Mechanical Overview

Year: 2018 **Semester:** Fall **Team:** 07 **Project:**Handi_glove
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Assignment Evaluation:

Item	Score (0-5)	Weight	Points	Notes
Assignment-Specific Items				
Commercial Packaging Analysis 1		x2		
Commercial Packaging Analysis 2		x2		
CAD Model Illustrations		x4		
Project Packaging Specifications		x2		
PCB Footprint Layout		x2		
Writing-Specific Items				
Spelling and Grammar		x2		
Formatting and Citations		x1		
Figures and Graphs		x2		
Technical Writing Style		x3		
Total Score				

5: Excellent 4: Good 3: Acceptable 2: Poor 1: Very Poor 0: Not attempted

Comments:
Comments from the grader will be inserted here.

1.0 Commercial Product Packaging

1.1 Product #1

Robo-Glove
https://technology.nasa.gov/patent/MSC-TOPS-37


Robo-Glove, a wearable assist device which is designed by GM and NASA to help reduce the grasping force needed by industrial worker to operate tools for a long period of time or when performing tasks that have repetitive motion. The positive aspect of this product is the round finger which can grasp object more firmly than our project because there is a sensor board on each fingertip for our project. However, the servo is placed on the glove for Robo-Glove and thus it increases the glove's weight. Also, Robo-Glove has no pressure and temperature feedback.

The aspect of Robo-Glove that we can adapt is the small and compact design of exoskeleton for the glove to provide assistance for human hand. However we will improve and enhance the design by adding more feature into like motion restraint. Also, we will place sensors on robotic hand to provide feedback system and these will be our differentiation from this commercial product.

1.2 Product #2

Dexmo exoskeleton glove

The Dexmo Exoskeleton Glove is a motion capture and force feedback device created for VR applications. The purpose of this product is to provide realistic haptic feedback to the user based on what object they come into contact with. For example, the user would be able to differentiate between holding a virtual rock versus holding a virtual baby chicken due to the magnitude of the force feedback. The user would not, however, be able to identify different textures.

One crucial aspect of this commercial packaging is the consideration in the design where the user's motions would not be restricted by the exoskeleton. This aspect is something that should be carefully integrated into our exoskeleton design. If the exoskeleton of our design becomes too bulky to the point where the motions of the user becomes limited, then the user experience would be greatly taken away. In addition, this design is very light weight, which is also something we plan to integrate.

In our project, we would design our exoskeleton with the intention of integrating Peltier coolers and our own design of the force feedback units. Our device would have more components attached to it.

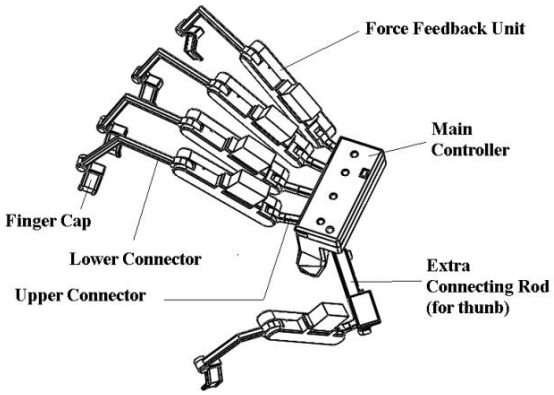

Figure 2. The mechanical design of the exoskeleton.

3.0 Sources Cited

[1] NASA, “Dexmo: An Inexpensive and Lightweight Mechanical Exoskeleton for Motion Capture and Force Feedback in VR,” n.d.. [Online serial]. Available: https://technology.nasa.gov//t2media/tops/pdf/MSC-TOPS-37.pdf. [Accessed Sept. 20, 2018].

[2] X. Gu, “Robo-Glove Wearable technology that reduces the force needed to operate tools,” n.d.. [Online serial]. Available: https://core.ac.uk/download/pdf/42340361.pdf. [Accessed Sept. 20, 2018].

[3] cpester1997, “Exoskeleton Hand,” https://www.thingiverse.com/, n.d.. [Online]. Available: https://www.thingiverse.com/thing:1108397. [Accessed Sept. 20, 2018].

