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GNG2101 Report

Project Deliverable F - Prototype 2

Submitted by

[One handed walker steering. A2, Team 3]

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Introduction

As seen in our lectures, after we have defined both the systems and subsystems we are going to use for our design solution, we must come to the part in which everything will come together by creating a proptype, which consists of assembling all the components our device will be composed of. After our first prototyping attempt; we have done a proof of concept after ordering the missing parts online. In this deliverable, we will create a physical prototype, which we will also use for testing.We have also had a meeting with our client and we will be reflecting on our client feedback as well. Finally we will once again describe a prototyping plan and a testing plan. On the other hand, on these plans we will outline how we will make sure our device works properly and optimize the subsystems.

Client Feedback

We have had our third client meeting with Janice, in which we had the opportunity to pitch our prototype and explain our project plan, and the functioning of our device. We have had some feedback from our client regarding the foldability of the walker when the device is attached and detached. We have talked about the user manual, so our client would understand better the detaching system of our device. We have talked about the braking system, the feedback given was very positive and similar to the system she used with her current walker. We had a question regarding the material in which we used galvanised steel, thus it is resistant during extreme weather conditions. Finally, we have learned that our client has gotten a new walker, similar to the one we have used for our prototype. The overall feedback was very positive and helpful for us to move on with the prototyping and testing phase.

Critical Product Assumption

For availability of material, we have tried looking at various sites to find an aluminum bar and due to the rarity of it in the current market and the pricing of the material, we have decided to change the bar to a steel one simply because they are much cheaper and easier to find. The numerical solution done on the aluminum bar for the amount of force that the bar can handle is around the same as the steel bar so the force applied onto the steel piece is not a thing to worry about.

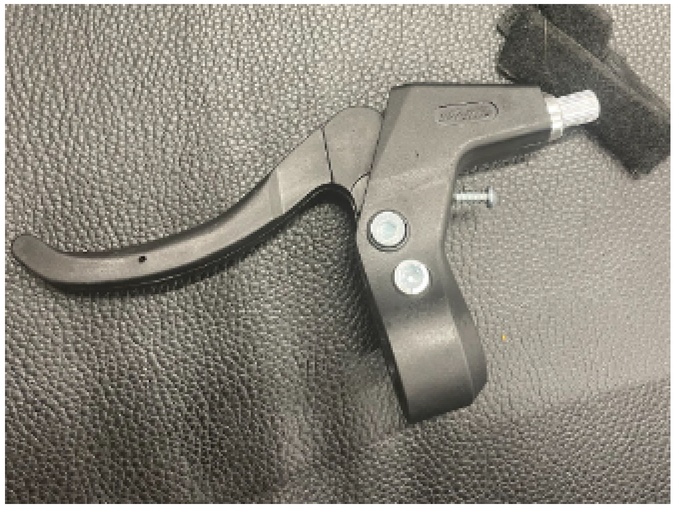
After distinguishing our prototype, most of the values are considered acceptable for a spec because most of our critical function problems seemed to disappear. Specs such as force applied, range of motion on brake, length and tension on the metal brake wire were all satisfactory.

We are at a point with our design where some of the critical problems about the functionality that we had discussed with the client has gone away while we were building the prototype. Along with that, we had some adjustments made to the materials that we were planning on buying simply made it much easier and efficient for us.

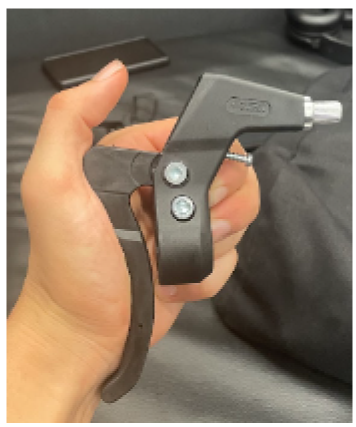
As we had discussed in the client meet, we had a few main issues coming into this prototype that would cause an overall failure during the testing phase. Power displacement was the error that could have occurred if the power applied on the bike brakes wouldn't be enough to activate the brakes on the walker itself. We were starting to plan on using a pulley system to make this problem disappear but frankly this issue seemed to fade away simply because the metal wires attached to the bike brake were tense enough to actually take effect.

Our second critical functionality problem would be the brake activation range because if the range of motion on the lever was too small, there wouldn't be enough displacement to pull the wires which then would lead to not enough range to pull on the walker brakes.

