

[INTRO](#)[REVIEW](#)[APPROACH](#)[AESTHETICS](#)[COLOR](#)[DESIGN](#)[NEXT](#)

# Robotic Housekeeping Cart

Project By

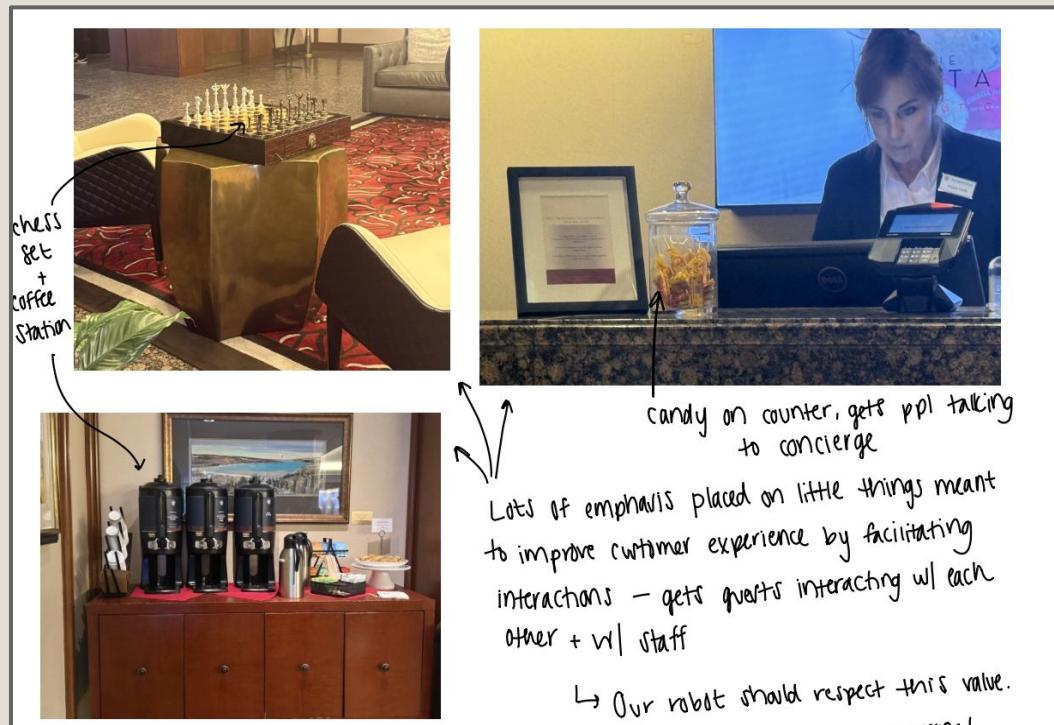
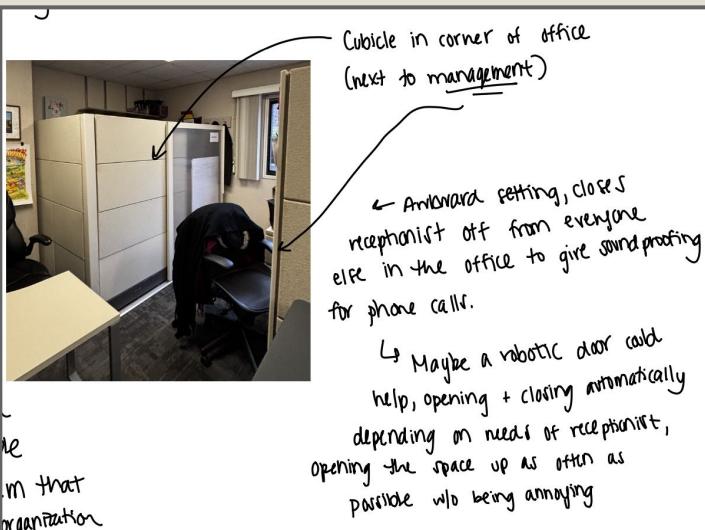
Arshia Agrawal, Gabriella Best, Ignacio Cavero, & Lili Mkrtchyan

# Our Design Process

- 01 Touring the Statler Storyboards
- 02 Benchmarking
- 03 Initial Prototyping
- 04 Final Prototype
- 05 Testing & Feedback
- 06 Reflection

