uOttawa

Deliverable E: Detailed Design and BOM

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Introduction:

This deliverable will discuss non-functional design constraints, changes to the design to satisfy these constraints, the effectiveness of the changes in satisfying the constraints, the summary of new client feedback, critical product assumptions not yet tested, the development of a second set of prototypes, latest prototype(s), and prototype testing. This document will therefore investigate the next steps in product development by confirming future ideas and current results of prototype testing based on client feedback, target specifications, and design constraints.

E.1 Design Constraints:

Two design constraints

1. Identify two non-functional design constraints that play an important role in the development of your prototypes. Justify your reasoning.

During the span of these 7 weeks our team has come across at least two non-functional design constraints. One non-functional design constraint involves cost. The costly constraint of the $100 budget has forced the team to prioritize cost over value/quality. In this case, the team has had to find the cheapest possible materials. This may affect the functionality/lifespan of our prototypes and therefore affect the validity of their testing.

Time has been another non-functional design constraint. Specifically, having deliverables due almost every week along with coordination with client meetings (and other course load elements), it has been challenging to coordinate accessing the given materials required to build prototypes along with finding the time to build and test them effectively.

Changes to satisfy design constraints

2. For each design constraint, explain in detail what changes would need to be made to your design to satisfy the constraint.

In order to satisfy cost constraints, the team will have to buy a minimum of the amount of materials needed along with prioritizing which materials are of utmost importance in each prototype and design. For example, if in the design of the main bar, we only need 12 screws, the team will only buy 12 screws to minimize wastage and unnecessary additional costs.

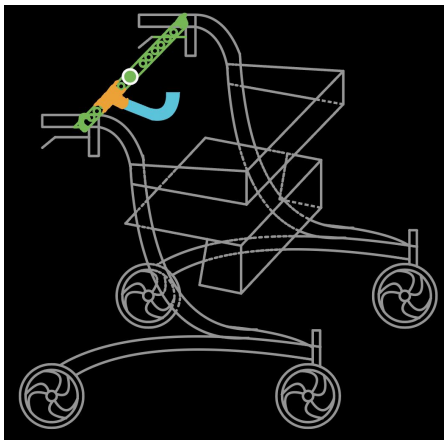
To satisfy cost constraints, the team will have to maximize each meeting and ensure that we are following the planned agenda. By doing so, the team will be able to stay on task and plan ahead accordingly.

Effectiveness of Changes in Satisfying Constraints

3. Provide proof (e.g. analysis, simple calculations and/or simulations, research) to demonstrate the effectiveness of your changes in satisfying the constraints. Justify the process and methods used.

We changed the BOM to find materials that are more inexpensive. As well as considering the materials we can use from the maker store that comes at a cheaper price. Now our BOM is under budget and we have more leeway if needed.

4. Update your detailed design accordingly.



Updated Detailed Design.
Our updated detailed design features the removal of the clamps that were on the sides of the walker and the addition of an attachment dock (in orange).

E.2 Prototype 2:

Summary of new client feedback

1. Summarize any new client feedback that you have received and clearly state what needs to be changed or improved in your design. Update your detailed design accordingly.

During the client meeting, we presented our first prototype. In doing so we received mainly positive feedback regarding the preliminary tests and design. In this first case, the client liked our idea of adding side clamps to either side of the walker. She appeared to like the idea of being able to easily clip and unclip the main bar without having to use much force or rotational movement. The client also liked the idea of the stack pin to attach the second steering bar to the main bar. One concern that the client had revolved around the potential that the secondary clips on the side of the walker may fall off if she were to hit it at the wrong angle. We can therefore improve the design by considering other alternatives to storing the bar when it is off the walker and folded. In this case, the team has brainstormed an alternative to include a velcro strip to hold the two sides of the bar together and store in the bar her walker. The client also informed us that she always has a mini-backpack, which could be used for storage.

Critical product assumptions not yet tested

2. Define the most critical product assumptions that you have not yet tested.

Some critical product assumptions that have not yet been tested include the functionality of the clamps (i.e how much weight can they bare from the main bar, how big can they be, how easily do they allow the bar to be removed) and the steering port (how easily can it be manipulated with the wrist/body weight, how sturdy/durable is it under weight and at different angles).

Future prototypes (second set of prototypes)

3. Develop a second set of prototypes that will help you on your way to creating your final prototype and test the critical product assumptions along the way.

Another prototype will involve the testing of the hinge attached to the bar. Specifically, the test will involve determining how much weight the central bar can bare while attached to the hinge. Another prototype will revolve around the movement of the steering port along the central bar. This will ensure that the port is easily moveable along the bar and can be used on either side. Finally, another prototype that will help in creating the final prototype involves the testing of how the clamps and central bar fit on the walker, fit together and how much weight they can withstand.