Appendix 1: CAD Model Illustrations

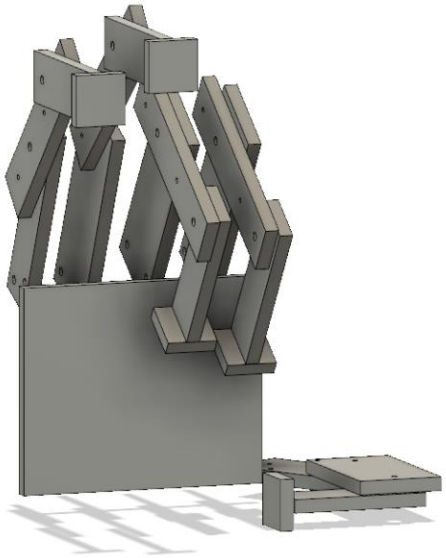

Figure 1.1 Overview of robotic hand

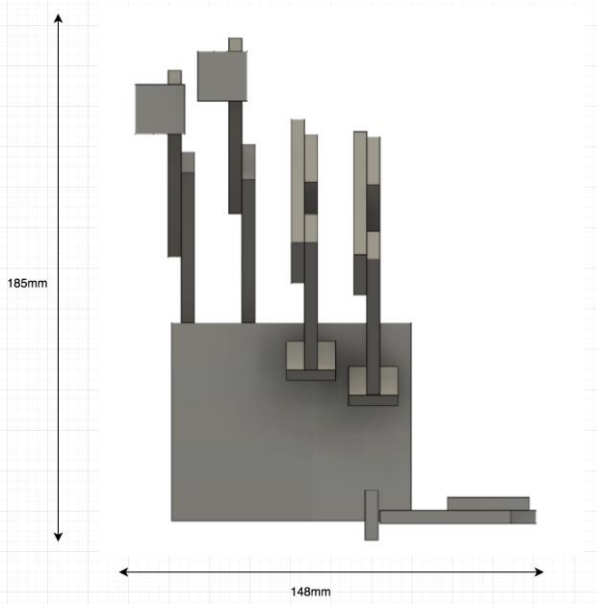

Figure 1.2 Front view of robotic hand

Figure 1.3 Right side view of robotic hand

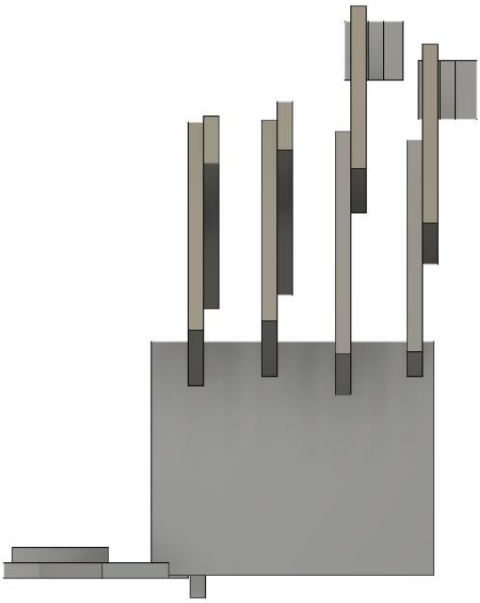

Figure 1.4 Back view of robotic hand

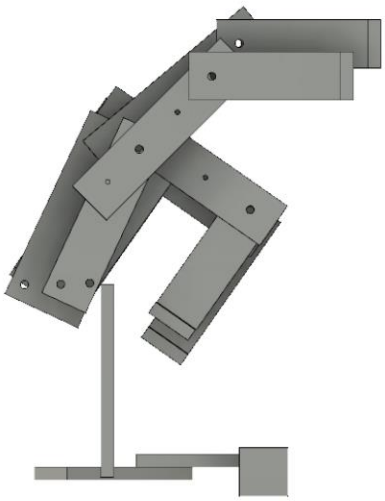

Figure 1.5 Left side view of robotic hand

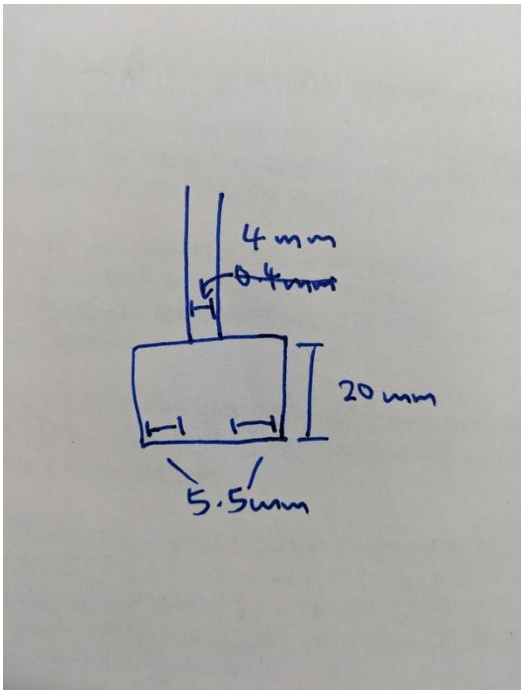

Figure 1.6 Fingertip with sensor board