# Touring the Statler

## Front Desk, Lobby, & Parking



# Touring the Statler

## Kitchen & Dining

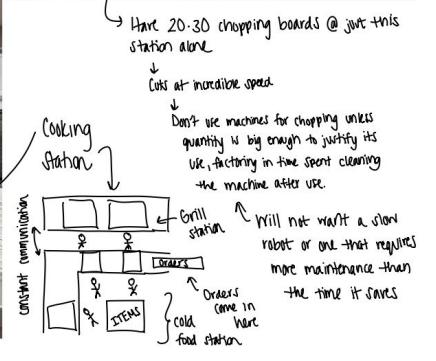
### Ordering system:

Orders come in (from) all restaurants-bars in the entire hotel – cooking stations are split up by restaurant + by meal (cold)

Order gets printed, placed on line, and then fulfilled (may get placed on line multiple times if  $> 1$  thing was ordered)

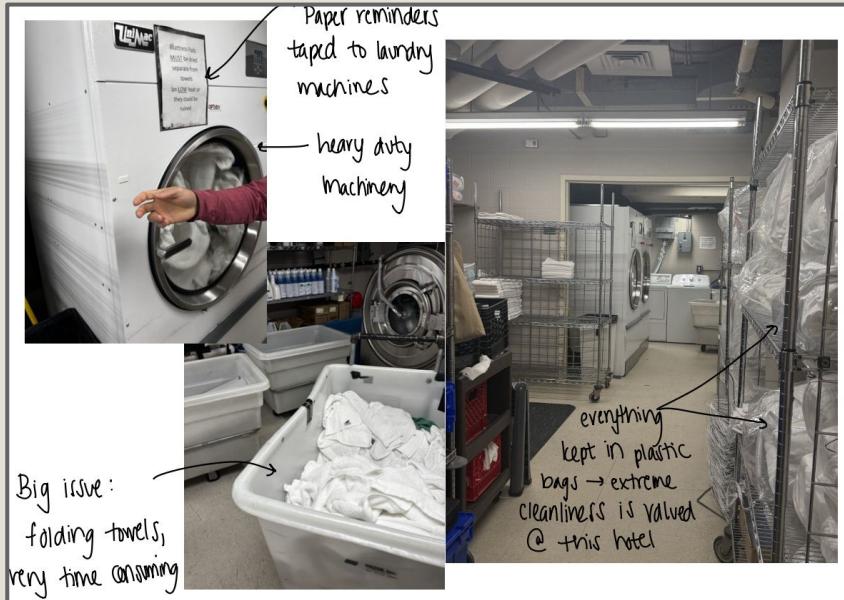
Timing is important to ensure food comes out at the same time as rest of the order + don't delay when done cooking + delivered to guest

Phone keeps ringing w/ room service orders – same person answering the phone + adds delivering all room service orders → very inefficient, leads to missed calls



# Touring the Statler

## Housekeeping



Issues:

- Cart is extremely heavy, causes shoulder + back issues + pain
- Guests steal things off cart
- Most time is spent cleaning + the bathroom
  - ↳ Difficulty cleaning grout (tile floor + shower walls)
- Must minimize # of trips cart ↔ room

prime air maintaining info  
cart goes almost to shower

Personal items (e.g. phone, water bottle)

handlebar

laundry basket (filled by housekeeper, emptied by housemaid)

interesting shape of handle, need to look further into ergonomics of handlebar shape.

