



Design of a non-invasive Hip Exoskeleton



Team Members:

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Project Description

- The goal of the project
- Who can use it.
- Budget
- Sponser
- Client
- Mentor



Figure 1: Picture of the design

Design Description

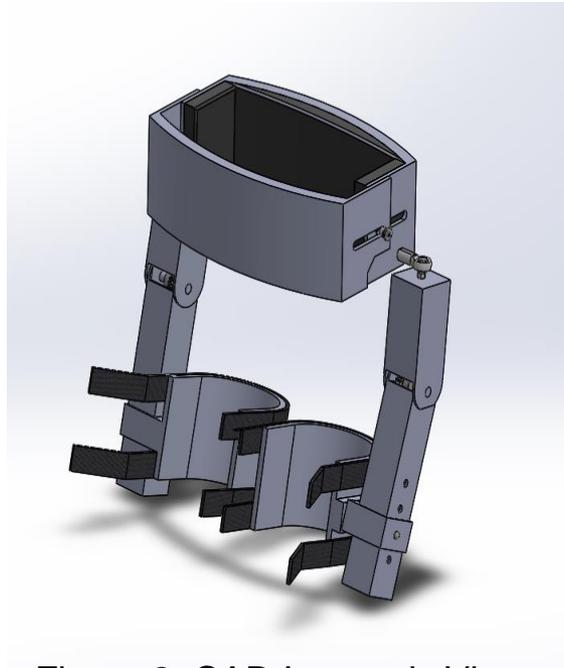


Figure 2: CAD Isometric View

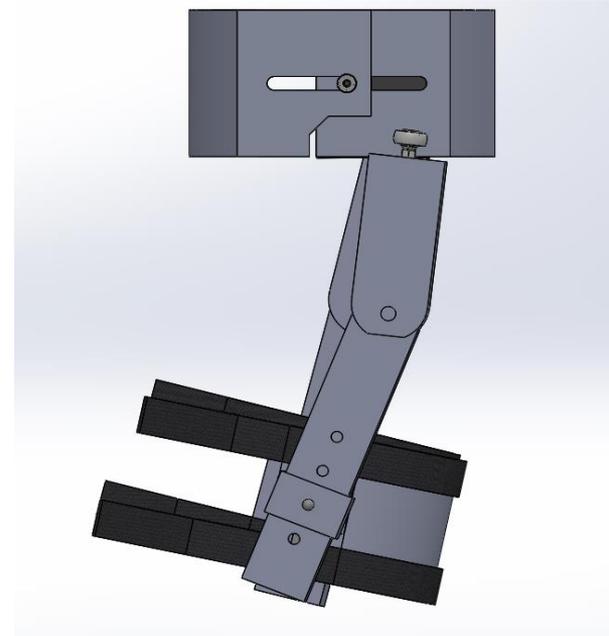


Figure 3: CAD Right View

Project Pictures



Figure 4: Gear connection inside the tube



Figure 5: Wiring outlet from the tube

Project Pictures



Figure 6: Thigh Brace connection

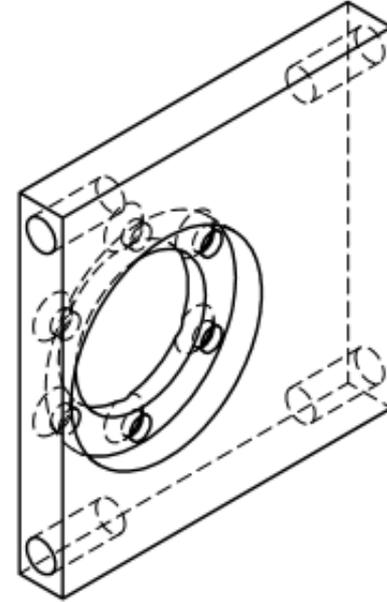


Figure 7: Motor mount (inside the lower tube)

Project Pictures



Figure 8: Project front view



Figure 9: Project side view

Project Pictures



Figure 9: Foam to gives user comfort



Figure 10: Foam to gives user comfort

Current State of System



Table [1]

Engineering Requirements (ERs)	Met or Not yet
Material Strength	Met
Cost (Under \$2250)	Met
Fitment (Children 6 to 14 years old)	Met
Non-invasive	Met
Torque (8-15 Nm out of the motor)	Not yet
Weight (Under 7 lb)	Met



Bill of Materials

Budget : \$2250

Spent: \$1810.14

Left: \$439.86

Table [2]

