Project Title: Digital Traction with Finger Sleeves

Client: Mr. Pape Samb (asamb@jamarek.org)
Advisor: Prof. Randolph Ashton (rashton2@wisc.edu)
Co-Team Leader: Amy Dang (adang9@wisc.edu)
Co-Team Leader: Sean Carey (srcarey@wisc.edu)
Communicator: Anshpreet Sohal (sohal2@wisc.edu)
BSAC: Patricia Prakasam (pprakasam@wisc.edu)
BWIG: Henna Razeq (razeq@wisc.edu)
BPAG: Anem Karthik (kanem@wisc.edu)

Date: 11/6/26 - 11/12/26

Problem Statement

The objective of this project is to create a digital traction device using finger traps that precisely pulls the patient's hand, wrist, and forearm into a comfortable, neutral position while holding a stable static load about 1/10th of the patient's weight. To be feasible for Idrissa Pouye Hospital, the device must be portable and usable in both the plaster casting room and the operating room. This requires a compact device that can be transported easily between spaces and provides unobstructed access to the forearm for casting and arthroscopy. It must tolerate routine sterilization without degradation and maintain its mechanical material properties. In addition, the design must be simple enough to fabricate, assemble, and repair using materials and processes available in or near Dakar so that the hospital can maintain a reliable inventory even as individual devices are lost or damaged over time.

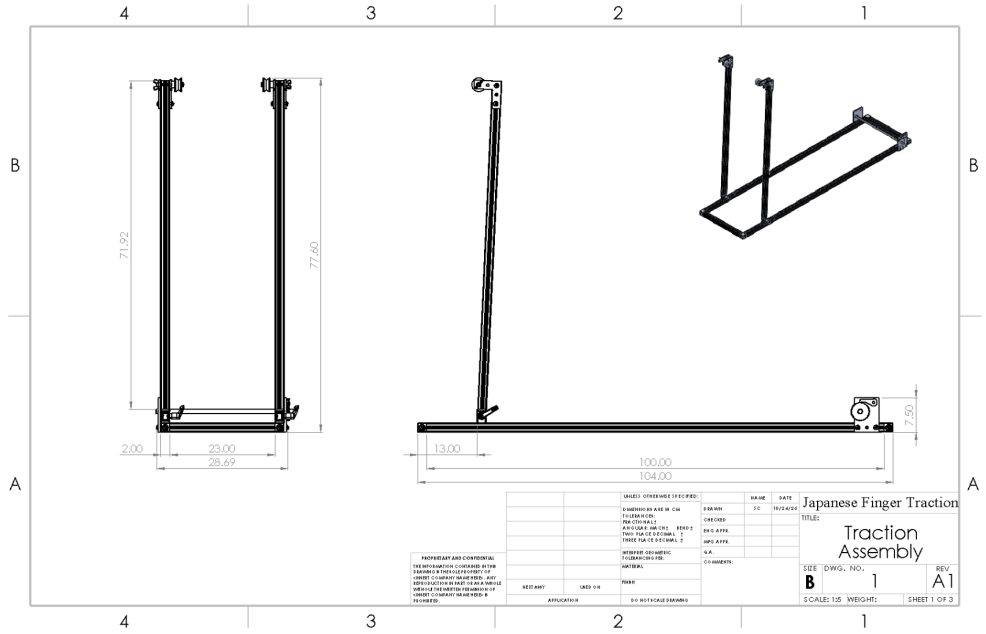
Brief Status Update:

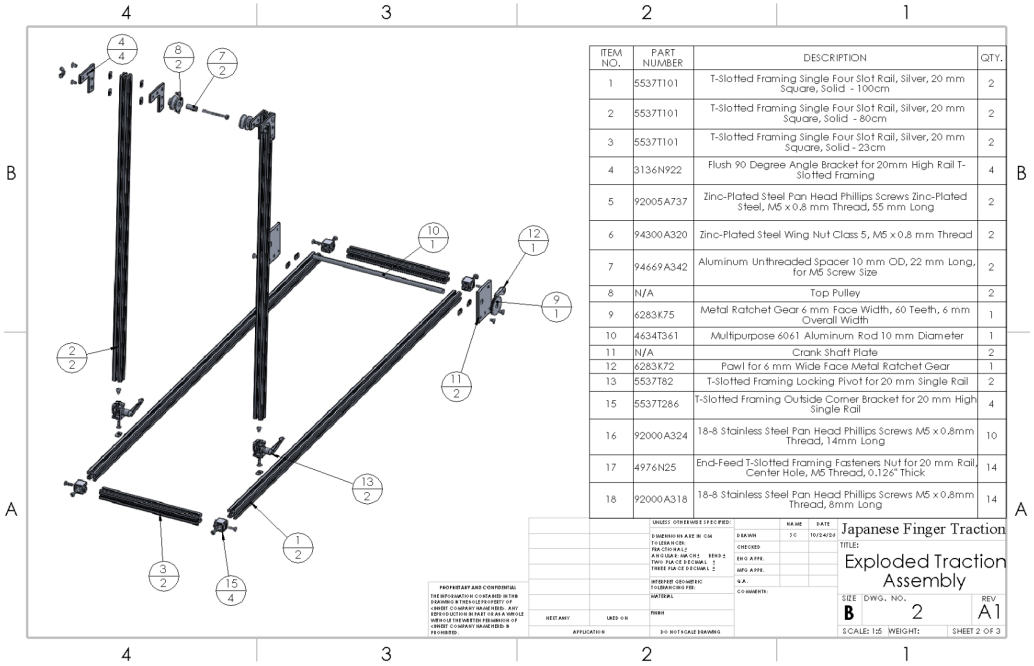
We have 3D printed a new wrist rotation device. We have sent a material list to Dr. P which he will order soon. Once those materials arrive we plan to fabricate the whole prototype.

Weekly/Ongoing Difficulties:

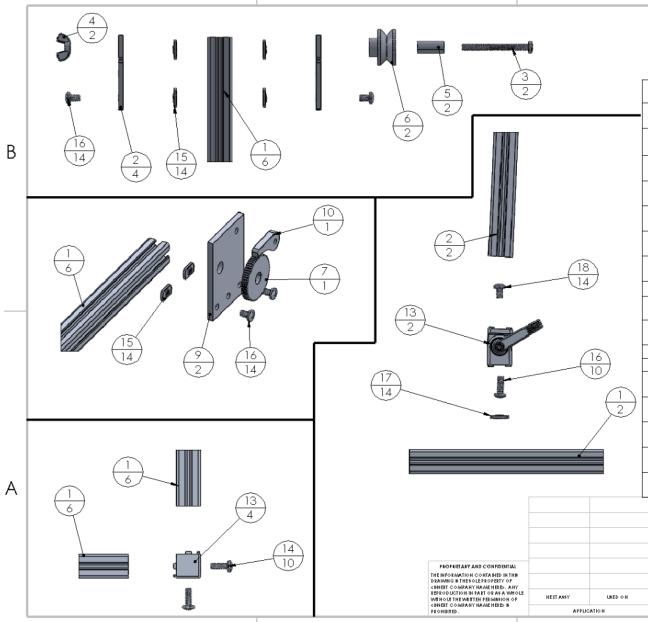
Our client has not responded to any of our recent emails, so we have reached out to Dr. P to order our materials for us. We hope to fabricate and test the device, but due to the delay in ordering the materials we will not be able to make many adjustments to the prototype.

Current Design





ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	5537T101	T-Slotted Framing Single Four Slot Rail, Silver, 20 mm Square, Solid - 100cm	2
2	5537T101	T-Slotted Framing Single Four Slot Rail, Silver, 20 mm Square, Solid - 80cm	2
3	5537T101	T-Slotted Framing Single Four Slot Rail, Silver, 20 mm Square, Solid - 23cm	2
4	3136N922	Flush 90 Degree Angle Bracket for 20mm High Rail T-Slotted Framing	4
5	92005A737	Zinc-Plated Steel Pan Head Phillips Screws Zinc-Plated Steel, M5 x 0.8 mm Thread, 55 mm Long	2
6	94300A320	Zinc-Plated Steel Wing Nut Class 5, M5 x 0.8 mm Thread	2
7	94669A342	Aluminum Unthreaded Spacer 10 mm OD, 22 mm Long, for M5 Screw Size	2
8	N/A	Top Pulley	2
9	6283K75	Metal Ratchet Gear 6 mm Face Width, 60 Teeth, 6 mm Overall Width	1
10	4634T361	Multipurpose 6061 Aluminum Rod 10 mm Diameter	1
11	N/A	Crank Shaft Plate	2
12	6283K72	Pawl for 6 mm Wide Face Metal Ratchet Gear	1
13	5537T82	T-Slotted Framing Locking Pivot for 20 mm Single Rail	2
15	5537T286	T-Slotted Framing Outside Corner Bracket for 20 mm High Single Rail	4
16	92000A324	18-8 Stainless Steel Pan Head Phillips Screws M5 x 0.8mm Thread, 14mm Long	10
17	4976N25	End-Feed T-Slotted Framing Fasteners Nut for 20 mm Rail, Center Hole, M5 Thread, 0.126" Thick	14
18	92000A318	18-8 Stainless Steel Pan Head Phillips Screws M5 x 0.8mm Thread, 8mm Long	14