Before Brake Activation

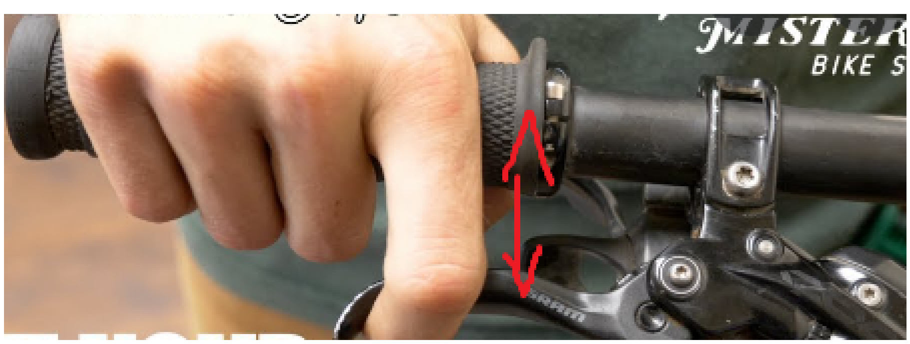


After Brake Activation



As seen with these images the activation range almost seems to be around 90 degrees which is far more than what we anticipated (which is a good thing).

Our anticipated range of the bike brake

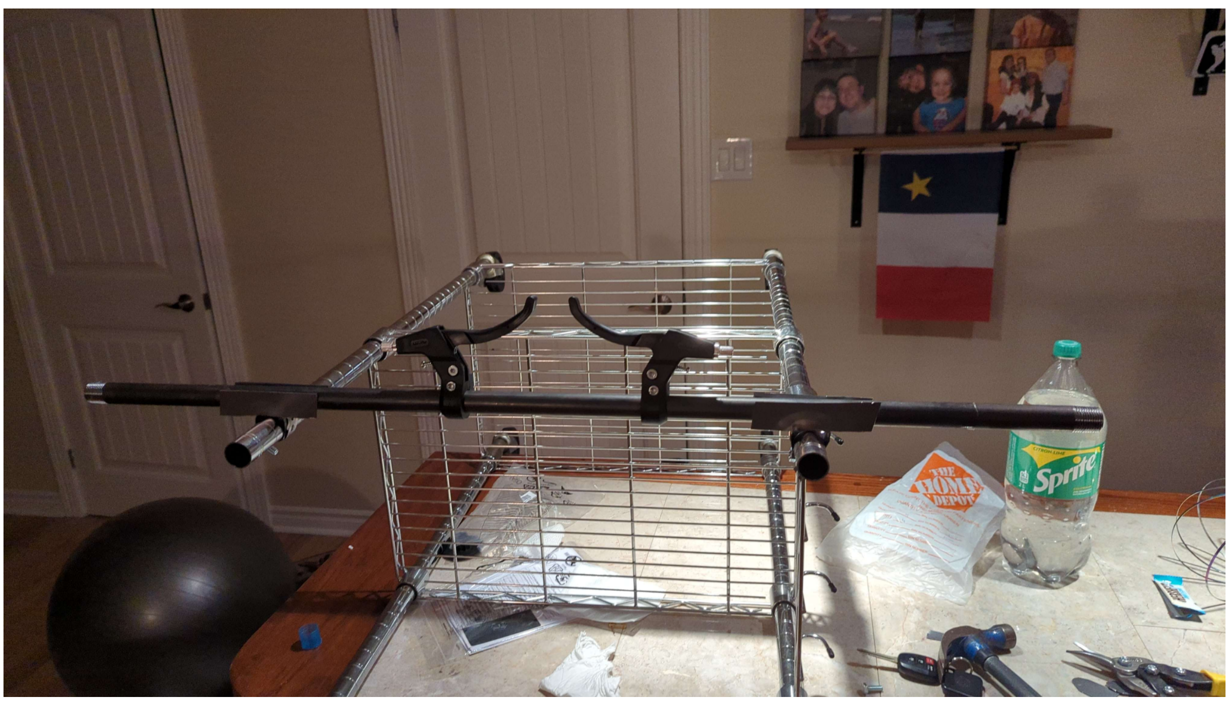


Just simply clipping on the brakes on to the bar, we will get the needed range to activate our motion.

