

MRI compatible motion platform

Date: 01/26/2024 – 02/01/2024

Client: Jiayi Tang

Advisor: Dr. Trevathan

Team:

Maxwell Naslund

Caspar Uy

Kendra Besser

Jamie Flogel

Amber Schneider

Problem statement

MRI phantoms used to test and calibrate MRI's are often static models of the human body. These static models don't give a good representation of the constant motion created from natural processes such as respiratory and digestive functions. To solve this, our team will work on a MR compatible device that will hold a phantom and simulate the movements found within the human body.

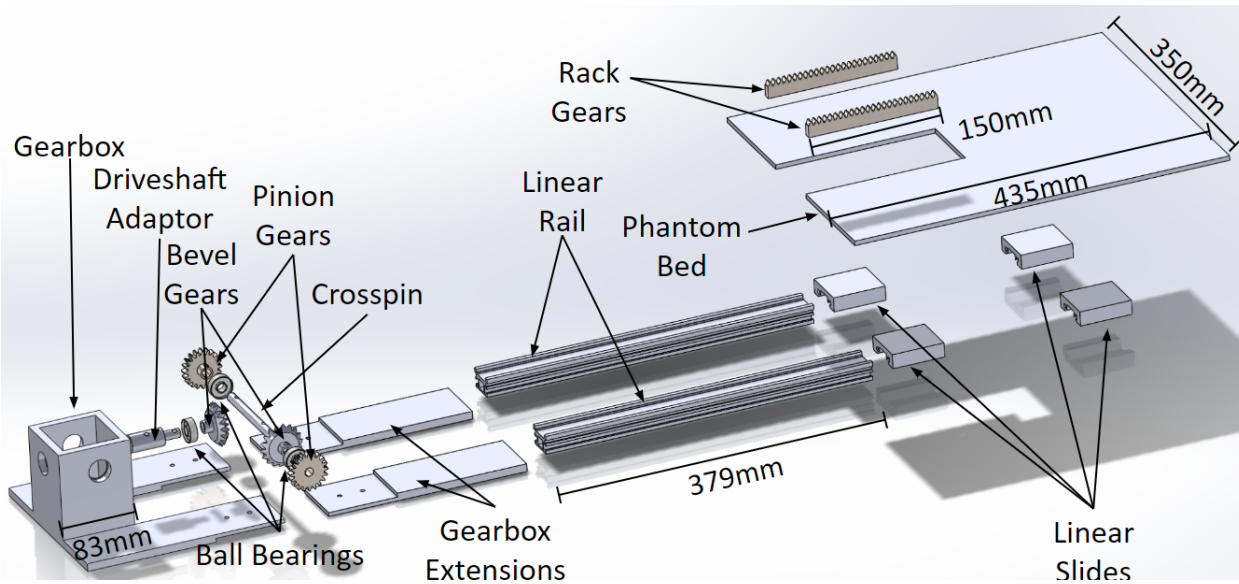
Brief status update

The team has begun the first steps of this semester's design project. Our team met for the first time on Friday and decided on our roles for the semester. We also determined times during the week that worked for us to meet with our client and our advisor. We met with our advisor for the first time and asked preliminary questions to get a better sense of the expectations for the project.

Difficulties / advice requests

N/A

Current design



Materials and expenses

Item	Description	Manufacturer	Part Number	Date	QTY	Cost Each	Total	Link
Component 1								
Ultimaker PLA (37.0 g)	3D printed gears to translate and facilitate motion	Ultimaker	RAL-9010	10/26/2023	3	\$2.96	\$2.96	N/A
Ultimaker PLA (325.0 g)	3D printed gears and gearbox	Ultimaker	RAL-9005	11/03/2023	1	\$26.00	\$26.00	N/A
Bamboo Labs PLA (127.34 g)	3D printed gearbox extension pieces	Bambu Lab	#000000	11/15/2023	1	\$12.19	\$12.19	N/A

