BiOM Prosthesis Adapter

Dominic Kristich: Project Manager/Client Contact
Leah Liebelt: Document Manager/Secretary
Abdulla Ghayeb: Website Developer
Ebrahim Hubail: Budget Liaison

Project Description

- Goal: Design adapter to test the BiOM Ankle Prosthesis on an able-bodied person
- Importance
  - Used to make improvements within the medical field
  - Aide in research for BiOM Ankle Prosthesis
- Clients:
    - Thomas Huck
    - Dr. Zachary Lerner
    - Kiisa Nishikawa

Figure 1: BiOM Prosthesis Adapter

Draft of Design

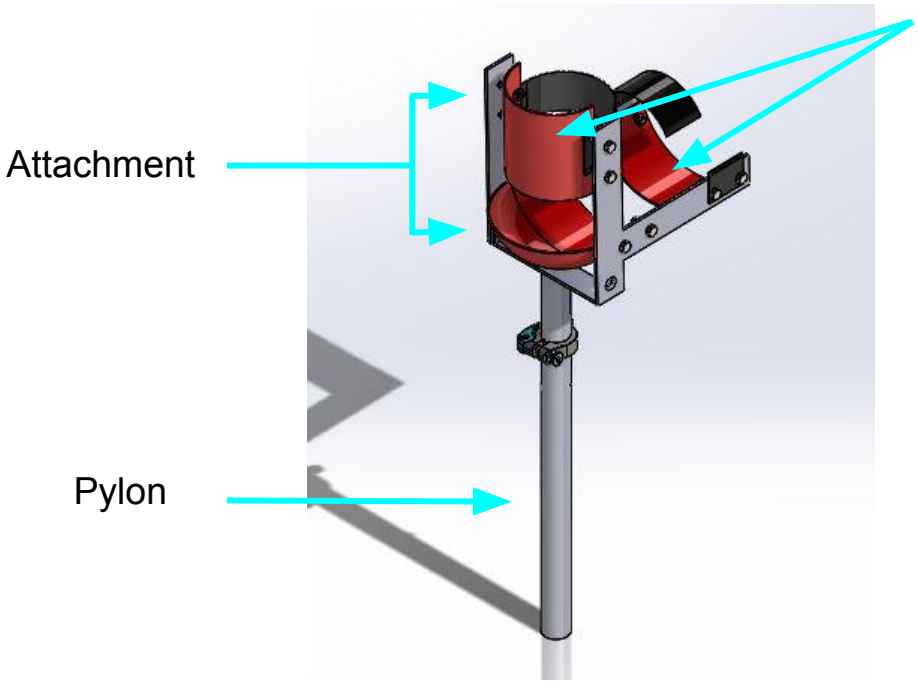

Figure 2: Computer Aided Design Draft [2]

Functions of the Design

- Secures upper and lower leg to the leg support using straps
- Aluminum Pylon to support the weight of a fully grown individual
- Height adjustable pylon using quick release clamp
- Width adjustable leg supports using straps and small side springs

Design Requirements

- Lightweight
- Comfortable
- Quick Attachment
- Adjustable
- Durable
- Portable
- Affordable
- Safe
- Leg fixed at 90-degrees
- Pylon to have 1 Degree of Freedom rotation about knee axis

Schedule - First Semester

Table 1: Gantt Chart - First Semester

PROJECT TITLE	BiOM Prosthesis Adapter	DATE	11/16/2018
PROJECT MANAGER	Dominic		

WBS NUMBER	TASK TITLE	TASK OWNER	START DATE	DUE DATE	DURATION (Days)	WEEK 1	WEEK 2	WEEK 3	WEEK 4	WEEK 5	WEEK 6	WEEK 7	WEEK 8	WEEK 9	WEEK 10	WEEK 11	WEEK 12	WEEK 13	WEEK 14	WEEK 15	WEEK 16
1	Project Team Charter	Leah	9/3/18	9/10/18	7																
2	Presentation 1 - Background	Ebrahim	9/10/18	9/15/18	5																
3	Website Check I	Abdulla	9/10/18	9/26/18	16																
4	Peer Evaluation I	Individual	10/3/18	10/5/18	2																
5	Analytical Analyses I Team Memo	Dominic	10/8/2018	10/10/18	2																
6	Presentation 2 - Concept Gen and Eval	Leah	10/5/18	10/14/18	9																
7	Preliminary Report	Ebrahim	10/9/18	10/15/18	6																
8	Website Check II	Abdulla	10/22/18	10/31/18	9																
9	Individual Analytical Analysis I	Individual	10/22/2018	11/5/2018	13																
10	Final Proposal Presentation	Dominic	11/5/2018	11/11/2018	6																
11	Peer Evaluation II	Individual	11/14/2018	11/16/2018	2																
12	Final Proposal Report	Leah	11/5/2018	11/21/2018	16																
13	Final Prototypes Summary	Ebrahim	11/19/2018	12/1/2018	12																
14	Final CAD package and BOM	Dominic	11/12/2018	12/3/2018	21																
15	Website Check III	Abdulla	12/3/2018	12/9/2018	6																
16	Peer Evaluation III	Individual	12/10/2018	12/12/2018	2																