Second Prototype

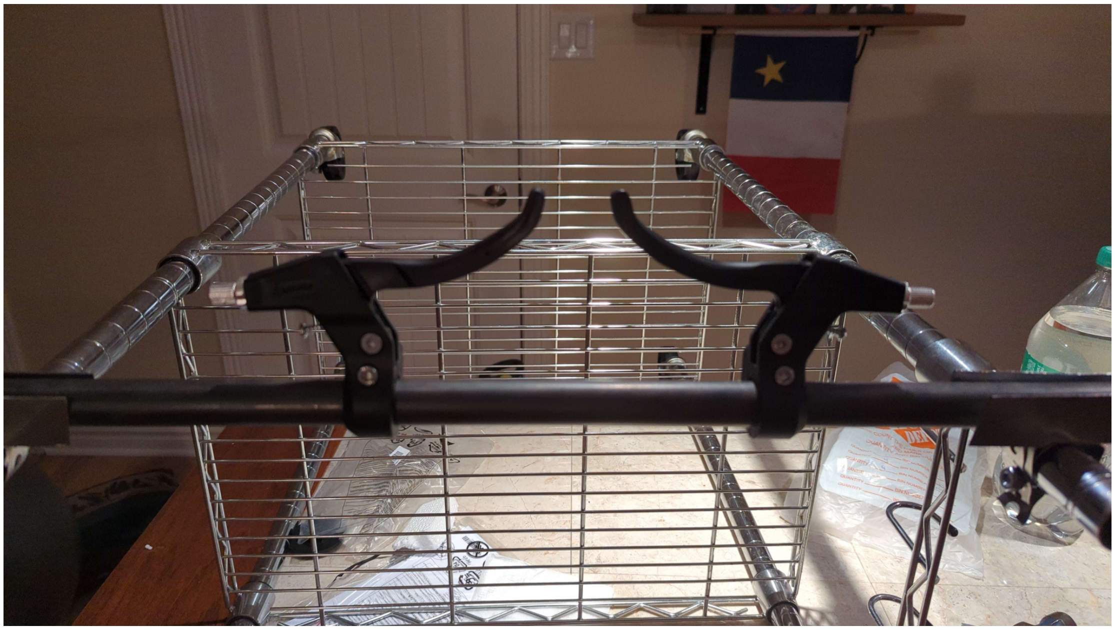
We have built our second prototype which is a medium fidelity where we can communicate the results between the group members and get general feedback from the prototype itself and see where we can improve on. The prototype is more on the physical & comprehensive side because it isn't focused on a single component of the prototype; having a goal of learning and integration. The results of the testing are provided in the following section of this document.

Front View of the Prototype



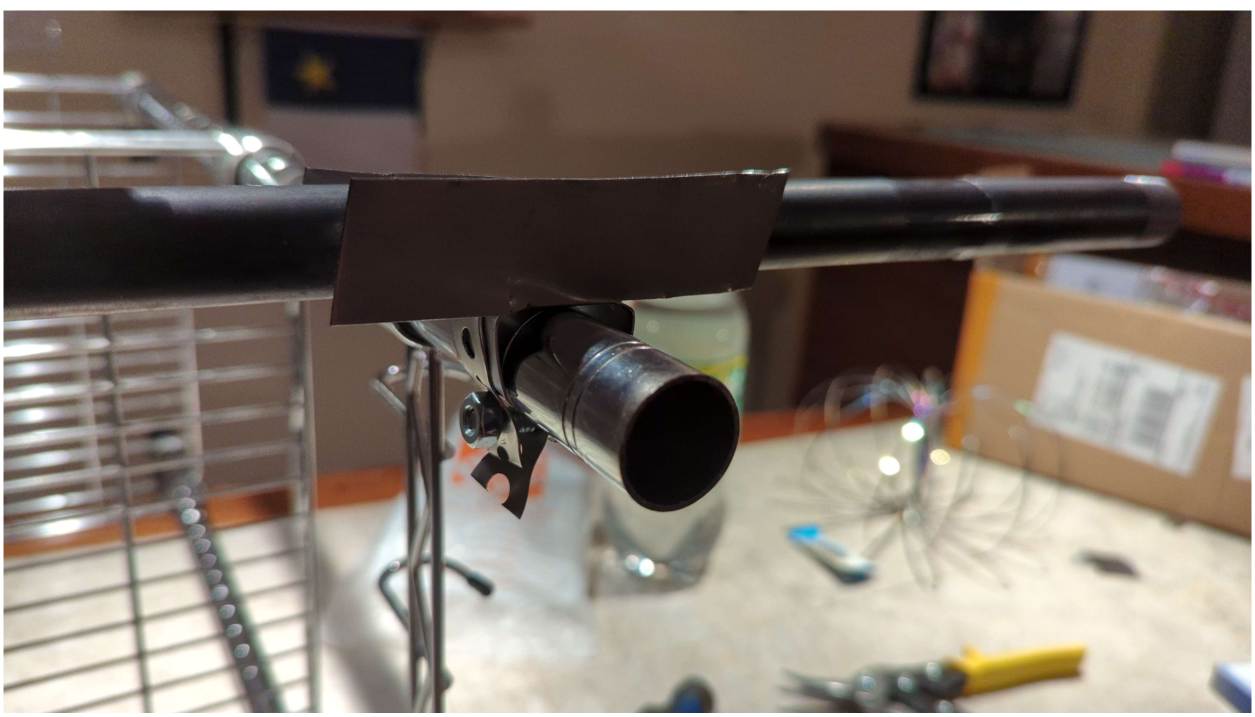
How the overall prototype will look once implemented onto the walker itself. The bar that we are using to test the prototype on has the same physical properties as the walkers that will get used on. The current length of the bar is too out of proportion for any of the walkers on the market so some of it will be cut with a grinder to adjust to the width of the walker.

