

Rowing biomechanics for lower extremities

Date: 2/29/2023

Client: Jill Thein-Nissenbaum, Tricia DeSouza

Advisor: Dr. John Puccinelli

Team:

Team Leader: Neha Kulkarni (nnkulkarni@wisc.edu)

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Problem statement

Many college rowing athletes, particularly women, are susceptible to lifelong lower back or hip injuries due to disparate weight distributions on each leg while rowing. This issue can be addressed through gathering real-time data on athlete biomechanics, but this data is often difficult to obtain. Collection and analysis of biomechanical data will enable athletes to adapt their technique towards better performance, and will assist coaches and trainers in preventing injury. The client, Dr. Jill Thein-Nissenbaum, has tasked the team with creating a force plate system that can collect biomechanical data from rowers' lower extremities. The team's goal is to create a wireless sensor system in the rowboat that will capture load distribution during time of use and will assess lower extremity asymmetry to establish risk stratification. Additionally, the team aims to translate the force plate system into a user-friendly interface that will enable coaches and athletes to understand essential biofeedback information, thereby improving both performance and safeguarding against potential injuries.

Brief status update

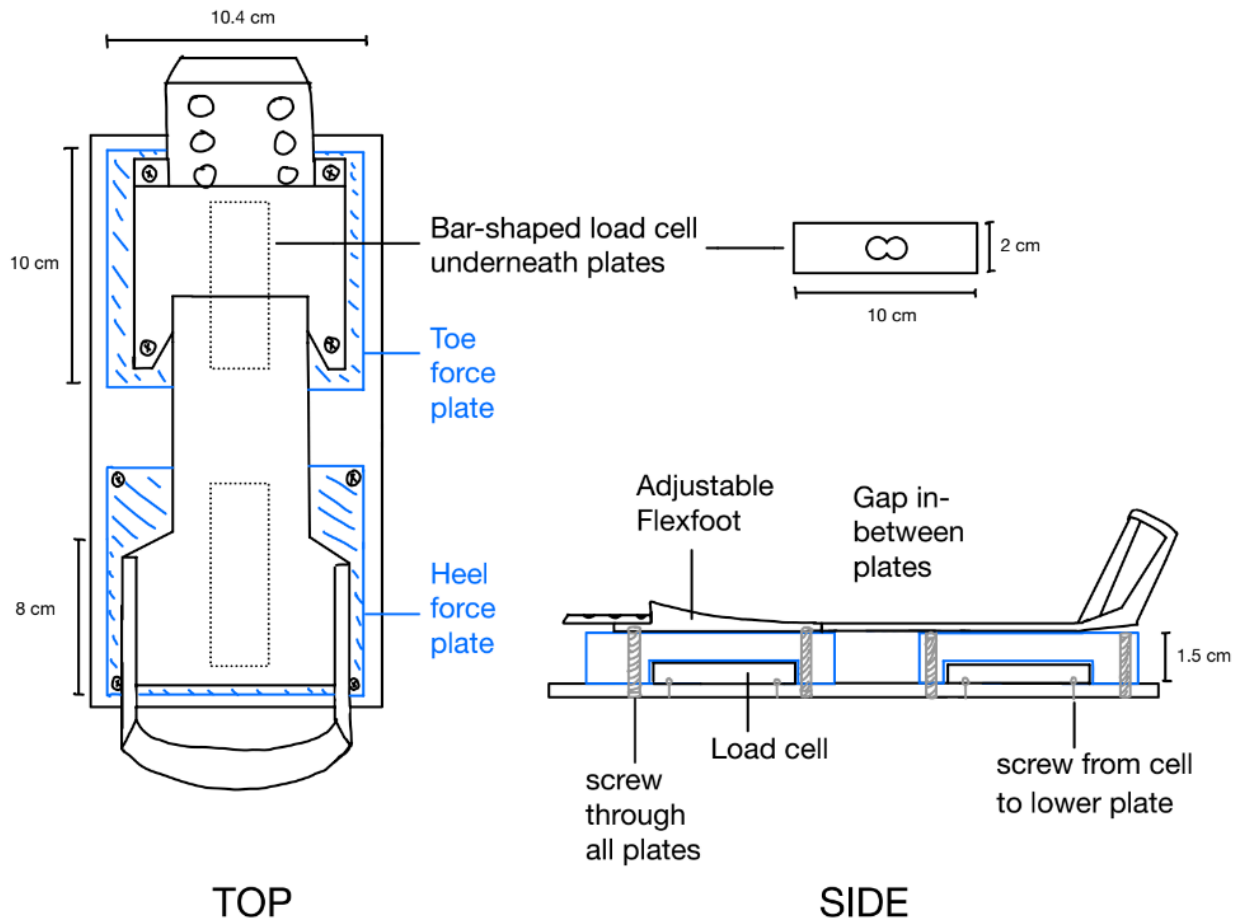
This week the team was focused on writing the Preliminary Report and reaching out to Dr. Kreg about his load cell and design suggestions.