Part #	Qty	Part Name	Cost \$
1	2	Motors&Gears	\$1,259.26
3	1	Frame (lower)	\$20.09
2	2	controller	\$341.00
3	1	Frame (upper)	\$ 29.28
5	2	Ball Joint	\$20.53
6	2	Ball Joint Bolt	\$6
7	2	hip brace bolt	\$8.06
8	2	hip brace nut	\$4.49
9	2	Lashing Strap	\$16.46
10	1	sticker	\$10
11	1	Pad	\$11.59
12	1	double sided tape	\$5
13	1	ABS Black plastic	\$64
14	1	bearing	\$7
15	2	shaft	\$7.24
Total Cost to date:			\$1,810.14

*See full BOM in Appendix A

Implementation Plan

- Plan for manufacturing and designing the final product.
- Design and material changes.
- Tasks owner: Thigh braces, Hip brace, Supporting frames, Motors and gears.
- Future action items.

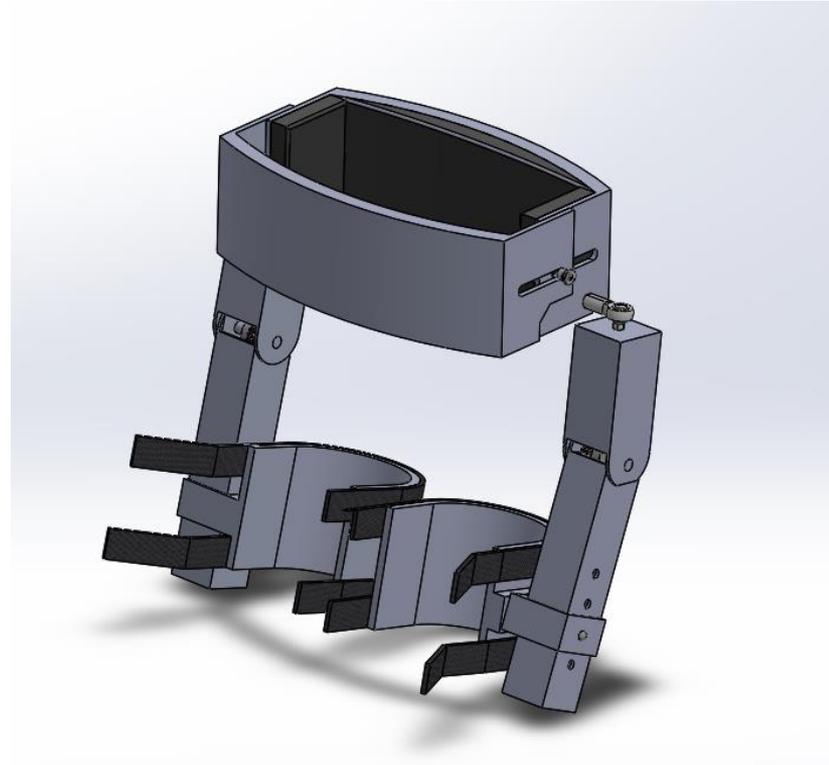


Figure 9: Cad Isometric View



Manufacturing Plan

Table [3]

Manufacturing Project Tasks	Tasks Due
Thigh Braces	02/14/2020
Hip Brace	02/21/2020
Supporting Frames	02/28/2020
Place The motors	03/20/2020
Testing The project	03/20/2020



Testing Plan

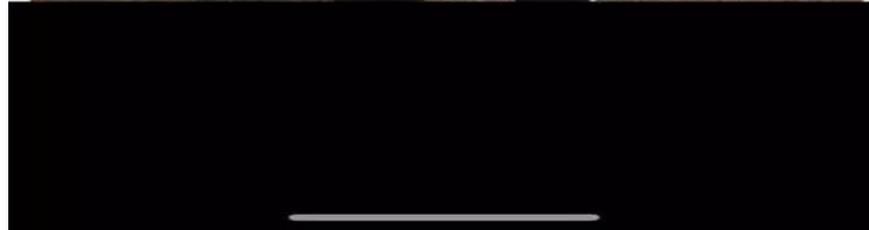
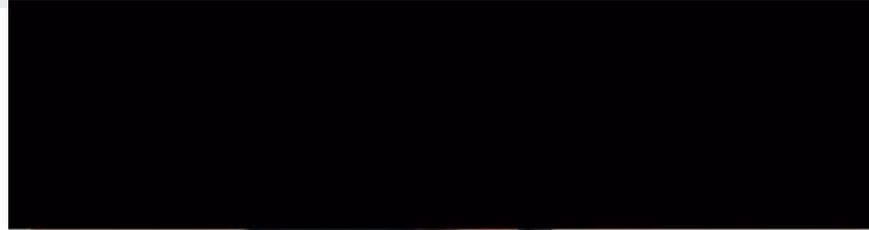
Tests to be performed	Status
Weight	6.83 lbs.
Strength	To be completed
Range of motion	To be completed
Coast	\$1810.14
Force	To be completed
Torque	To be completed

Conclusion

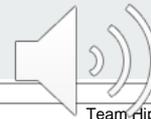


- Deliver a design that meets all the customer and engineering requirements.
- Staying within the budget.