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1	5537T101	T-Slotted Framing Single Four Slot Rail, Silver, 20 mm Square, Solid - 100cm	2
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11	N/A	Crank Shaft Plate	2
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UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN mm
TOLERANCES:
FRACTIONAL
ANGULAR: MACH BEND
TWO PLACE DECIMAL
THREE PLACE DECIMAL
INTERPRET GEOMETRIC TOLERANCING PER:
MATERIAL
FINISH
NEXT ASSY | USED ON
APPLICATION | DO NOT SCALE DRAWING

	NAME	DATE
DRAWN	JC	10/24/24
CHECKED		
ENG APPR.		
MFG APPR.		
Q.A.		

COMMENTS:

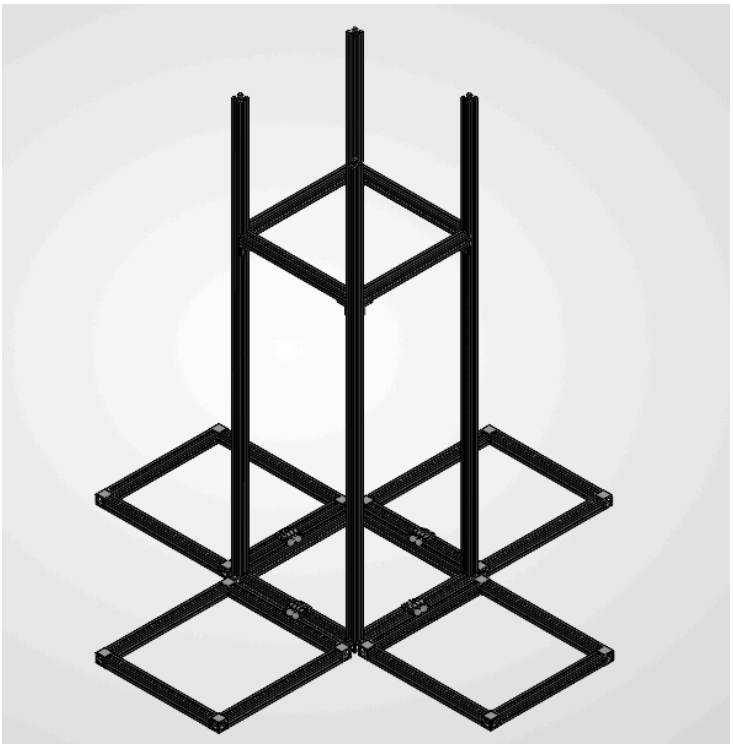
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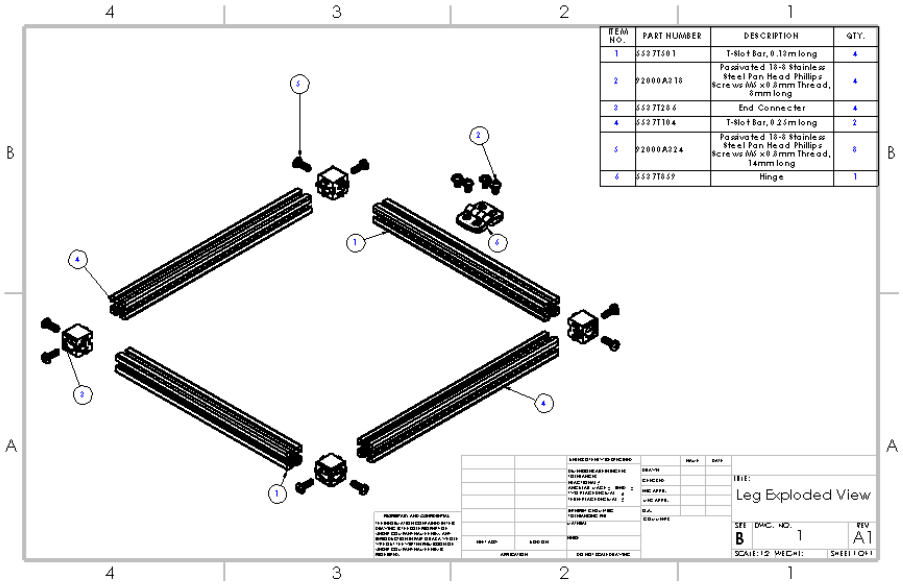
Japanese Finger Traction