Difficulties / advice requests

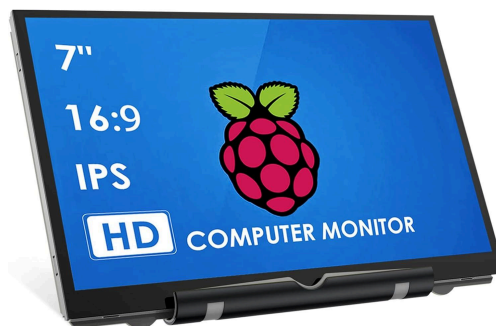
The team is still struggling to find load cells that will work for our application while still being within budget. The capacity requirements as well as the number of load cells required make the potential cost quite high.

Current design

Proposed footplate design



Display design matrix winner: Raspberry Pi + 7" LCD



Materials and expenses

Item	Description	Manufacturer	Mft Pt#	Vendor	Vendor Cat#	Date	#	Cost Each	Total	Link
Electronics										
Raspberry Pi	Microcontroller	Raspberry Pi		Sparkfun	DEV-15446	2/15	1	\$45	\$60.43	Link
Raspberry Pi	7" Display Screen	Raspberry Pi		Amazon		2/23	1	\$33.99	\$33.99	
Raspberry Pi	20W 5V 4A Power Supply	Raspberry Pi		Amazon		2/23	1`	\$11.99	\$11.99	
MicroSD Card	32GB 3D NAND High Speed MicroSD Card with Adapter	Silicon Power USA		Amazon		2/23	1	\$8.99	\$8.99	
HDMI Cable	4K Micro HDMI to HDMI Cable 1 FT Adapter 2.0	Szsea US		Amazon		2/23	1	\$8.99	\$8.99	
Raw Materials										
									\$0.00	
									\$0.00	
								TOTAL:	\$124.39	

Major team goals for the next week

1. Finish preliminary report
2. Choose a load cell to order
3. Connect the raspberry pi to load cell from last semester for practice

Next week's individual goals

- Neha
 - Talk to Dr. Kreg
 - Finalize which load cell we are using
 - Begin ordering footplate materials
- Simmi
 - Worked with Alicia to write code for HX711 amplifier
 - Look into more secure connected for load cells
- Alicia
 - Work with Simmi on the code to read values from the load cell amplifier.
 - Integrate real-time load cell sensor data with the GUI code
- Emily
 - Decide on load cell and order
 - Start dimensioning footplate to cut in teamlab

- Colin
 - Fabricate Load cell housing in TeamLab
 - Start brainstorming testing protocols

Timeline

Task	Jan	Feb					March					April				May	
	26	2	9	16	23	29	1	8	15	22	29	5	12	19	26	3	10
Project R&D																	
Empathize	X	X	X														
Background	X	X	X	x													
Prototyping				x	x	X											
Testings																	
Deliverables																	
Progress Reports		x	x	x	x	X											
Prelim presentation							x										
Final Poster																	
Meetings																	
Client		x		X													
Advisor		x	x	X	X	x											
Website																	
Update		x	x	x	X	X											

Filled boxes = projected timeline

X = task was worked on or completed

Previous week's goals and accomplishments

- Neha:
 - Worked on Preliminary Report
 - Emailed with Dr. Kreg about his design ideas
- Allicia:
 - Worked with Simmi on the hardware connections between the load cell, amplifier, and raspberry pi.
 - Started working on code to write values from the HX711 to the raspberry pi.
- Emily:
 - Worked on preliminary report
 - Researched ethical considerations
- Colin:
 - Worked on preliminary report

- Modeled the Load cell housing in SolidWorks
- Simmi:
 - Built the load cell circuit to connect to raspberry pi
 - Created a GUI
- Team previous goal:
 - Presented at Preliminary Design Presentations

Activities

Name	Date	Activity	Time (h)	Week Total (h)	Sem. Total (h)
Neha Kulkarni	3/4	Worked on Preliminary Report	3	3	23
Alicia Moeller	3/6	Tried to configure a keyboard widget on the raspberry pi	2	2	30
Alicia Moeller	3/6	Worked with Simmi on hardware	3	5	33
Alicia Moeller	3/6	Started the load cell code	1	6	34
Simmi Kaur	3/6	Worked with Alicia on Hardware	3	5	25
Simmi Kaur	3/6	Worked on Preliminary Report	2	5	25
Emily Wadzinski	3/6	Worked on Report	4	4	22
Colin Fessenden	3/6	Preliminary Report	3	3	21