Seems like this handle is just shaped to make room for dirty laundry

little space for dirty dishes

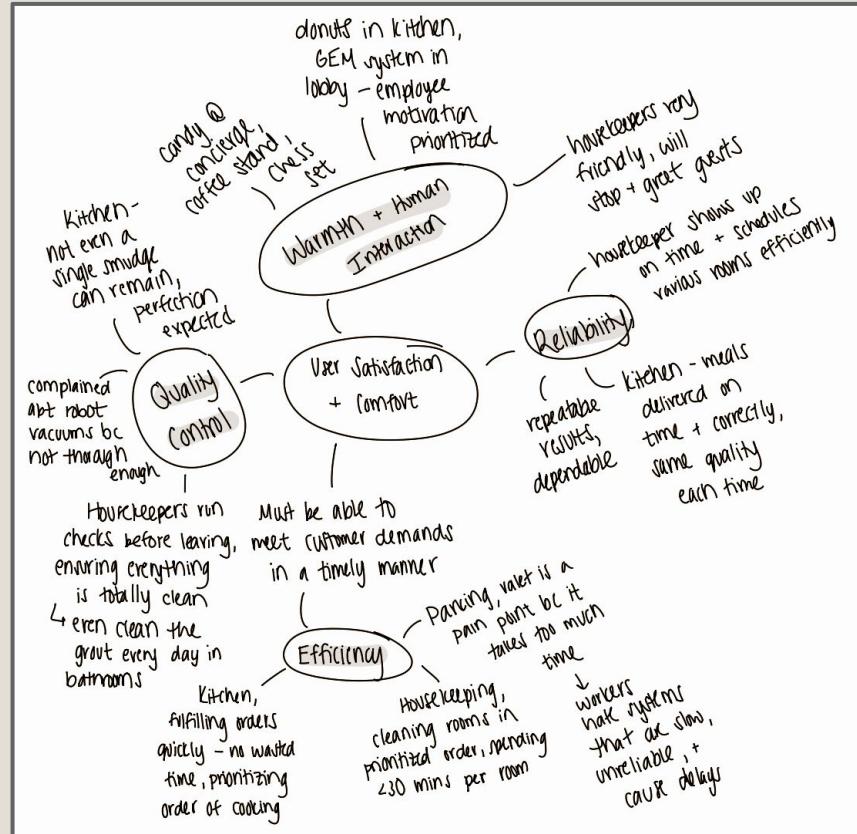
majority is just tons + tons of towels + sheets (to get them through the whole day)

Time limit per room: 30 mins

# Understanding The Hotel's Values

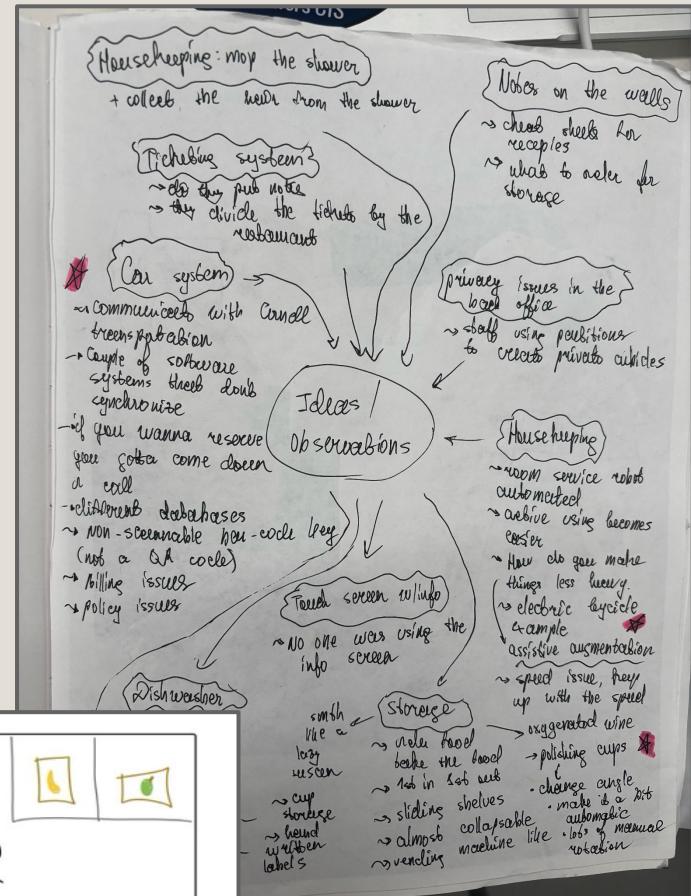
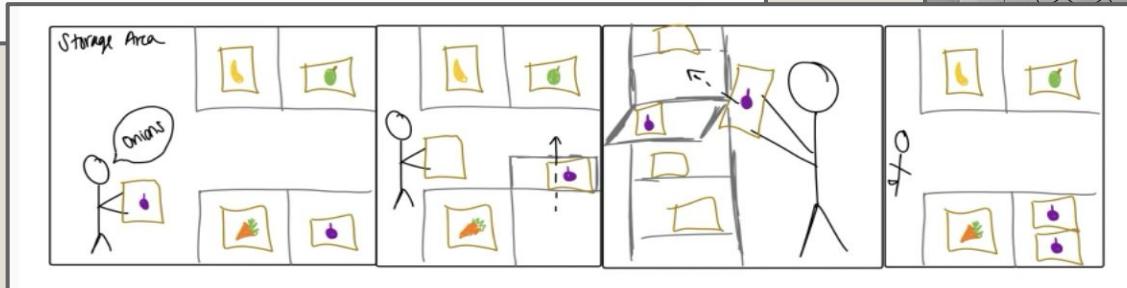
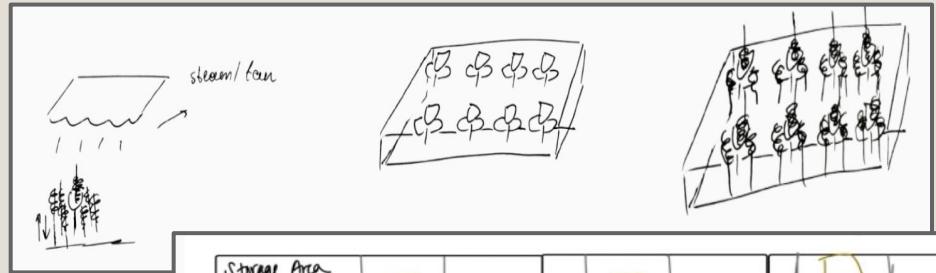
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- ❑ Efficiency
- ❑ Reliability
- ❑ Quality Control
- ❑ Warmth & Human Interaction