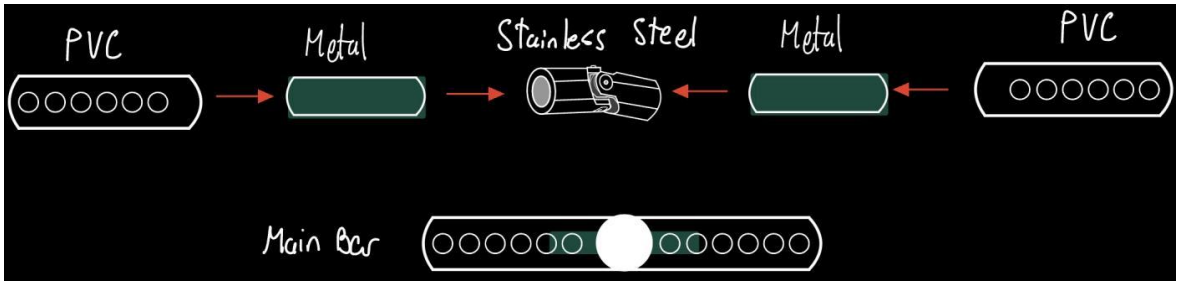
Prototype testing

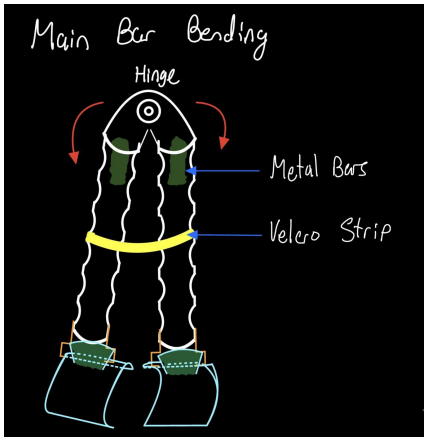
4. Carry out prototype testing, analyze and evaluate performance compared to the updated target specifications first developed in Project Deliverable B and document all your testing results and prototype specifications. Present your testing in an organized, tabular format that shows expected versus actual results (i.e. compare your measured prototype specifications to your target specifications by including both in a similar table to the one you developed for Project Deliverable B).

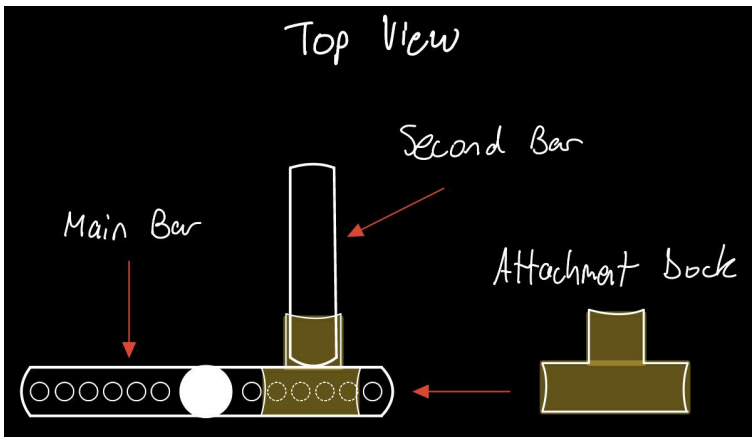
Prototype tested	Purpose of testing	Expected results	Actual results (compare to target specs)
2	Length of Main Bar	Around 50cm (An estimate for the width of the walker from handle to handle)	68cm (Can be decreased to any required length)
2	Length of Main bar while folded	40cm<	38cm
2	Weight Supported (In the direct middle of the bar)	<25lbs	35lbs (Not tested to failure)
2	Weight of main bar and secondary bar	5lbs<	Well below the 5lbs limit

Latest prototypes

5. Document your latest prototype(s) using as many sketches/diagrams/pictures as required and explain the purpose and function of your prototype(s).







The sketches presented above are updated versions of what we had come up with in the previous project deliverables. The first drawing represents how the main bar is set

up, this time with the addition of two metal bars to go in the PVC pipes and in the hinge to fit everything properly with the help of nuts and bolts. The main bar bending now has a velcro strip (as mentioned in the summary of our second client meeting). The last sketch includes a top view of the main bar connected with the second bar with the addition of the attachment dock to allow easy assembling.

Conclusion:

Our second prototype was a medium fidelity physical model which contains most of the parts that will be used in the final build, with the exception of the pins, clips, foam and adhesives. As stated before, none of the pieces were connected using any adhesive to allow for quick modifications, however this is not how the final build will be made. The second prototype allowed us to test some of the metrics that we have been designing around since the beginning of the design process. We tested the length of the main bar, length of the main bar while folded, weight supported and weight of the 2 bars. All of which were found to be in compliance with what we had planned for.

UPDATED WRIKE:

https://www.wrike.com/frontend/ganttchart/index.html?snapshotId=I5WvuiJmmmbOwPm3WL7SA2PVAiVQJ8oY%7CIE2DSNZVHA2DELSTGIYA

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