Close Up on the Brakes



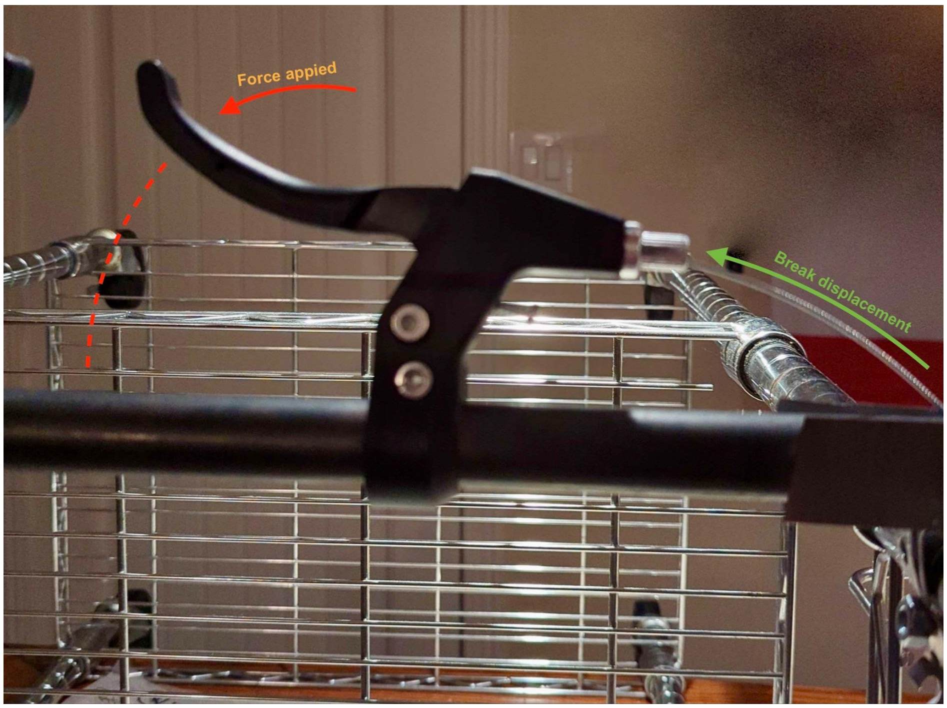
Brakes are attached in parallel to the bar. Once you press the right brake the brake on the right hand side will get triggered and vice versa for the left side.

Bar Attachment to the Walker



We have cut and shaped 2 small pieces of rectangle sheet metal and attached it onto the handles of the walker. The steel bar that contains the brakes would just slide right in between them.

Prototype Testing



Metric#	Metric	Measured Specifications	Target Specifications
1	Force required to use device	5.6 N	< 10 N
2	Turning Radius	N/A	< 2 m
3	Rotational Speed	N/A	> 30 deg/s
4	Total Weight	3.1 kg	< 8.5 kg
5	Dimension	0.13 m^3	< 0.55 m^3
6	Reliability	>2500h	> 2500 h
7	Material	Steel, Plastic	Aluminium
8	Time to assemble	15 min	< 20 min
9	Ease of use	Good	N/A
10	Cost	$30	< $100

Our measured specifications fall well within the target specifications we set in the deliverable B. Even exceeding what we once initially anticipated after doing the testing on individual components at first and then a comprehensive physical test of the medium fidelity prototype taking into consideration the latest client feedback and previous mistakes to comply with her needs.

Conclusion

Throughout the time frame of this project deliverable, we successfully completed the assembly of our second prototype, which we can conclude is the most important one, since it is the main device which should just be optimized to be presented on design day, without any major changes. The prototype is easy to use, light, doesn't require a lot of force to use, compact, quick to assemble, cheap and reliable.

Furthermore, we have tested our activation range and also did our critical product assumptions. We have laid a solid foundation to keep working on our design so that it can be ready and fully functional for our design day presentation. We also have gotten feedback from our client regarding our prototype and since it was positive we did not make any major changes into our prototype.