Deliverable G

Introduction:

Having trouble holding onto items? Are you experiencing difficulties in gripping motion due to your thumb? Then, GripMate is the product for you. GripMate turns your imagination into reality as you experience the future in your hands. Just put the glove on and set your troubles aside as you grip with GripMate. This report summarizes the details on the second prototype for GripMate.

Central Body:

1. Summarize the client feedback that you received during your third client meeting for your first product prototype and clearly state what needs to be changed or improved in your design.

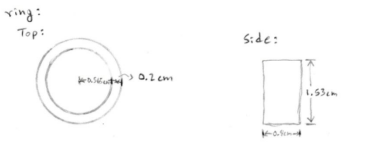
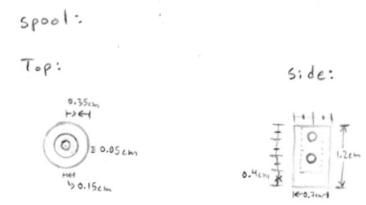
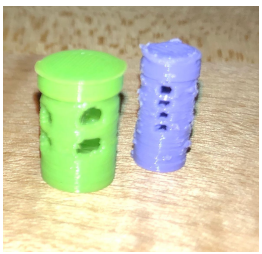
    Upon showing the client a physical glove sample to be used to implement our device, she had some concerns with the rubber that was attached. She thought some rubber should have to be trimmed off to reduce the bulk of the glove. However, the client liked the breathability of the glove as well as the strap to secure it on the wrist. The client also liked the new design that eliminated the use of a microcontroller allowing for the hand grip device to be reduced in size on the client's hand. Since we presented her with different parts of the final product, she was concerned about how everything would come together at the end.

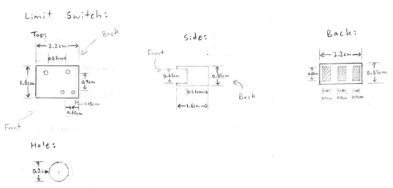
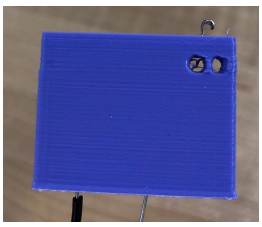
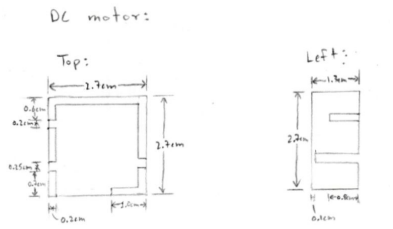
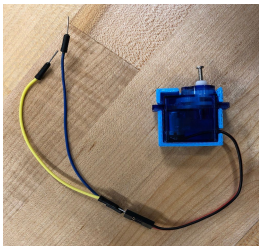
    Moving forward, the rubber texture needs to be changed in the glove. Simplicity is key for our client so everything we do should be easily understandable to the client. We need to put every part together and test out the glove on its overall performance for the second prototype.

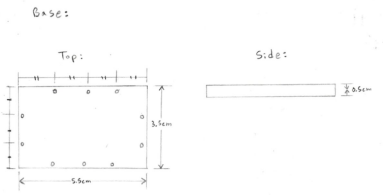
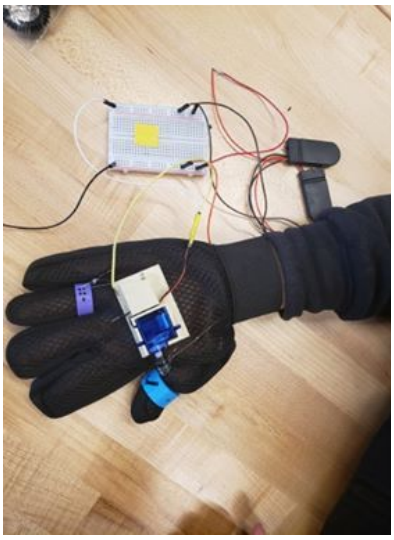
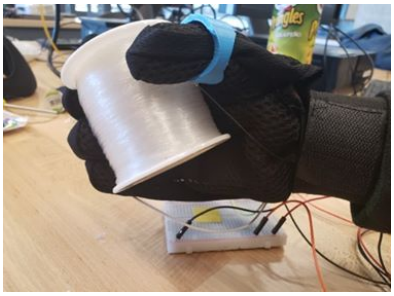
2. Based on the feedback, develop a second prototype (or more) which will help you on your way to creating your final product.