Schedule - Second Semester

Table 2: Gantt Chart - Second Semester

PROJECT TITLE	BiOM Prosthesis Adapter	DATE	11/16/2018
PROJECT MANAGER	Dominic		

WBS NUMBER	TASK TITLE	TASK OWNER	START DATE	DUE DATE	DURATION (Days)	WEEK 1	WEEK 2	WEEK 3	WEEK 4	WEEK 5	WEEK 6	WEEK 7	WEEK 8	WEEK 9	WEEK 10	WEEK 11	WEEK 12	WEEK 13	WEEK 14	WEEK 15	WEEK 16	WEEK 17
1	Final Proposal Rewrite	Leah	1/7/19	1/14/19	7																	
2	Individual Post Mortem	Individual	1/7/19	1/14/19	7																	
3	Website Check 1	Abdulla	1/21/19	1/28/19	7																	
4	HR1 Summary	Ebrahim	2/4/19	2/18/19	14																	
5	Peer Evaluation I	Individual	2/15/19	2/18/19	3																	
6	Analytical Analyses II	Individual	2/11/2019	02/25/19	14																	
7	Midpoint Presentation	Dominic	3/4/19	3/11/19	7																	
8	Midpoint Report	Leah	2/25/19	3/4/19	9																	
9	HR2 Summary	Ebrahim	3/4/19	3/11/19	7																	
10	Peer Evaluation II	Individual	03/08/2019	3/11/2019	3																	
11	Website Check II	Abdulla	3/18/2019	3/25/2019	7																	
12	Drafts of Poster and Operation Manual	Dominic	3/25/2019	4/1/2019	6																	
13	Final Product Testing Proof	Leah	4/1/2019	4/8/2019	7																	
14	Final Poster & Operation Manual	Ebrahim	4/15/2019	4/22/2019	7																	
15	Final Presentation	Dominic	4/15/2019	4/22/2019	7																	
16	Final Report	Leah	4/22/2019	4/29/2019	7																	
17	Final CAD package and BOM	Abdulla	4/8/2019	4/29/2019	21																	
18	Website Check III	Abdulla	4/29/2019	5/6/2019	7																	
19	Peer Evaluation III	Individual	5/3/2019	5/6/2019	3																	

Budget

- Sponsored by Gore
- Budget of $2,000

Table 3: Cost of Materials

Material	Amount Needed	Cost
Carbon Fiber	4 @ $52	$210 [3]
Aluminum Rod	1	$32 [4]
Quick Release Clamp	1	$25 [5]
Bolts	12 @ $4	$48 [6]
Nuts	12 @ $3	$36 [6]
Thermoplastic Cuff	1	$37 [7]
Velcro Straps	1 pack	$8 [8]
SUM		~$400

Prototype

What was learned?

- Product needs to include rotation about the knee joint
- Below the knee support needed
- Implement spring mechanism into system for more natural walking

Figure 3: Adapter Prototype

References

[1] A. Ghayeb, E. Hubail, D. Kristich, and L. Liebelt, *BiOM Ankle Prosthesis*. 2018.

[2] A. Ghayeb, *BiOM Ankle Prosthesis Computer Aided Design Screenshot*. 2018.

[3]"Prepreg - Carbon Fiber (AS-4) - 50' Wide x 0.012' Thick - Standard Modulus 3k Twill Weave (375 gsm OAW) - 250F Resin - Sold In 4 Sqft. Units & Full Roll," *Rock West Composites*. [Online]. Available: https://www.rockwestcomposites.com/materials-tools/fabrics-pre-pregs-tow/prepregs/14054-d-group. [Accessed: 19-Nov-2018].

[4]"High-Strength 2024 Aluminum Tubes," *McMaster-Carr*. [Online]. Available: https://www.mcmaster.com/aluminum-alloy-2024-tubing. [Accessed: 19-Nov-2018].

[5] "Hope Seat Clamp & QR," *Science In Sport GO Caffeine Shot 150mg (6x60ml) | Chain Reaction Cycles*. [Online]. Available: http://www.chainreactioncycles.com/us/en/hope-seat-clamp-qr/rp-prod80495. [Accessed: 19-Nov-2018].

[6] Ccss and BigDoug, "Prime-Line 12-Piece 1/4-20 Carriage Bolts and Nuts with Smooth, Domed Heads (Pack of 12)-GD 52103," *The Home Depot*, 24-Mar-2015. [Online]. Available: https://www.homedepot.com/ [Accessed: 19-Nov-2018].

[7] "WORBLA HAND-FORMABLE BLACK THERMOPLASTIC SHEET," *Interstate Plastics Quality Assurance Specification*. [Online]. Available: https://www.interstateplastics.com [Accessed: 19-Nov-2018].

[8] "6pc Universal D-Ring Adjustable Multi-Purpose Quick Straps," *Walmart.com*. [Online]. Available: https://www.walmart.com/ [Accessed: 19-Nov-2018].