**LAYOUT**

**TEAM MEETING**

***Cameron,*** *Diogo, Jose, Samuel, Yujui, Lio*

**Duration:**

**Agenda:**

## Notes from meetings throughout the week

| **No.** | **Agenda and Minutes** | **Actions needed** |
| --- | --- | --- |
| **1** | 1/18 - Talked about requirements-> updated resolution requirement(led Sam) | Jose will try to find a spring scale |
| **2** | 1/18- 1DOf team, Cam Ray, Liu, came up with many designs, 3 main designs. Sam will CAD spiral design, Cam, Liu and Ray will research necessary details of two other ideas: both magnets moving vs 1 magnet.  Need to determine possible strength of magnet in order to influence design decisions. | Cam to source some magnets for experimentation before Friday. |
| **3** | 1/19 - Things to talk about with Profs. on Friday  Overall Team   * Discuss overall system architecture/block diagram   + Pinching requirement, 8 inches too much?   + 2 full rotations too much? Is 1 enough?   + Further discussion of haptic loop * Are we designing for the general population or for an experienced user?   + We are not trying to create a consumer product, we are trying to explore the concept and its usage * Should the actuator team work with magnets right away in their prototyping?   + Dissonance in group, concerned that it might be too much work but others concerned that waiting too long could delay finding out other issues * Should we be designing with the predisposition that the actuator team and mechanism team combine their end products?   + i.e. actuator team prototypes something that can be easily mounted to mechanism team prototype and we just combine our prototypes at the end of the quarter * Touch screen & display questions   + Focus on the robot first, before focusing on including a screen   + How can we get one?   + What kind should we look for?   + How will we know if it’s compatible with magnets? * What are some major milestones for the rest of the quarter? i.e. What does the path to a finished robot look like?   Mechanism SubTeam:   * What does our deliverable look like at the end of the quarter?   + Can motors be replaced with hand cranks, knobs, etc. * Discussion of workflow   + Proposed: Rank concepts/architectures in order of most feasible/easiest to build/satisfies most requirements, then “proportionally” prototype the top 2-3 until we find a fatal flaw   + Other ideas * Technical questions   + How does the inertia requirement of free motion impact the design of our robot? Are we trying to minimize inertia? Or are we just trying to optimize our inertia distribution for easiest manipulation and the best step response? * Concept questions   + Can we use the gantry system of a cheap 3d printer (timing belts and sliders)   + Can the rotation DOF be just a motor?     - Every other idea we have had is overly complicated     - Should we include a planetary gear?   + Proposed idea: turn PCBs into electromagnets   1DOF subteam   * How to measure feedback when magnets are involved? A bit unsure of solution space   Discussed concepts:   * open chain linkage * closed chain linkage   + DexTAR type of robot - https://www.youtube.com/watch?v=dnixuCu49o4&t=69s * traditional gantry with EE   + Double rack & pinion   + Double disc with swirl [Sam] * Ball screw gantry [Sam] * Pure cable bot [Diogo] * ~~Cablet bot gantry~~ * double gantry on different planes [Sam] * double cable bot on different planes * Magic wallet design [Sam] | Mechanism Team: Draw discussed concepts ahead of Friday’s meeting |
|  | 1/19 - Review feedback  **Requirements**:   * Is 2 full rotations necessary?   We don’t need to address full proof   * Is 8 inch pinching allowance too much?   Architecture:   * How is the haptic loop achieved?   + “Will the controller depend on force measurements at any point, either from a load cell or from motor current feedback? If the base controllers are all position controllers, how will the device behave? How would you, for example, render a virtual spring? Does this depend on a fixed model of the impedance of the coupling?”   + We’ll we need a gesture controller?   + Signaling might not be quite right   Brainstorming:   * Carriage vs two separate control mechanisms * How could we have the 2 fingers independently? * How would the chain linkage work on the case * Look for papers on SPIDR haptic interface (for cable system) * For belting system keep in mind that every pulley adds friction and mass |  |

## Notes From Meeting with Professors

### Questions

Rotation is probably most important gesture

Zoom could be good to implement

Size:

Do we benefit from making things smaller? Or is it better to be bigger?

Use cases:

Not trying to solve every possible use case, not a commercial product

-dont need fool proof device

What are our specs on backdriving?

Backdrive and lead robot OR robot has to track where you are going if not backdrivable

Admittance vs impedance

### Advice

* Focus in on the robot and don't worry about the screen and coupling and whatever
* Need to consider constraining to line vs driving along line distinction- impedance vs admittance
* Magnet acting like a spring can be used to our advantage but also can complicate
* In plane friction is always a problem
* Might be challenging with actual tablet touchscreen because touch screen resolution is only 1mm
* Admittance->controller is trying to mask natural behaviors of machine vs
* Impedance->controller trying to add on

### Brainstorming

Idea for 2 gantry system where one of them has a cantilever bar that skims above the other gantry, would allow for some overlap, important idea

Could have a puck that sits on screen rather than glove->actually very elegant idea.

Admittance Control Potential plan->”I am just going to build a robot, no haptics” -> use touch screen sensor and non-backdrivable robot. Turn off robot on virtual wall->could buy 3DP gantry->beauty of it is getting to focus in on a robot, but maybe a cop out?

Maybe could build 1DOF with gear motor, then put mag and plate, with tablet and position feedback

Ferrofluid?

Kinda gross but maybe a possibility - lubricant

Wearable:

Puck that stays on the screen and tracks your hand

2 classes of robot: parallel vs serial

### Plan going forward

1DOF team, pick a motor, pick a transmission, just build it, SOOOOOOON. start off with just motor and encoder, for impedance control, then think about adding in potentiometer

3DOF team, build multiple prototypes, 3D, wireframe but just do it. do it fast. just do it . build them all simple. So we can move them with our hands and stuff

## POST MEETING

### 1DOF

Driving mechanism by belts, 10 inch or a bit less total dimension

Need to buy pulley, linear rail, sliders and timing belt, also buy motor.

Think about magnet

Liu has motor, 42mm stepper motor with encoder.

Liu will do sketch of design,

Cam will do first pass of block diagram

Ray will write explanation of design

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### Mechanism

Two types of robots - serial or parallel

Three types of designs - cable bot, gantry, open linkage