Each finger is 15mm apart and we will have a platform as shown above placed on each fingertip to hold pressure and temperature sensors. The platform will have a width of 15mm and height of 20mm. Thus there is a width of 5.5mm on each side and remember we have 15mm between each fingers. Therefore there will certainly have enough space between each board on the fingertip.

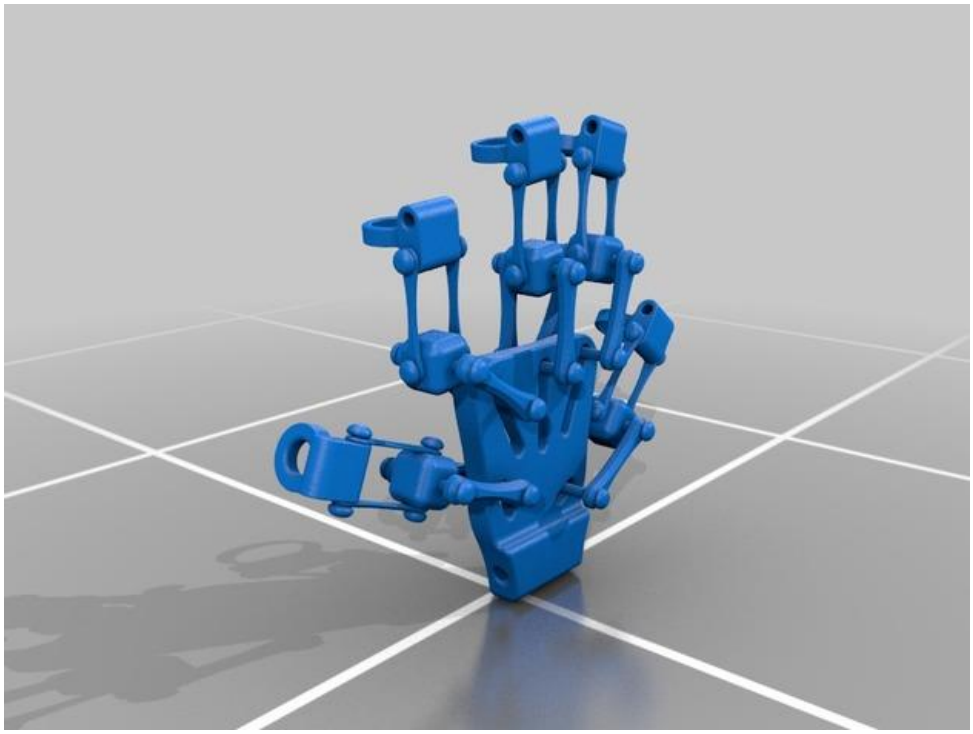

Figure 1.7 Control glove exoskeleton[3]