Ultimaker PLA (118 g)	3D printed support for the driveshaft	Ultimaker	RAL-9005	11/17/2023	1	\$9.44	\$9.44	N/A
Ultimaker PLA (27 g)	3D printed racks	Ultimaker	RAL-9005	11/29/2023	1	\$2.16	\$2.16	N/A
Ultimaker PLA (126 g)	3D printed Motor Stand	Ultimaker	RAL-9005	12/01/2023	1	\$10.08	\$10.08	N/A
Component 2								
Linear Rails	400 mm linear rails	igus	CWS-06-30-400	11/13/2023	2	\$167.69	\$335.38	Link
Component 3								
Linear Slides	Slides to support platform on linear slides	igus	WWPL-06-30-06	11/13/2023	2	\$18.25	\$36.50	Link
Component 4								
Driveshaft	Connection piece between motor and gearbox	Grainger	H0400075PW1000	11/16/2023	1	\$8.00	\$8.00	Link
Component 5								

Platform	1/4 black acrylic sheet provided by Makerspace	MSC	MSC# 63391700 (no part number given similar example)	11/17/2023	1	\$20.00	\$20.00	N/A
Component 6								
Glass Ball Bearings	Glass ball bearings to allow for frictionless rotation	Grainger	MSN0459939	12/1/2023	5	\$17.07	\$85.35	N/A
Component 7 - unused features due to reprints/redesigns								
Ultimaker PLA	3D printed Gearbox	Ultimaker	RAL-9005	10/26/2023	3	\$19.36	\$19.36	N/A
Ultimaker PLA	Motor to driveshaft adapter piece	Ultimaker	RAL-9005	12/1/2023	1	\$1.12	\$1.12	N/A
Ultimaker PLA	Motor to driveshaft adapter piece reprint	Ultimaker	RAL-9005	12/4	1	\$2.84	\$2.84	N/A
Ultimaker PLA	Motor to driveshaft adapter piece reprint	Ultimaker	RAL-9005	12/5	1	\$2.65	\$2.65	N/A
TOTAL:	\$574.03							

Major team goals for the next week

1. Prepare and present preliminary presentation
2. Continue research for the redesign and prototype improvement
 - a. Kendra and Amber - transfer function incorporation
 - b. Max, Jamie, and Caspar - mechanical improvements to limit friction

Next week's individual goals

- Max
 - Team meeting to review friction reduction of design
 - Brainstorm several methods of friction reduction
 - Prepare for preliminary presentation
- Amber
 - Meet to review changes in motor documentation
 - Brainstorm ways to incorporate controls research into device
 - Prepare for preliminary presentation
- Jamie
 - Meet to discuss mechanical changes
 - Begin implementing mechanical changes
- Kendra
 - Redownload Mbed and import necessary libraries
 - Work on transfer function integration
 - Prepare for preliminary presentation
- Caspar
 - Team meeting to review research needed for journal
 - Meet with Max and Jamie on friction and gears
 - Prepare for preliminary presentation

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		X														
Background...		X														
Prototyping																
Testings																
Deliverables																
Progress Reports		X														
Prelim presentation																
Final Poster																
Meetings																
Client		X														

Advisor	X															
Website																
Update	X															

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

Previous week's goals and accomplishments

- Max
 - Set up labarchives
 - Met with client to redefine project goals
 - Began work into friction reduction
- Amber
 - Updated the website
 - Met with the client to discuss semester expectations
 - Began research on motor control
- Jamie
 - Met with client to discuss work for the semester
 - Researched organ motion
- Kendra
 - Researched and brainstormed transfer function application
 - Contacted client to set up a meeting
- Caspar
 - Research organ movement in various MRIs
 - Met with client to discuss semester plan

Activities

Name	Date	Activity	Time (h)	Week Total (h)	Sem. Total (h)
Max	1/26/24 1/31/24	Semester planning with team Client meeting	1.5 0.5	1.5 2	1.5 2
Amber	1/26/24 1/31/24 2/1/24	Semester planning with team Client meeting Controls research	1.5 0.5 1.0	3.0	3.0
Jamie	1/26/24 1/31/24	Semester planning with team Client meeting Researched organ motion	1.5 0.5 0.5	2.5	2.5
Kendra	1/26/24 1/31/24	Semester planning with team Client meeting Researched transfer function	1.5 0.5 0.5	2.5	2.5
Caspar	1/26/24 1-31-24	Semester planning with team Client Meeting Researched organ movement in MRIs	1.5 0.5 0.75	2.75	2.75