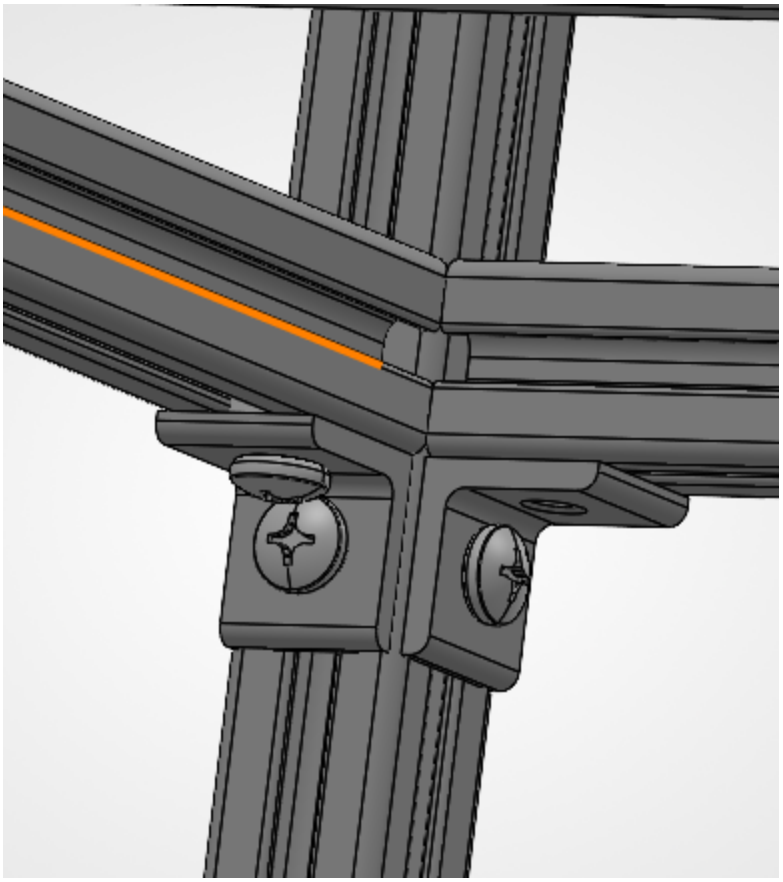
TITLE:
Traction Assembly Exploded Views

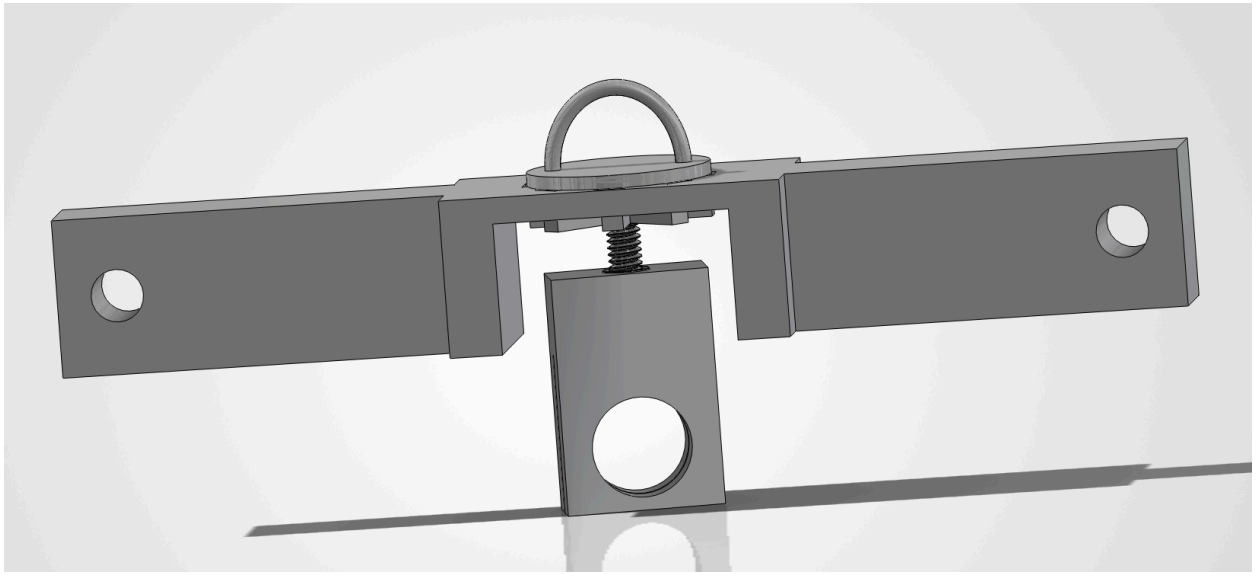
SIZE	DWG. NO.	REV
B	3	A1

SCALE: 1:2 WEIGHT: SHEET 3 OF 3




4
3
2
1
B
A
ITEM NO.
PART NUMBER
DESCRIPTION
QTY.
1
6607T501
T-Slot Bar, 0.12m long
4
2
92000A218
Passivated 18-8 Stainless Steel Pan Head Phillips Screws M5 x 0.8mm Thread, 8mm long
4
3
6607T286
End Connecter
4
4
6607T104
T-Slot Bar, 0.25m long
2
5
92000A224
Passivated 18-8 Stainless Steel Pan Head Phillips Screws M5 x 0.8mm Thread, 14mm long
8
6
6607T859
Hinge
1
Leg Exploded View
SIZE
B
DWG. NO.
1
REV
A1
SCALE: 1:5
WEIGHT:
SHEET 1 OF 1





New Final Design: Guillotine Pulley traction mechanism with new base design (top image) and wrist rotation mechanism (bottom image).

Summary of Weekly Team Member Design Accomplishments

Team: Continued to improve the current design while we are waiting to begin fabrication. We also did some materials research for both the traction system and wrist rotation device.

Individual:

- Amy Dang:
  - Revised wrist rotation design, 3D printed it, and bought new materials to use for it.
  - Update wrist rotation fabrication protocol.
- Sean Carey:
  - Reviewed Materials List
  - Began FEA Analysis Protocol
- Anshpreet Sohal:
  - Revised Materials Order List
  - Sent email to order materials
- Patricia Prakasam:
  - Added more research sources about materials/biology
- Henna Razeq:
  - Researched sources about testing the device
- Karthik Anem:
  - Finished up the clamp to be compatible with the base.

Upcoming Team and Individual Goals:

Team: Once we have the materials, we hope to fabricate the design as soon as possible. We would also like to finish the FEA Analysis of the different parts of our design. Also complete the rest of the test protocols.

Individual:

- Amy Dang:
  - Fabricate traction device.
  - Update testing protocols.
- Sean Carey:
  - Update Models
  - Finish Protocols
- Anshpreet Sohal:
  - Fabricate traction device
  - Finish protocols
- Patricia Prakasam:
  - Assist with any final poster/report creation/online things

- Henna Razeq:
  - Fabricate Device
  - Help with final product, report, etc.
- Karthik Anem:
  - Fabricate the traction device
  - Update models.

Project Timeline:

Project Goal	Deadline	Team Assigned	Progress	Completed
Product Design Specifications	09/18	All	Started	Yes
Design Matrix	09/25	All	Started	Yes
Preliminary Presentations	10/02	All	Started	Yes
Preliminary Deliverables	10/07	All	Started	Yes
Show and Tell	10/30	All	Started	Yes
Final Presentation	12/04	All	Not Started	No
Final Deliverables	12/09	All	Not Started	No

Timeline

Task	September				October					November				December		
	4	11	18	25	2	9	16	23	30	6	13	20	27	4		
Project R&D																
Research	X	X	X	X	X	X	X	X	X	X	X					
PDS	o	o	X	X	X	X	X	X	X	X	X					
Design Matrix	o	o	o	X	X	X	X	X	X	X	X					
Prototyping	o	o	o	o	o	o	o	X	X	X	X					
Testings	o	o	o	o	o	o	o	o	o	o	o					
Deliverables																
Progress Reports	na	X	X	X	X	X	X	X	X	X	X					
Prelim presentation	o	o	o	X	X	X	X	X	X	X	X					
Final Poster	o	o	o	o	o	o	o	o	o	o	o					
Meetings																
Client	na	o	X	o	X	o	X	o	X	X	o					
Advisor	X	X	X	X	o	X	X	X	X	o	X					
Website																

