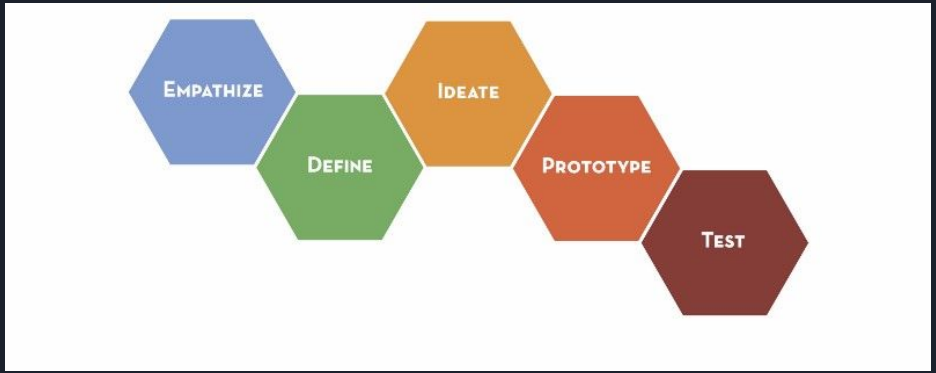
- There is sand buildup in the hopper

- There is no way for the user to tell when the hopper is full



How we solved the problems

- Design Thinking



Define

- Bowie's arm has an attached shovel tip which it uses to scoop the litter from the beach.

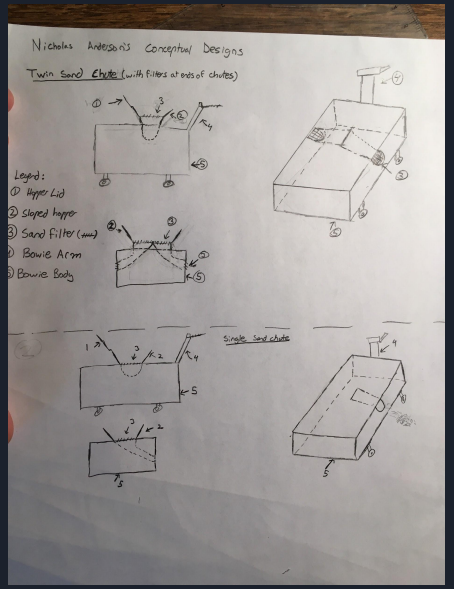
- The shovel attachment, consists of numerous holes which act as a means of filtering any sand out and isolating the litter to be stored in Bowie's hopper.

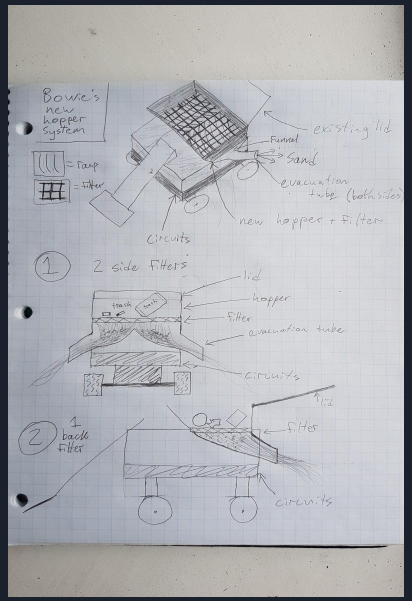
- We understood in class that even with the holes, Bowie still struggled with the building up of sand in its hopper leading to a less than ideal portion of the hopper full of sand.

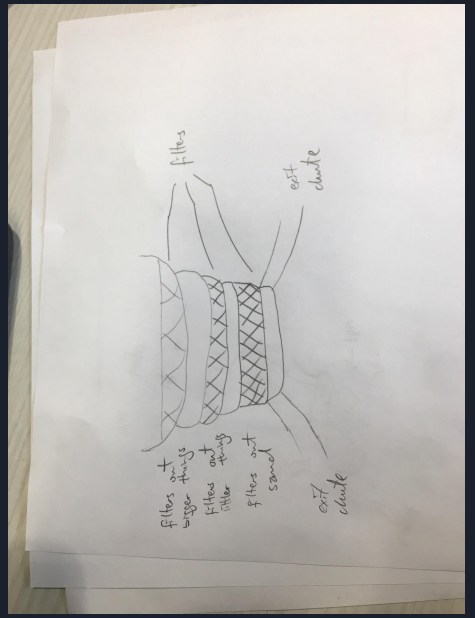
Problem Statement

- There exists a need for Robot Missions and Bowie to create a mechanism that reduces Bowie's sand intake, in order to allow him to maximize the amount of trash that he can intake, while minimizing the amount of space wasted in the hopper by sand

