Asymmetrical Force Sensor for Rowing Biomechanics

Date: 1/31/2025

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

Team Leader: Allicia Moeller (aamoeller@wisc.edu)

Communicator: Neha Kulkarni (nnkulkarni@wisc.edu)

BWIG: Simerjot Kaur (kaur26@wisc.edu)

BSAC: Emily Wadzinski (ewadzinski@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.

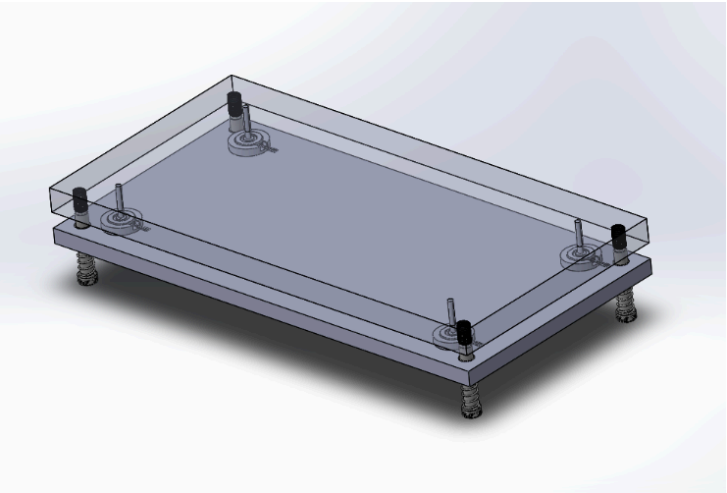
Brief status update

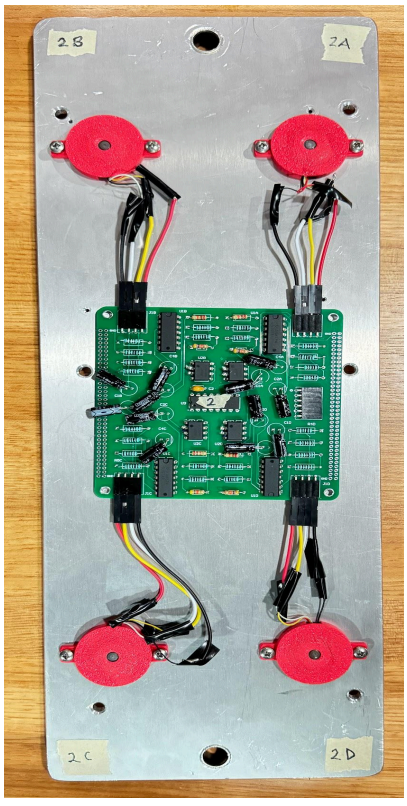
This week, the team is focused on creating a plan for testing the prototype and finding a relevant journal to which we can submit our finished article. We also created some interim goals and a rough timeline for the work we wish to complete this semester.

