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)

Communicator: Simerjot Kaur (kaur26@wisc.edu)

BWIG: Emily Wadzinski (ewadzinski@wisc.edu)

BSAC: Allicia Moeller (aamoeller@wisc.edu)

BPAG: Colin Fessenden (ckfessenden@wisc.edu)

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 focused on making our preliminary design presentation. After receiving some new materials, we set-up the Raspberry Pi and got it to connect with the 7 inch display. We iterated on our demonstration GUI from last week, adding the features of a calibration

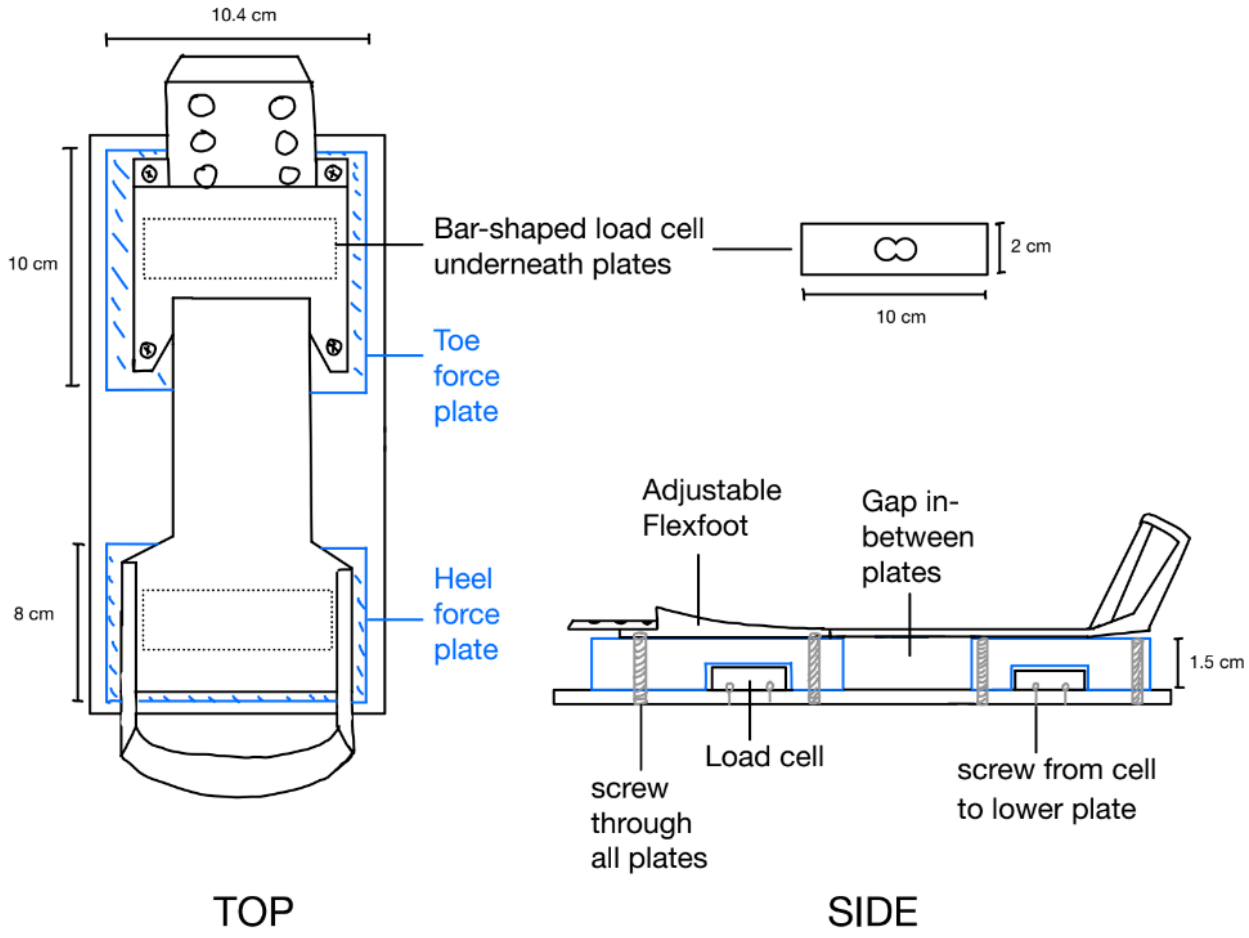
period, a threshold bar, and color-changing bar graphs. After reaching out to Interface, a load cell vendor, we learned that purchasing from them may be too expensive for this project, but we are actively looking for alternative load cells.

Difficulties / advice requests

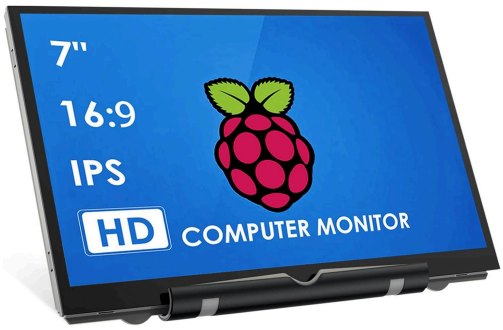
The team is still struggling to find load cells that will work for our application while still being within budget. The capacity requirements as well as the number of load cells required make the potential cost quite high.

Current design

Footplate design matrix winner: Stationary uniplate design



Display design matrix winner: Raspberry Pi + 7” LCD



Materials and expenses

Item	Description	Manufac-turer	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. Create 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

    - Work on preliminary report
    - Finalize footplate fabrication
    - Talk more with Interface about their load cells
- Simmi
    - Work on preliminary report section
    - Connect current load cells to the Raspberry pi
    - Work with Allicia on connecting load cell data to GUI
- Allicia
    - Work on preliminary report
    - Work with Simmi to connect last semester's load cell to raspberry pi
    - Get feedback from clients on updated GUI
- Emily
    - Work on preliminary report
    - Look at materials for footplates
- Colin
    - 3D Print Load cell housing

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												
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:
    - Found footplate material on Grainger
    - Initiated discussion with Interface about load cells for our application
    - Worked on preliminary presentation
- Allicia:
    - Ordered remaining materials needed for the display.
    - Set-up Raspberry Pi with display
    - Updated the demo GUI with new features
- Emily:
    - Edited prelim slides after feedback
    - Dimensioned designs
- Colin:
    - Did Prelim presentation slides after receiving peer feedback
    - Modeled load cell housing in SolidWorks
- Simmi:
    - Worked on creating a GUI through Spyder
    - Worked on preliminary presentation slides
- Team previous goal:
    - Create preliminary presentation
    - Start preliminary report
    - Order materials required for prototype

Activities

Name	Date	Activity	Time (h)	Week Total (h)	Sem. Total (h)
Emily Wadzinski	2/28	Dimensioned and labeled all designs	2	2	17.5
Colin Fessenden	2/26	SolidWorks Modeling	1.5	1.5	15
Colin Fessenden	2/28	Solidworks Modeling	.5	2	15.5
Neha Kulkarni	2/25	Work on preliminary presentation	1.5	1.5	19
Neha Kulkarni	2/25	Call with Interface about load cells	1	1	20
Allicia Moeller	2/26	New demo GUI	3	3	25
Allicia Moeller	2/27	Set-up Raspberry pi and display	3	6	28
Simerjot Kaur	2/25	Set up GUI on Spyder	2	2	15
Simerjot Kaur	2/26	Look up setting up Raspberry Pi to Mac	2	4	17