Spider Cage to Support Cerebral Palsy Patient

Client: Mr. Matt Jahnke - mattjahnke@ucpdane.org

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

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Stephen Kindem - kindem@wisc.edu (BPAG)

Date: January 25th - February 1st, 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

- Talk with Matt Jahnke about possible experiments/testing for the cage
- Solidify budget and obtain materials from Home Depot

Summary of Team Role Accomplishments

- *Leader* - Sent Progress report to TA, client and advisor
- *BWIG* - Updated website
- *BSAC* - Will meet with BSAC chair to review the meeting from Friday, January 27th.

- *Communicator* - Communicated with Emily, an OT student, about bungee cords for the spider cage
- *BPAG* - Submitted formal request for funding.

Summary of Accomplishments:

This week the team was able to rearrange all of the mesh retainers on the cage. In the first assembly of the cage two different bolts were assembled in the wrong position on all of the retainers, this was fixed by the team. Stephen and Darcy tapped the end of one of the shorter members on the top of the cage to allow us to rearrange the top of the cage for an easier assembly in the future.

Activities

Date	Person	Task	Time (hrs)	Weekly Total	Semester Total
1/27	Team	Switched all the mesh retaining screws on the cage to their correct positions	1.5	1.5	4
	Kevin	Read product architecture article	0.5		1.5
		Developed list of possible experiments	0.5	1	
1/31/17	Darcy	Read and reviewed product architecture article	0.5		
1/31/17		Brainstormed what to include in “Design for Assembly” individual talk	0.5	1	2.5
1/31/17	Sheetal	Read and reviewed product architecture article and schematic	0.5	0.5	2

1/29/17	Breanna	Read product architecture article and created schematic for spider cage	2.0		4.0
1/27/17	Stephen	Rearranged mesh retaining screws	1	1	2.5

Team Goals

- Meet with Matt Jahnke and Amanda Miller to discuss testing (2/3/17)
- Obtain flooring materials

Individual Goals

- *Kevin:* Work on individual presentation, reattach the top of the cage once the hole is bored.
- *Darcy:* Work on individual presentation, create animation for this
- *Sheetal:* Work on individual presentation and formulate full testing hypothesis
- *Breanna:* Work on individual presentation and continue developing testing procedures
- *Stephen: Work on individual presentation, complete CNC milling upgrade.*

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														
Padding																
Assembly Tools																
Fabrication																
Order Materials																
Create Fastener Hole		X														
Trim Mesh																
Base Support																
Padding																
Assembly Tools																
Testing																
Exercise Simulation																
Force/Stiffness Calculations																
Assembly Directions																
Redesign																
Deliverables																
Progress Report	X	X														
Individual Presentation																
Preliminary Presentation																
Preliminary Deliverables																
Poster																
Final Deliverables																
Meetings																
Advisor	X															
Client																
Team	X	X														
Website																
Update	X	X														
Colored Cells: Projected Timeline																
X: Completed Tasks																

Expenses

- Fall 2016: Total cost of materials: $1,702.75
- Spring 2017: No expenses at this time

ME Technical Section

Product Architecture:

A product architecture is used to help a design team create a layout of the different sections (or chunks) that make up a design and visualize how each section interacts to create a whole. Breaking up a design into different chunks and analyzing each part makes it easier to divide tasks between group members with a common goal in mind. Using this layout to analyze a design makes it easier to divide tasks with chunks that do not interact with each other and also coordinate between the chucks that do interact with each other. This layout also helps to show the design team any incidental interactions between components and prevent unintentional effects made by design changes. A schematic of the architecture for the spider cage is displayed in Figure 1 and is broken up into 4 main chunks: Frame, T-Slot Connection Parts, Mesh Connection Parts, and Reinforcements. The frame can be viewed as the base of the design because it is connected to all of the other chunks.

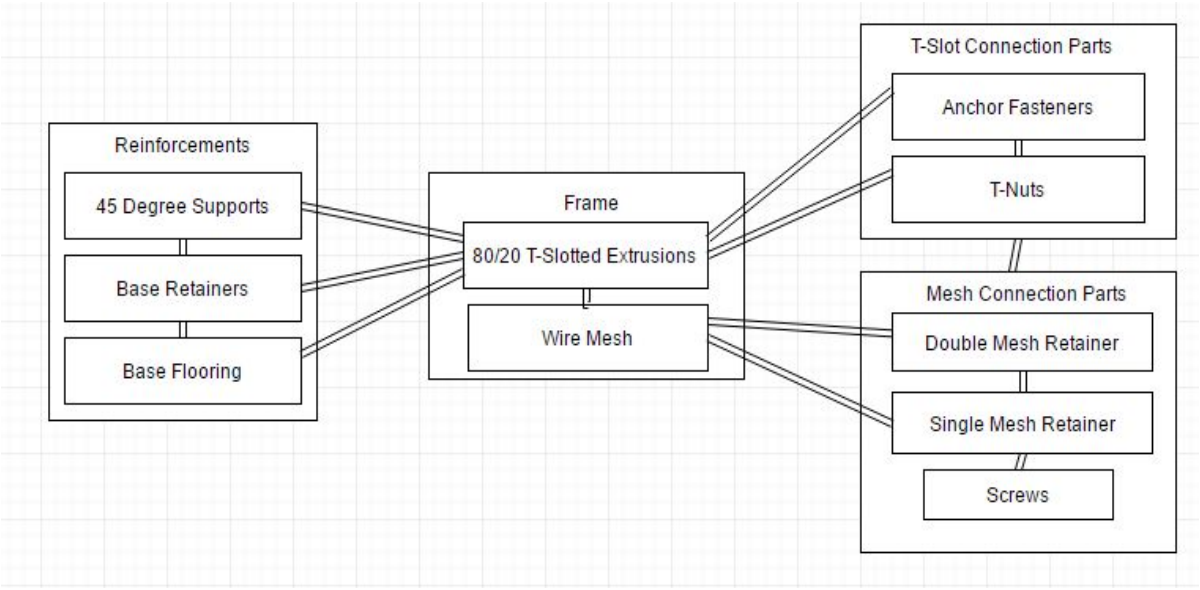

Figure 1: Product architecture for the Spider Cage design team. The connection clusters are fundamental to the assembly of the cage.

There are no incidental connections in the product architecture of the spider cage. From Figure 1, it is implied that the T-slot connection parts and the Mesh connection parts rely on each other. The placing of either connection part will affect the other. The schematic also displays that reinforcements should have no impact on the wire mesh of the cage. This will allow the team to dedicate some members to focus on testing reinforcement while others can optimize the location of the wire mesh retainers. The product architecture is subject to change as the cage is optimized for stability.

Written By: Kevin Collins
Reviewed By: Breanna Hagerty