Project Video Pitch



Appendix A: Bill of Materials



Bill of Materials							Team Hip Exoskeleton A	
Team			Team Hip Exoskeleton A					
Part #	Part Name	Qty	Description	Functions	Material	Dimensions	Cost \$	Link to Cost estimate
1	Motors&Gears	2	motor with gearbox in each side (left & right)	actuate thigh movment	Plastic & Metal		\$1,259.26	https://www.maxongroup.com/maxon/view/product/gear/planetary/gp22/370782
2	controller	2	ESCON Module 50/5 4-Q servocontroller for DC/EC	Controller	Electrical		\$341.00	https://www.maxongroup.com/maxon/view/product/motor/ecmotor/ec4pole/323218
3	Frame (Lower)	1	frame connect the thigh beace with the upper frame	support thigh brace	aluminum	2" x 2", 1/8" x 24"	\$20.09	https://www.amazon.com/6063-Aluminum-Hollow-Rectangular-Temper/dp/B000H9JJB0?th=1
4	Frame (upper)	1	frame that support motors and thigh frame (connected to hip joint) (cutting and modification required)	support motors	aluminum	1.125 x 1.25 x 66"	\$ 29.28	https://www.amazon.com/Aluminum-6063-T52-Square-Tubing-Length/dp/B000H9OYN8/ref=sr_1_1?keywords=6063-t52%2Bsquare%2Btubing%2C%2Bastm&qid=1582934364&sr=8-1&th=1
5	Ball Joint	2	ball joint in each side to provide required angle movment	angle movement	zink-plated alloy steel	1.4" x 1.8"	\$20.53	https://www.mcmaster.com/60745k833
6	Ball Joint Bolt	2	bolt to hold the ball joint to the hip brace	holding the ball joint	18-8 stainless steel	3/4"	\$6	https://www.mcmaster.com/92949a599
7	hip brace bolt	2	bolts to adjust hip size	adjustment of hip size	grade 5 Titanium	3/4"	\$8.06	https://www.mcmaster.com/94081a102
8	hip brace nut	2	nut to adjust hip size	adjustment of hip size	18-8 stainless steel	7/16" x 1/2"	\$4.49	https://www.mcmaster.com/91833a125
9	Lashing Strap	2	2 in each thigh brace to fit user size (comes in 2 pack)	thigh fitment	Fabric	8' x 1"	\$16.46	https://www.amazon.com/Keeper-85243-Lashing-Strap-Pack/dp/B004PL4H0Q/ref=lp_25640011_1_15?s=industrial&ie=UTF8&qid=1583297512&sr=1-15
10	Pad	1	pads in the hip brace to ensure comfort for the user	comfort	foam	12"x54"x1/8"	\$11.59	https://www.amazon.com/Dualplex-Neoprene-Perfect-Cosplay-Padding/dp/B07WDSMV82
11	ABS Black plastic	1	Thermoplastic sheet for hip and thigh brace	thigh & hip brace	Thermoplastic	1/4"*24"*48"	\$64	https://www.amazon.com/ABS-Plastic-Textured-Vacuum-Forming/dp/B07BX4GW6L
12	sticker	1	stickers to improve the outside appearance of the project	appearance	Plastic	N/A	\$10	https://www.amazon.com/gp/product/B07QLMZDHS/ref=ppx_yo_dt_b_asin_title_o02_s01?ie=UTF8&psc=1
13	double sided tape	1	to tape foam pads to the hip and thigh brace	attach	plastic	15 ft x 2-1/2 in	\$5	https://www.walmart.com/ip/Roberts-15-ft-x-2-1-2-in-Double-Sided-Carpet-Tape-50-605-12/170529477
14	bearing	1	thrust bearing between the upper and lower frames	reduce friction	steel	8x16x5mm	\$7	https://www.amazon.com/gp/product/B0192SOXN0/ref=ppx_yo_dt_b_asin_title_o01_s00?ie=UTF8&psc=1
15	shaft	2	two needed for the lower support frame (cutting required)	hold gear	1045 Carbon Steel	6" x 3/8" (D)	\$7.24	https://www.mcmaster.com/8632t133
Total Cost Estimate:							\$1,810.14	

Any Questions?