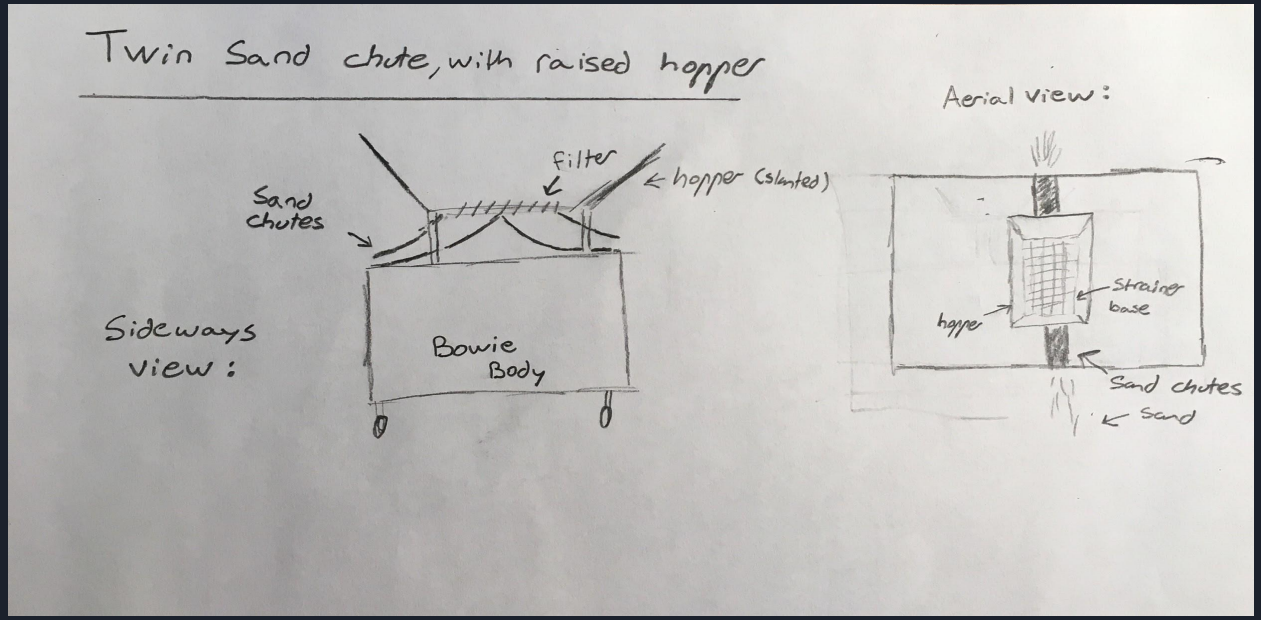
Example design ideas





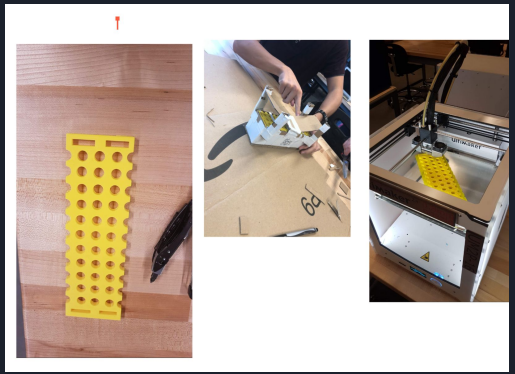


Ideate


Twin Sand chute, with raised hopper
Sideways view:
Sand chutes
filter
hopper (slanted)
Bowie Body
Aerial view:
hopper
strainer base
Sand chutes
Sand