Difficulties / advice requests

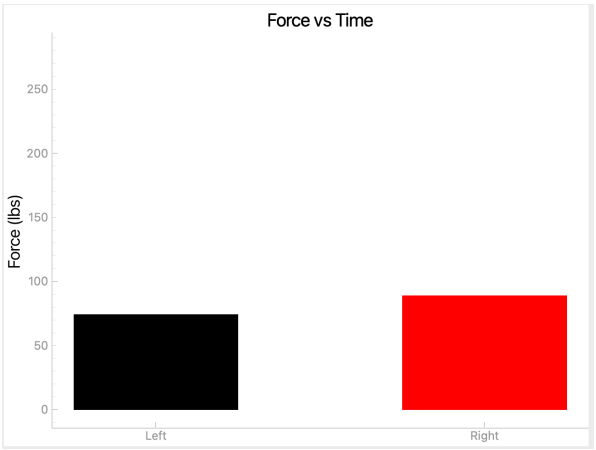
Current design

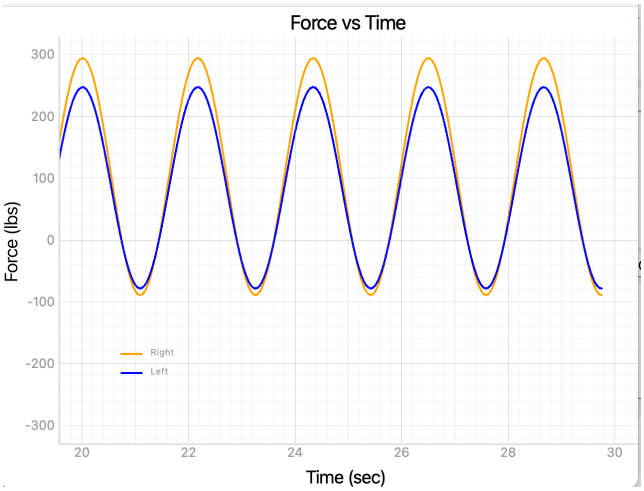
Stationary Force Plate

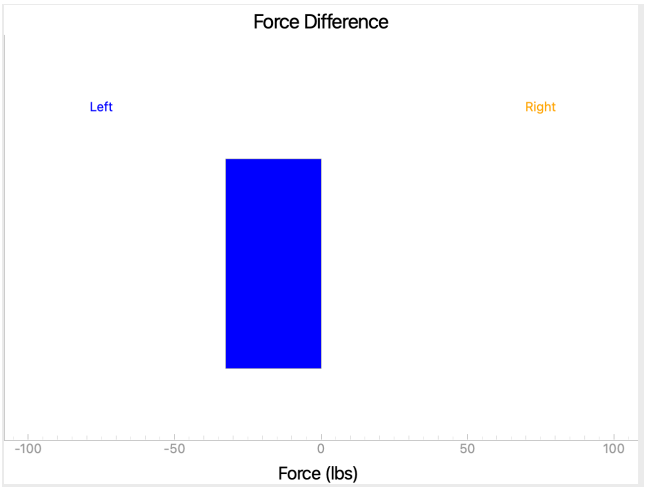


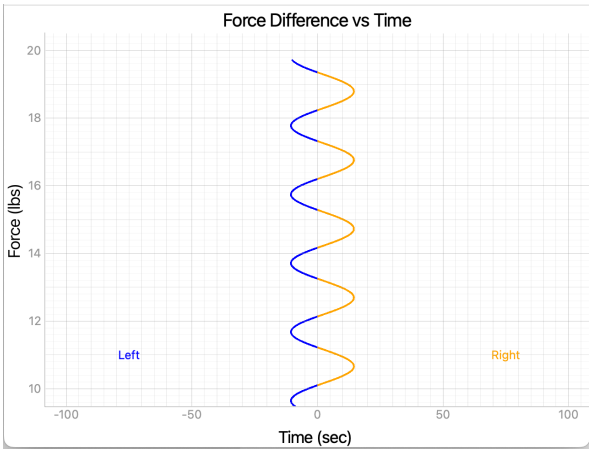


GUI (graphical user interface):









Materials and expenses (from last semester)

Description	Item #	Specs	Link	Price	Qty	Item Total
Alloy Steel Sleeve Shoulder Screw	91259A632	3/8" Shoulder Diameter	Link	$2.86	4	$11.44
PTFE Sleeve Bearing Shell	60695K2	3/8" OD 0.5" Length	Link	$2.44	4	$9.76
One End Threaded Stud	97042A145	6-32 Thread, 1" Long	Link	$3.86	5	$19.30
Steel Compression Springs (Pack of 5)	9434K113	0.48" OD 0.5" Length	Link	$4.83	1	$4.83
Dowel Pin (Pack of 5)	8381A172	1/8" Diameter	Link	$5.92	1	$5.92
Bronze Sleeve Bearing	6391K173	3/8" OD 0.5" Length	Link	$1.40	1	$1.40
TI Connectivity Compression Load Cells	824-FX292X-100A0100L	100lb Operating Force	Link	$28.43	8	$227.44
12 BIT MCP3008 ADC	MCP3208-CI/P-ND	12 Bit IC ADC	Link	$4.97	2	$9.94
TLV274IN	296-14379-5-ND	Op Amp 4 Circuit	Link	$1.06	10	$10.58
1K Ohm Resistors	RNF14FTD1K00	1k ohm resistors	Link	$0.03	100	$3.15
Raspberry Pi Pico H	2648-SC0917-ND	microcontroller	Link	$5	1	$5.00
Jumper Wire	1528-1967-ND	M-M 6"	Link	$2	2	$3.90
10 BIT MCP3008 ADC	MCP3008-I/P-ND	10 Bit 16 DIP	Link	$3	1	$3.12
LM358 Amplifiers	296-1395-5-ND	8 DIP	Link	$0	30	$5.10
Stainless Steel Flat-Tip Set Screws (Pack of 25)	94355A337	10-32 0.5" Long	Link	$5	1	$5.41
Aluminum Footplates	6061 T651	12x16x.25	Link	$31	2	$61.16
Custom Printed Circuit Boards		95x95mm (5 copies)	Link	$10.61	1	$10.61
Compression Spring	9657K374	124 max load, 1.75" L	Link	from last year	12	
					Total	$398.06
Final Design Parts					**Total After Shipping**	**$446.86**

Timeline

Timeline

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

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

Previous week's goals and accomplishments

- Neha
  -
- Simmi
  -
- Allicia
  -
- Emily
  -
- Colin
  -

Activities

Name	Date	Activity	Time (h)	Week Total (h)	Sem. Total (h)