Update	X	X	X	X	X	X	X	X	X	X	X					

Filled boxes = projected timeline
X = task was worked on or completed – **o = Not completed**

Expenses

Item	Description	Manufacturer	Mft Pt#	Vendor	Vendor Cat#	Date	QTY	Cost Each	Total	Link
Print										
Part 1	CF-PLA	DI Lab	X	X	X	10/19/2026	1	$2.61	$2.61	
Part 2	CF-PLA	DI Lab	X	X	X	10/19/2026	1	$0.11	$0.11	
Part 3	CF-PLA	DI Lab	X	X	X	10/19/2026	1	$0.35	$0.35	
Brackets Test	CF-PLA	DI Lab	X	X	X	10/21/2026	1	$0.55	$0.55	
Brackets, gears, paw, crank, pulley	CF-PLA. 1 top pulley. 4 3-way corner brackets. 7 2-way corner brackets. 1 surface corner bracket. 1 gear. 1 paw. 1 crank plate. 1 L bracket. 1 T bracket	DI Lab	X	X	X	10/28/3036	1	$3.07	$3.07	
Writ rotation	CF-PLA All 3 parts of the wrist rotation	DI Lab	X	X	X	10/28/2026	1	$3.20	$3.20	

Traction Device										
T-Tube	Single Four Slot Rail, Silver, 20 mm Square, Solid			McMaster Carr	5537T82		4	$35.73 / 10ft	$142.92	https://www.mcmaster.com/5537T101-5537T504/
T-tube rotating joint	Locking Pivot for 20 mm Single Rail			McMaster Carr	5537T82		2	$23.49	$46.98	https://www.mcmaster.com/5537T82/
Aluminum Unthreaded Spacer	10 mm OD, 22 mm Long, for M5 Screw Size			McMaster Carr	94669A342		2	$2.50	$5.00	https://www.mcmaster.com/94669A342/
Zinc-Plated Steel Pan Head Phillips Screws	Zinc-Plated Steel, M5 x 0.8 mm Thread, 55 mm Long			McMaster Carr	92005A737		1	$13.80 / 10	$13.80	https://www.mcmaster.com/92005A737/
Zinc-Plated Steel Wing Nut	Class 5, M5 x 0.8 mm Thread			McMaster Carr	94300A320		1	$4.61 / 25	$4.61	https://www.mcmaster.com/94300A320/

Multipurpose 6061 Aluminum Rod	10 mm Diameter, 1 ft.			McMaster Carr	4634T36		1	$3.87	$3.87	https://www.mcmaster.com/4634T36-4634T361/
Hinge	Rail-to-Rail Hinge for 20 mm High Rail, Silver			McMaster Carr	5537T859		4	$13.89	$55.56	https://www.mcmaster.com/5537T859/
18-8 Stainless Steel Pan Head Phillips Screws	M5 x 0.8mm Thread, 14mm Long			McMaster Carr	92000A324		1	$11.90 / 50	$11.90	https://www.mcmaster.com/92000A324/
End-Fed T-Slotted Framing Fasteners	Nut for 20 mm Rail, Center Hole, M5 Thread, 0.126" Thick			McMaster Carr	4976N25		6	$2.27 / 10	$13.62	https://www.mcmaster.com/4976N25/
18-8 Stainless Steel Pan Head Phillips Screws	M5 x 0.8mm Thread, 8mm Long			McMaster Carr	92000A318		$1.000	$8.50 / 50	$8.50	https://www.mcmaster.com/92000A318/

								TOTAL:	**$316.65**	

Activities Time

Team Member	**Date**	**Activity**	**Time (h)**	**Weekly Total (h)**	**Semester Total (h)**
Amy Dang	11/9 11/11 11/12	Solidworks and 3D-print Fabricate wrist rotation design Wrist rotation fabrication protocol	1 hr 1.5 1 hr	3.5	52.5 hr
Sean Carey	11/9 11/11	Began FEA Protocols Materials List	30 min 1 hr	1.5 hr	66.5 hr
Anshpreet Sohal	11/11	Materials List	2.5 hr	2.5 hr	52.5 hr
Patricia Prakasam	11/12	Research	1.5 hr	1.5 hr	40.5 hr
Henna Razeq	11/12	Research	1 hr	1 hr	42.5 hr
Karthik Anem	11/12	Solidworks	2 hr	2 hr	47.5 hr