

BIOM Test Fixture

GROUP 7

ME476C – section 001

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INTRODUCTION

- What is the BiOM ?

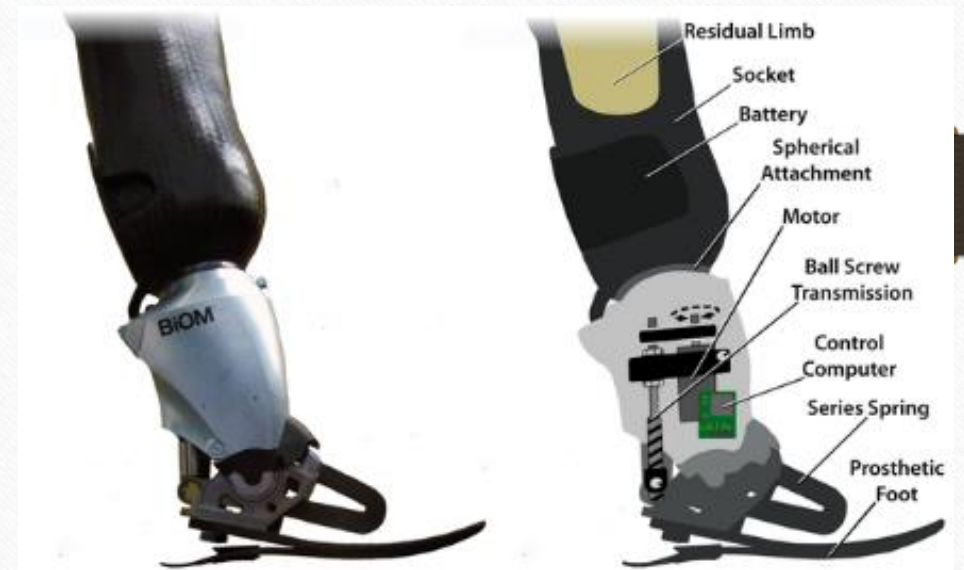
The BiOM is a prosthetic leg that is under the knee height. It replicates the ankle and muscles surrounding it, propelling the user forward with each step, developed by Hugh Herr, a survivor of lower limb amputation at MIT Media Lab's Biotronic research group

- What is a Test Fixture ?

A Test Fixture is a device that is used to run tests on any other device (Testing Electronics, Software's and Physical Devices)

Project description

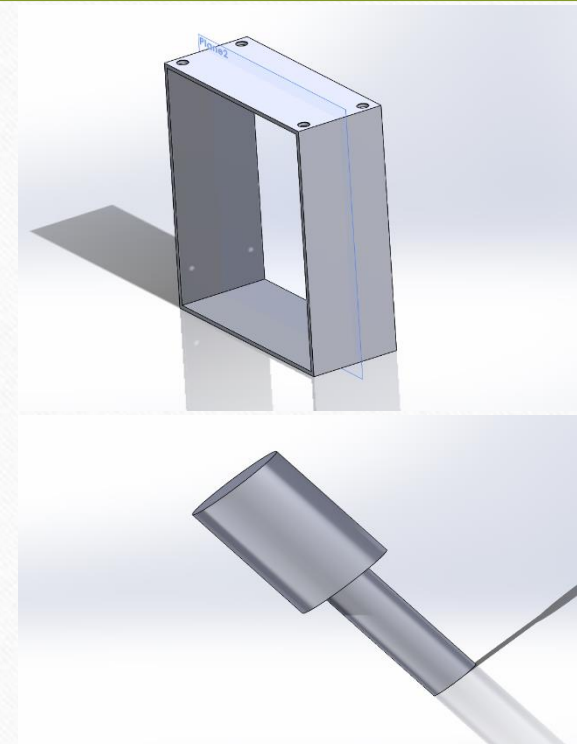
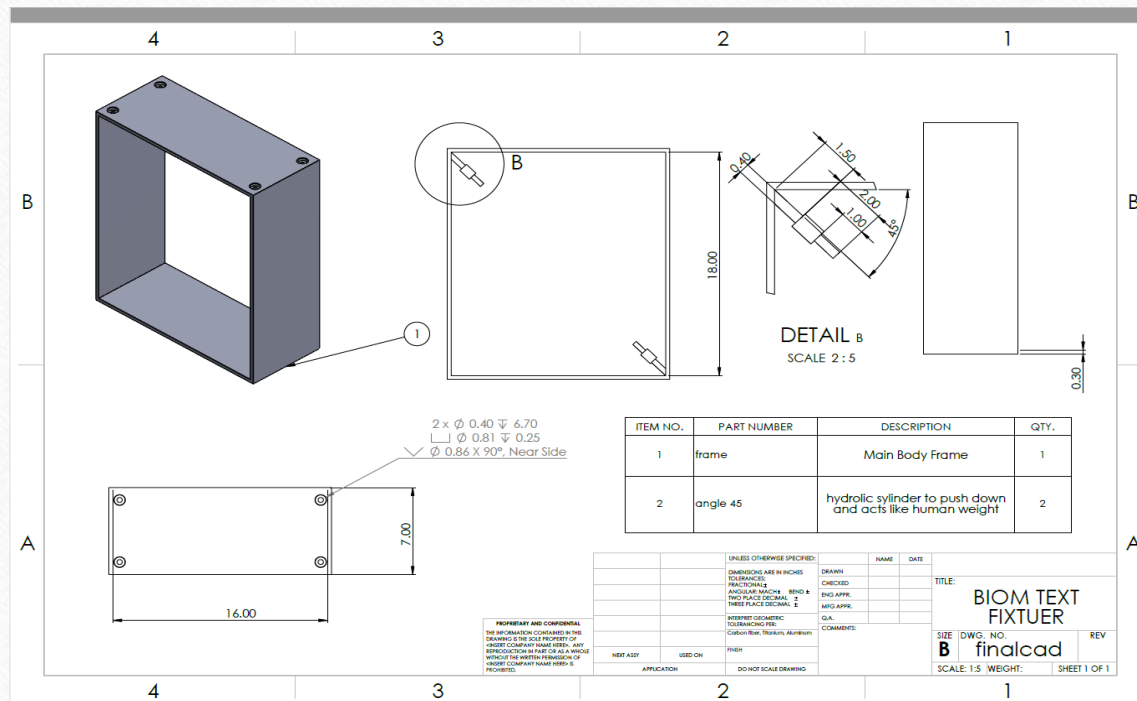
- Design an automated, programmable test fixture for the robotic prosthetic lower limb (foot-ankle prosthesis) that Dr. Tester has been conducting research with (the BiOM). Use the single actuator, Pneumatic design currently underway for reference, but design for either an electrical motor or hydraulics that is controlled.



