Asymmetrical Force Sensor for Rowing Biomechanics

Date: 9/19/2024

Client: Jill Thein-Nissenbaum, Tricia DeSouza
Advisor: David Appleyard
Team:

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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

Last week our team checked in with our clients to reiterate their design goals and thoughts on last semester's prototype.

The team met this week with Dr. Gruben to get his expertise on preliminary design ideas considering load cells and how to shield off tangential forces. The team also updated our Preliminary Design Specifications from last semester to correspond to adjusted constraints.
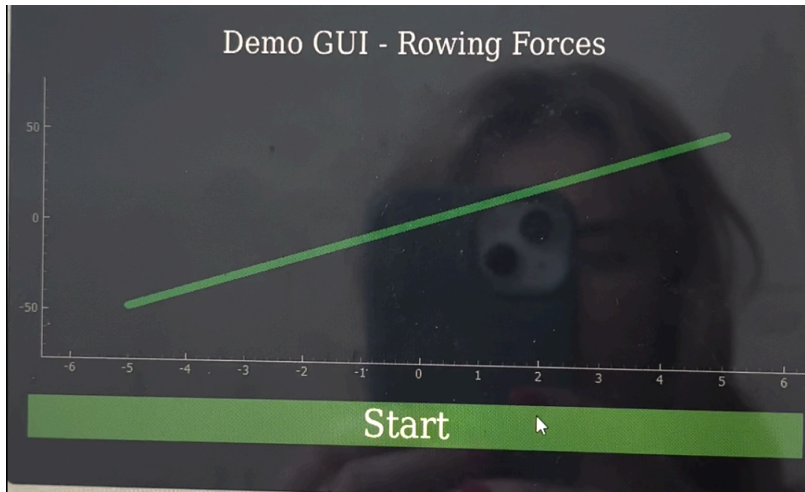
Difficulties / advice requests

None this week.

Current design

Final design from last semester:

Materials and expenses - None yet

Item	Description	Manufac-turer	Mft Pt#	Vendor	Vendor Cat#	Date	#	Cost Each	Total	Link
Category 1										
									$0.00	
									$0.00	
Category 2										
									$0.00	
									$0.00	
								TOTAL:	**$0.00**	

Team goals for the next week

1. Make design matrix for force measurement method.
2. Order load cells.

Next week's individual goals

- Neha
  - Finish creating demo GUI options for design matrix
  - Create google form for collecting rower feedback on GUI options
  - Research housing materials
- Simmi
  - Research load cell vendors
  - Brainstorm design ideas for housing
- Allicia

- ○ Make drawings for 2 different enclosure designs
- ○ Consult Makerspace on instrumentation design.
- Emily
  - ○ Work on design matrix
  - ○ Continue research on load cells
- Colin
  - ○ Work on Design Matrix
  - ○ Brainstorm load cell housing

Timeline

Task	Sep				Oct				Nov					Dec
	6	13	20	27	4	11	18	25	1	8	15	22	29	6
Project R&D														
Empathize	x	x												
Background	x	x	x											
Prototyping		■	■	■	■	■	■	■	■			■		
Testings								■	■	■	■	■	■	■
Deliverables														
Progress Reports	x	x	x	■	■	■	■	■	■	■	■	■	■	■
Prelim presentation				■										
Final Poster													■	
Meetings														
Client		x	x		■		■		■		■		■	
Advisor	x	x	x	■	■	■	■	■	■	■	■	■	■	
Website														
Update	x	■	■	■	■	■	■	■	■	■	■	■	■	■

Filled boxes = projected timeline
X = task was worked on or completed

Previous week's goals and accomplishments

- Neha:
  - ○ Met with Dr. Gruben
  - ○ Researched load cell specs and options
  - ○ Began work on understanding GUI code
- Allicia:
  - ○ Research load cell options.
  - ○ Consult Dr. Gruben about load cell enclosures.
- Emily:
  - ○ Researched insole pressure sensors
  - ○ Brainstormed design ideas

- Colin:
  - Research Wii Fit board idea and concept
  - Met with Dr Gruben to discuss load cells and design
- Simmi:
  - Brainstormed housing ideas for load cells
  - Researched force output during rowing

Activities

Name	Date	Activity	Time (h)	Week Total (h)	Sem. Total (h)
Team	9/13	Client and Advisor Meeting	2	2	
Team	9/18	Meeting with Gruben	1	3	
Allicia	9/12	Load cell research	1	1	5
Neha	9/18	Load cell research	1	2	5
Emily	9/18	Force sensor insole research	2	2	2
Simmi	9/18	Load Cell Research	2	2	2
Colin	9/18	Wii Board research	1	2	2