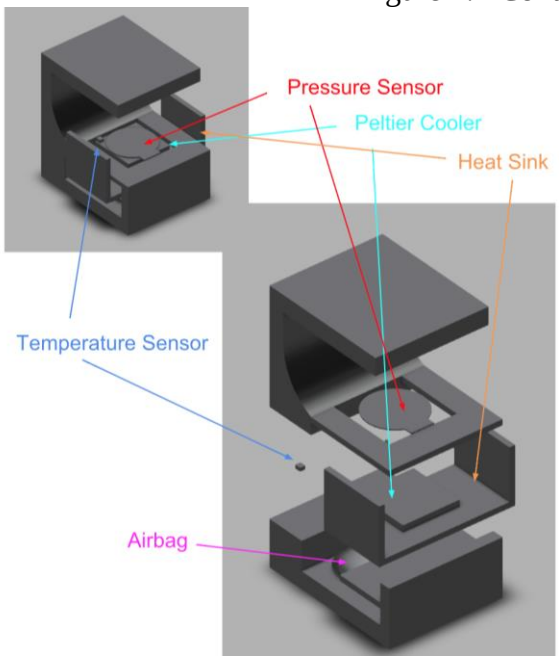

Figure 1.8 Glove fingertip holder

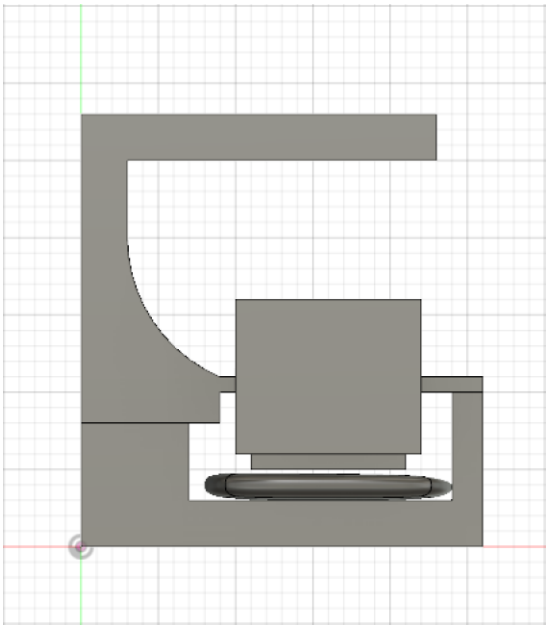

Figure 1.9 left view of fingertip holder

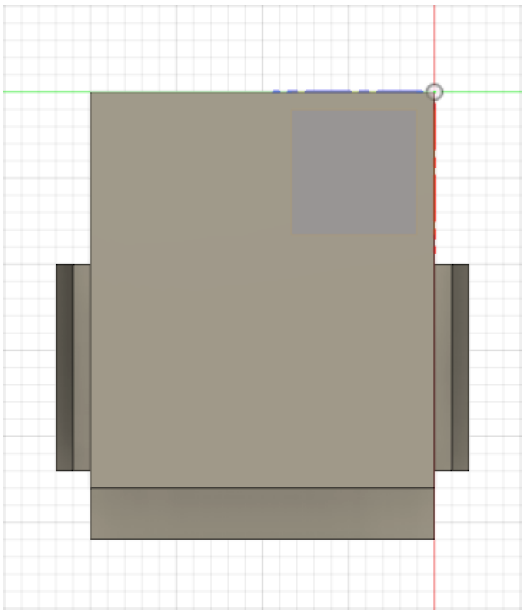

Figure 1.10 top view of fingertip holder

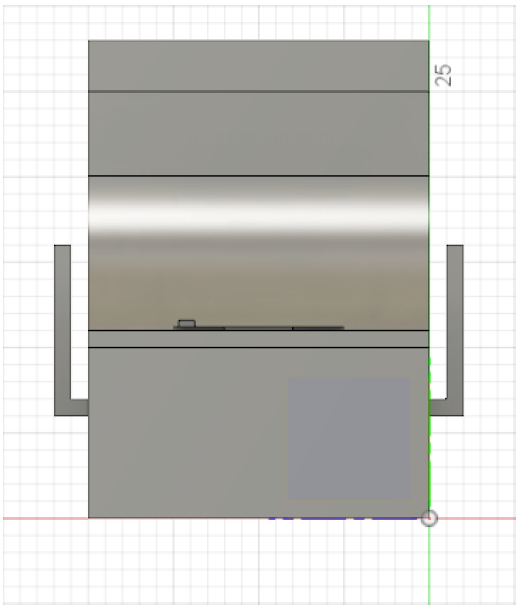

Figure 1.11 front view of fingertip holder

Fingertip holder will be placed on user's fingertip.It contains pressure sensor, temperature sensor, Peltier cooler, aluminum heat sink, and air bag. (in pictures above, one unit block is 1mm)

Appendix 2: Project Packaging Specifications

Materials	Tools	Weight	Cost
Plastic Box	Glue	0.22 kg	$ 4.00
Screws	Screwdriver	0.3 kg	$ 5.00
Robotic hand	Screwdriver	1.36 kg	$ 250
ABS filament	3D printer	0.5 kg	$ 20
Aluminum sheet	Saw	0.054kg	$ 5
Gloves	Screwdriver	0.15 kg	$ 10
	Total	2.53kg	$289

Appendix 3: PCB Footprint Layout