Biom Test Fixture

<http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0135148#sec0023/>

CAD Drawing



Implementation Details

- **Frame:** the main body of this test fixture is the frame of the device this will hold the piston cylinder and the BiOM in place.
- **Piston Cylinders:** this will be connected on two parts of the BiOM the top and bottom and will work as the surface of the floor and the human weight.
- **Battery:** Lithium type battery will be used to make the piston cylinders work.

Bill of Material

Part Name	Qty	Description	Functions	material	Dimension s	cost	Link
EconomyPlate™ Solid Carbon Fiber Sheet	2	Carbon Fiber sheet	Frame	Carbon Fiber	3mm x 6" x 6"	\$552	https://dragonplate.com/ecart/cartView.asp?rp=product%2Easp%3FpID%3D400
1515-L T-slot Extrusion - Custom Length	2	80/20 Frame	Frame	6105-T5	1.5" x 1.5"	\$22.50	https://f-l-8020-store.myshopify.com/products/1515-lite
BORE SINGLE ACTING AIR CYLINDER	2	piston cylinder	Motor	AluminumFeatures: Gold	2-1/2"-6-3/4"	\$123	https://www.zoro.com/velvac-air-cylinder-air-2-12-in-bore-clevis-100101/i/G5246236/feature-product?gclid=EAIaIQobChMI873omOy_2gIVGL3sCh0RRgp4EAQYASABEgLF5fD_BwE
Hex Bolt, 18-8 Stainless Steel	2	Bolt	Frame	Stainless steel	3/4-10 x 1"	\$25.18	http://www.wholesalebolts.com/hexboltstainlesssteel3/4x1per10.aspx
Shorai Lithium Battery LFX07L2- BS12	1	Battery	Motor	Lithium Battery	2.28" x4.45" x 3.5"	\$89.85	https://www.revzilla.com/motorcycle/shorai-lithium-battery-lfx07l2-bs12?gclid=EAIaIQobChMI9Z-Znu_2gIVhP5kCh2yywM1EAQYAYABEgIC-1fD_BwE
Total						\$316	

Customer Requirements (CR)

- Size (80x40x35 cm)
- Time needed for testing (15 - 25 minutes)
- Types of planes for testing (0°, level ground testing)
- weight ($\leq 15\text{Kg}$, 33lbs)
- Material (Carbon Fiber and Titanium offer lower weight, Aluminum)
- Hydraulic system (90 psi)
- A system able to respond exactly like a particular foot
- Cost ($\geq 500\text{\$}$)

Engineering Requirements (ERs)

Tape Measure	To measure length and depth of the frame
Stop Watch	Time needed to conduct testing
Protractor / Angle Caliper	To measure the angle of the plane of walking
Newton Meter / Electronic Scale	To measure the weight of the test fixture
Pressure Sensor	To measure pressure exerted from the piston cylinder
Cost	Receipts received from purchases

