Spider Cage to Support Cerebral Palsy Patient

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Team: Kevin Collins - kdcollins2@wisc.edu (Team Leader)

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Date: March 8th - March 14th, 2017

Problem Statement:

A spider cage is a device used by therapists to work with individuals (usually children) who have cerebral palsy. The cage supports the patient's weight with the use of bungee cords that are connected to a custom suit that allows the patient to work on building leg and arm strength. This product is available commercially but it is quite expensive. The client is looking for a design that is relatively inexpensive, transportable via trailer, able to fit through a standard doorway, and customized to meet the needs of one particular person.

Last Week's Goals

- Figure out optimal bungee attachment locations
- Determine how to measure mesh deflection
- Test epoxy resin for base coating purposes

Summary of Team Role Accomplishments

- *Leader* - Sent progress report to TA, Client and Adviser
- *BWIG* - Uploaded progress report
- *BSAC* - No meetings attended

- *Communicator* - Invited Amanda to campus to help evaluate bungee cord positions
- *BPAG* - Worked with Susan Sauer to initiate the reimbursement process for the base material purchase.

Summary of Accomplishments:

This week the team began experimental testing. Steve created a stand for a dial indicator to sit on to test beam deflection during testing and a new testing protocol was drafted for this experiment. A testing setup was finalized for recording measurements and testing with one subject has almost been completed.

Activities

Date	Person	Task	Time (hrs)	Weekly Total	Semester Total
3/10/17	Team	Advisor meeting	0.5		
3/9/17		Prelim testing setup and planning	2	2.5	9.5
3/14/17		Testing	2.5	5	12
	Kevin	Write technical section	.5	.5	17
3/9/17	Darcy	Resin testing on test OSB board and a quick fix of the harness	2	2	15.5
3/12/17	Sheetal	Brainstormed new experimental procedure based on advisor meeting and ideas for statistical analysis	1	1	16
3/13/17	Breanna	Wrote notes for testing and rough draft of testing protocol	1.5		19

3/9 /17	Stephen	Created dial indicator stand for displacement testing	1	1	18

Team Goals

- Continue testing

Individual Goals

- *Kevin:* DIY instructional project
- *Darcy:* Find grommets to apply to the harness to allow for smaller people to use it safely
- *Sheetal:* DIY instructional project
- *Breanna:* Begin looking at DIY project
- *Stephen:* DIY instructional project, update support calculation code to reflect testing connection scheme.

Project Timeline

	January		February				March					April				May
Task	19	26	2	9	16	23	2	9	16	23	30	6	13	20	27	4
Project R&D																
Base Support	X	X														
Harnesses and Bands		X	X	X												
Padding					X	X										
Assembly Tools																
Fabrication																
Order Materials				X	X	X										
Create Fastener Hole		X														
Base Support						X	X	X								
Padding																
Assembly Tools																
Testing																
Slip Test							X	X								
Deflection Calculations																
Assembly Directions																
Redesign																
Deliverables																
Progress Report	X	X	X	X	X	X	X	X								
Individual Presentation				X	X											
Preliminary Presentation				X	X											
Preliminary Deliverables				X	X											
Poster																
Final Deliverables																
Meetings																
Advisor	X		X					X								
Client			X													
Team	X	X	X	X	X	X	X	X								
Website																
Update	X	X	X	X	X	X	X	X								
Colored Cells: Projected Timeline																
X: Completed Tasks																

Expenses

Fall 2016: University Funded Expenses: $1,702.75

Description	Supplier	Part/Model #	Link to Part	QTY	Date	Price	Total
Price Engineering Cage Materials & Shipping (Itemized BOM in separate file)	Price Engineering	N/A	N/A	1	1/1/2017	$1,702.75	$1,702.75
						Total	$1,702.75

Spring 2017: University Funded Expenses: $32.94

Description	Supplier	Part/Model #	Link to Part	QTY	Date	Price	Total
19/32 4'x8' OSB	Home Depot (IN STORE)	0000-339-696 5/8 OSB SQ	N/A	2	2/24/2017	$14.75	$29.50
TEE NUT ZINC 5/16-18 x 3/8"	Home Depot (IN STORE)	887480023114 TEE NUT	N/A	2	2/24/2017	$0.98	$1.96
HEX BOLT 5/16-18 x 3/4"	Home Depot (IN STORE)	AEE 5/16X3/4HBLT	N/A	8	2/24/2017	$0.16	$1.28
HEX BOLT 5/16-18 x 1"	Home Depot (IN STORE)	AFE 5/16X1HXBOLT	N/A	8	2/24/2017	$0.17	$1.36
						Total	$34.10

Spring 2017: Client Funded Expenses: $159.74

Description	Supplier	Part/Model #	Link to Part	QTY	Date	Price	Total
Harnesses	Zoro	Zoro #: G1320821 Mfr #: 1191209	https://www.zoro.com/protecta-full-body-harness-ml-420-lb-redgray-1191209/i/G1320821/?gclid=COn-5on-_NECFR61wAodtbMCkg	1	2/9/2017	$75.86	$75.86
Resistance Bands	Fitness Insanity	Unsure	https://www.amazon.com/gp/product/B01GCA4BJC?ref_=sr_1_7&qid=1486677502&sr=8-7&keywords=Fitness%20Resistant%20Bands&pldnSite=1	4	2/9/2017	$20.97	$83.88
						Total	$159.74

Total UW - Expenses: $1735.69
Total Client Expenses: $159.74
Total Expenses: $1895.43

ME Technical Section

Slip Test Mesh Deflection Procedure

Purpose: Setup and perform a slip test to view and measure deflection experienced by the cage. The purpose of the slip test is to determine if changing the carabiner attachment locations on the mesh will cause a significant difference in deflection of the mesh at the attachment points. The experiment will be conducted for five subjects with deflection measurements taken at five different attachment point setups and three tests at each attachment location.

Materials:

- spider cage
- harness

- resistance bands with carabiners (various resistances)
- dial indicator (x2)
- dial indicator stand/clamp
- plywood or any sturdy, flat surface
- 5 test subjects

Procedure:

1. Record height and weight of subject.
2. Set up bands in attachment points and record locations.
3. Have subject put on harness and tighten correctly.
4. Setup dial indicator to measure deflection of the carabiner at attachment point #1
    a. See Figure 1 for dial indicator set up.
5. Have subject fall forward to imitate "slip" and get deflection measurement
6. Record the readout of the dial indicator
7. Repeat steps 5-6 for a total of 3 trials
8. Change location of the dial indicator to the next carabiner and record deflection 3 times
9. Repeat steps 4-8 for all carabiner locations with 3 dial indicator readings at each location
10. Repeat steps 3-9 for the other 4 attachment setups
11. Repeat steps 1-10 for all subjects

Figure 1: Dial indicator connected to the spider cage to measure the deflection of the mesh at the carabiner attachment point.