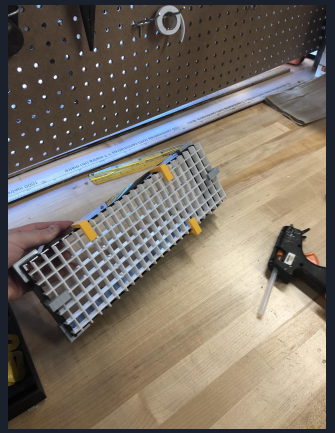
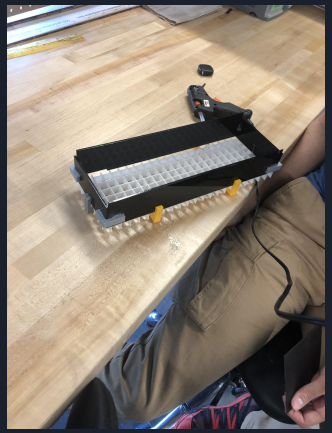
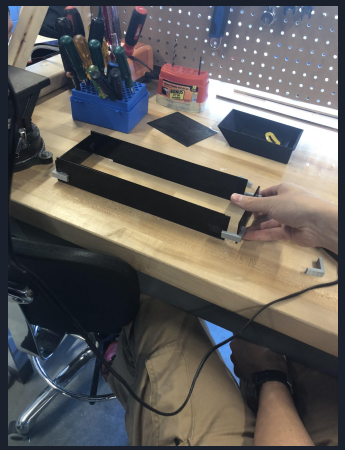
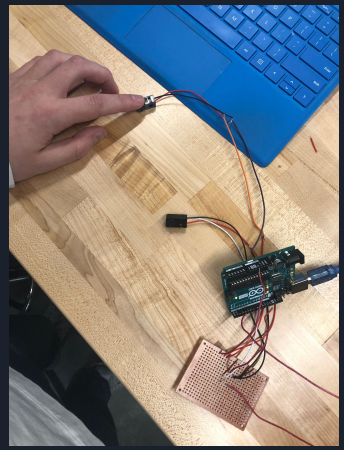
Prototype 1

- Prioritize testing the filter
- 3D printed a filter with circular holes
- A cardboard scale model
- Benchmarked against other filter types



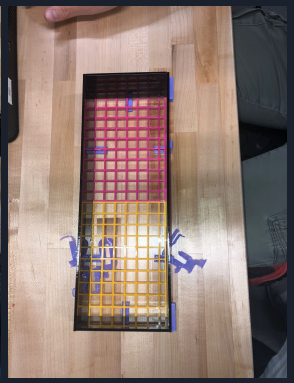
Prototype 2

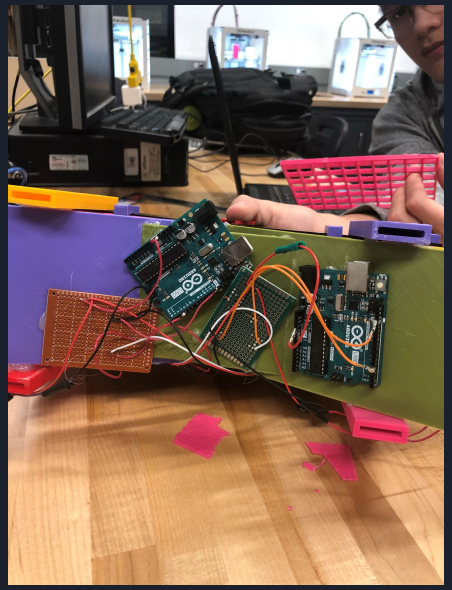
- Create a comprehensive physical prototype of the sand filtering system
- Create a focused physical prototype for the break beam laser.
- Our testing of the filter proved positive of its design and only slight design modifications would need to be made.

Prototype 3

- Combine prototype 2 with the break-beam laser system and new ramps
- Implement design tweaks from Erin's feedback





Testing objectives

Acrylic vs PLA

Effectiveness of laser sensors

Recap: Our design

- Our team created a design where the hopper and filter are combined
- We implemented a filter at the bottom of the hopper in order to effectively filter out both, wet and dry sand.
- Finally we installed break beam lasers that alerts the operator when Bowie's hopper is full.

The future of our design

1. Removable filters with different style/size holes
2. Different integration of the circuits and lasers (like a slot for the wires and housing for the circuits.
3. We would have liked to make small brackets for the lasers themselves to ensure they stay attached and have a long lifespan
4. Interlocking parts that can fit together and be taken apart rather than superglue