    Based on the feedback, we need to test the overall functionality of the glove by putting the activation unit, the thumb-pull unit and the glove together to form one continuous system. For this prototype, we will be testing the gripping motion of the hand as we put all our components together as well as model and 3d-print different parts of the device and test each component individually before moving forward.

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

Sketches/diagrams/pictures	Purpose	Function
 Figure 1: Sketch of the ring	The sketch diagram helps us doing 3D modeling of the ring	Provides a recorded data for the dimensions used to 3d prints components for this project.
 Figure 2: Printed model of the ring	To position the the user's finger movement properly	One of the ring is attached on the thumb, with the power transmitted through the string from the DC motor, it can give the user power to do gripping motion. The another ring is used as the activation equipment. When the user bends his ring finger, the switch will be activated and power up the DC motor. Similarly, when the user stops bending the ring finger, the motor will be stopped.
 Figure 3: Sketch of the spool	The sketch helps us construct the 3D model	Provides a recorded data for the dimensions used to 3d prints components for this project.
 Figure 4: Printed model of the spool	To allow the strings to be connected to the head of the motor	Keeps the strings tight and operational through the movement of the thumb. The holes on the sides are to tie part of the string they are spooling.

 Figure 5: Sketch of the limit switch case	The sketch helps us creating the 3D model of the switch case.	Provides a recorded data for the dimensions used to 3d prints components for this project.
 Figure 6: Printed model of the limit switch case	To attach the switch on the glove.	It has 2 holes on either side to allow the string to go through it. This keeps the string in place and allows it to pull the lever down and activate the switch. This prototype was used to collect the right dimensions for the limit switch and ensure that the holes allowed the string to pull down the lever sufficiently enough to activate it.
 Figure 7: Sketch of the DC motor case	The sketch helps us to develop the 3D model of the actual base and find the best placement method.	Provides a recorded data for the dimensions used to 3d prints components for this project.
 Figure 8: Printed model of the DC motor case	To attach the motor on the glove.	The motor fit perfectly in it and also worked when attached to a power supply. It keeps the motor in one location in the glove so that the strings can be attached and spooled correctly.

 Figure 9: Sketch of the base	Used as the intermediary that attaches with the switch and the DC motor on the back of the glove.	Provides a recorded data for the dimensions used to 3d prints components for this project.
 Figure 10: All components connected and put together	It helps us to find the best and most efficient position to place our motor and the switch.	Figure 10 shows that all the components fit together properly as a single device. For the testing purposes, the parts are not fixed in one location of the glove. The battery packs will be directly connected with the components without the help of the breadboard in the final product.
 Figure 11: Gripping test being performed	It tests the gripping power of our design as well as the functionality of our project.	As shown in figure 11, the forward gripping motion of the glove is operational. It functions as planned, however, the reverse movement will be incorporated for the final prototype.

4. Carry out prototype testing, analyze and evaluate performance compared to the target specifications 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.

Table 1: Summarized results after testing compared with Target Specifications

Metrics	Units	Acceptable Value	Ideal Value	Actual Value (After testing)
Total mass	g	< 500	< 300	< 400
Minimum gripping strength generate by the device	kg	> 15	> 20	> 15
Device size for client	Size	=Large Size	=Medium Size	Medium Size
The time device can last	hour	< 3	< 6	> 3
Water Resistant	bars	No	Yes	No
Manufacturing Cost	$ CAD	< 100	< 90	< 70
Time for client to take off the device	minute	< 2	< 1	< 2
Instills pride	Subjective	A bit	A lot	A bit
Wireless Charging	qi	No	Yes	No

5. Outline what your team intends to present on Design Day and how you intend on verifying that your “Solution Works Really Well”.

As of the current state of the product, it assists with holding/gripping of objects of specific size, which will be further tested to broaden the types of objects the glove can be used with. Also, our next steps would be to reverse the motion of the thumb to bring it back to its rest position after the client wants to release the object being hold and proper placement of rubber on the glove for better grip. There are other minor issues like frequent movement of the base and string location in the glove which will be solved as we add proper connectors to have all parts be located in a fixed position.

On the Design Day, we want to present our product that can accomplish the task that assist our client with her holding and listed in our problem statement. We also intend on presenting the various parts of our projects deliverables to give a backstory and a look at the

progress of the development of our product. Our product will go through rigorous testing to verify the working condition of the glove and so that our final product works really well as intended.

Conclusion:

Overall, we accomplished our goal for this deliverable which was to combine all the parts together and test out the gripping motion of the device. Although there are small issues that needs to be fixed like frequent movement of the base and string location, the device functions properly as intended.