Design Criteria Group 6

Interpreted Need: Bowie needs an improved hopper that allows him to collect around the same amount of trash as the existing hopper while reducing the sand picked up, thereby reducing the weight.

Our initial design criteria was altered significantly after having watched Erin's presentation. Prior to the presentation, our team was heavily invested in the idea of utilizing solar panels on Bowie in order to increase the longevity of its battery life. This would allow the robot to be active for a greater duration of time, and it would also mean that the operator of the machine would need to interact with it less frequently. Unfortunately, after our team suggested the idea, Erin explained that the integration of solar panels is not feasible due to the negligible amount of power the panels would produce, compared to the needs of Bowie. More specifically, Erin stated that solar panels would generate significantly less power than the capacity of the 5000 mAh lithium polymer battery. Furthermore, Bowie would need to expend more power in order to compensate for the added weight of the panels. This increase in the energy expended by Bowie would be greater than the power supplied by the panels and thus a net loss of power would take place.

The client meeting delivered detailed insight on Bowie's most pressing needs, resulting in an altering to our design criteria. Our team noted that a prominent issue in the design of Bowie's hopper was the buildup of unwanted sand. Since trash is mixed with sand, each time that Bowie scoops up waste, sand is picked up as well. This accumulation of sand in the hopper creates less space for the trash which Bowie is supposed to be storing. Thus, it was determined that a feasible way of solving this problem would be to implement a sand filtration system in the hopper, allowing him to collect more trash before his has to be emptied.

Customer perceptions: Does the filter/hopper system increase the amount of waste that the hopper is able to hold? Can I interact with the robot (empty it) less often?

Technical performance: Does the filter/hopper system evacuate sand while retaining the garbage in the hopper?

Target range for design specifications:
Ideal target specifications: The removal of 75% of the sand, while keeping 90% of the volume.
Acceptable target specifications: The removal of 50% of the sand, while keeping 70% of the volume.

Design Criteria	Design specifications	Relation (=, < or >)	Value	Units	Verification method
Functional requirements	Hopper size and volume	<=	30x10x6	cm^3	measure/test with a ruler
	3D printable (replaceable parts)	=	yes	N/A	test
	Must evacuate and filter majority of sand	=	50-75	% of sand	test
	Must retain most trash and waste of existing hopper	=	70-90	% of existing trash	test

Constraints	Price	<=	100	$	receipts
	Weight	<=	Asked Erin	kg	scale
	Biodegradable 3D plastic	=	yes	N/A	test
	Type of movable sand	=	Dry/soft only	N/A	test
	Inclination of funnel	=	Angle To be determined	Degrees	test
	Compatibility with existing lid	=	yes	N/A	test
Non-functional requirements	Black coloured (absorb light energy to evaporate moisture from wet sand)	=	yes	N/A	test
	Durability	>	6	months	test/abuse
	Appeals to people	>	0	years	test