Brake Down Schedule

Marzouq Alenezi	CAD Model and Drawing
Hussain Alshammari	Bill of Material
Saoud Alenezi	Website Checks
Saoud Alenezi	Gantt Chart and Budget
Naser Alowaihan	Researching

Schedule

Biom Test Fixture

Project Lead: [John Tester]
 Project Start Date: 1/16/2018 (Tuesday)
 Display Week: 1

Gantt Chart Template © 2016 by Vertex42.com.
[See info on Gantt Chart Template Pro](#)

WBS	Task	Lead	Predecessor	Start	End	Cal. Days	% Done	Work Days	Weeks																																							
									M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F
1	[Task Category]	[Name]																																														
1.1	Team Charter	[Name]		Tue 1/16/18	Wed 1/24/18	9	100%	7	[Bar]																																							
1.2	Presentation			Fri 2/02/18	Mon 2/05/18	4	100%	2	[Bar]																																							
1.3	Report 1			Tue 2/06/18	Tue 2/13/18	8	100%	6	[Bar]																																							
1.4	Website 1			Tue 2/13/18	Thu 2/15/18	3	100%	3	[Bar]																																							
1.5	Peer Eval 1			Tue 2/20/18	Thu 2/22/18	3	100%	3	[Bar]																																							
1.6	Presentation 2			Fri 2/23/18	Tue 2/27/18	5	100%	3	[Bar]																																							
1.7	Conceptual Report			Fri 2/23/18	Tue 2/27/18	5	100%	3	[Bar]																																							
1.8	Analyses Memo			Fri 3/09/18	Tue 3/13/18	5	100%	3	[Bar]																																							
1	[Task Category]																																															
1.1	Website 2			Sun 3/25/18	Tue 3/27/18	3	100%	2	[Bar]																																							
1.2	Analytical Reports			Thu 3/29/18	Tue 4/03/18	6	100%	4	[Bar]																																							
1.3	Peer Eval 2			Mon 4/09/18	Tue 4/10/18	2	100%	2	[Bar]																																							
1.4	Presentation 3			Fri 4/13/18	Tue 4/17/18	5	100%	3	[Bar]																																							
1	[Task Category]																																															
1.1	Final Report			Fri 4/13/18	Mon 4/23/18	11	70%	7	[Bar]																																							
1.2	Website 3, BOM, CAD			Thu 4/26/18	Tue 5/01/18	6	40%	4	[Bar]																																							
1.3	Peer Eval 3			Tue 5/01/18	Tue 5/01/18	1	0%	1	[Bar]																																							
2	Summer 2018																																															
1.1	Final Proposal Rewrite			Mon 6/04/18	Wed 6/06/18	3	0%	3	[Bar]																																							
1.2	Individual Post Mortem			Mon 6/04/18	Wed 6/06/18	3	0%	3	[Bar]																																							
1.3	Website Check 1			Sat 6/07/18	Wed 6/13/18	7	0%	6	[Bar]																																							
1.4	HR1 summary			Fri 6/15/18	Wed 6/20/18	6	0%	5	[Bar]																																							
1.5	Peer Eval 1			Tue 6/19/18	Wed 6/20/18	2	0%	1	[Bar]																																							
1.6	Individual Analysis II			Fri 6/22/18	Wed 6/27/18	6	0%	5	[Bar]																																							
1.7	Midpoint Report			Thu 6/28/18	Wed 7/04/18	7	0%	6	[Bar]																																							
1.8	HR2 summary			Fri 7/06/18	Wed 7/11/18	6	0%	5	[Bar]																																							
1.9	Peer eval 2			Tue 7/10/18	Wed 7/11/18	2	0%	1	[Bar]																																							
2	Drafts of poster, operation manual			Wed 7/11/18	Wed 7/18/18	8	0%	7	[Bar]																																							
2.1	Website Check 2			Thu 7/19/18	Wed 7/25/18	7	0%	6	[Bar]																																							
2.2	Final Poster, operation manual			Tue 7/26/18	Wed 8/01/18	7	0%	7	[Bar]																																							
2.3	Final Report, Website, Peer eval 3, CAD			Wed 8/01/18	Tue 8/07/18	7	0%	7	[Bar]																																							

Budget

- This project is an analytical project focusing on CAD simulations.
- After consulting Dr. Tester we were given a 500\$ budget after conducting research our test fixture needs 316\$.
- A prototype can be built if required and a budget of maximum 500\$ is set if team moves forward with the prototype.
- Highest cost = Actuator

THANK YOU FOR YOUR TIME
ANY QUESTIONS