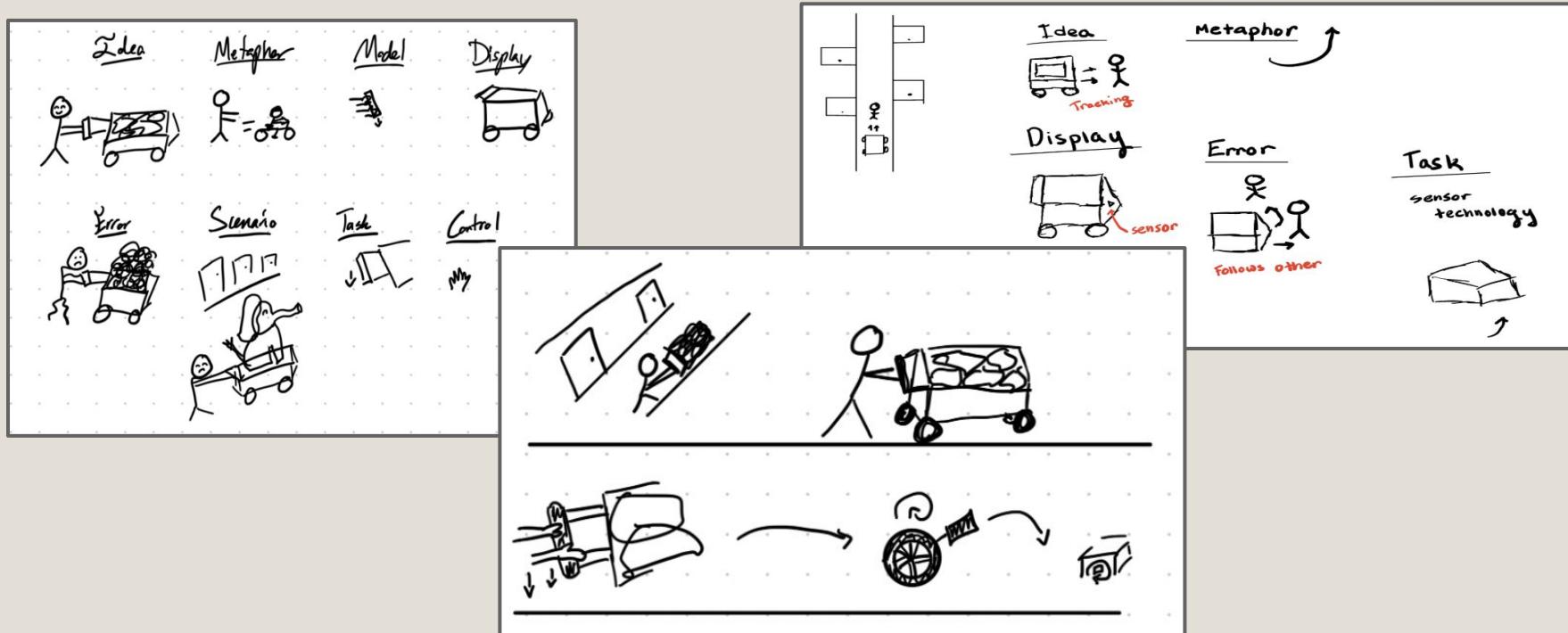
# Brainstorming Ideas

- Housekeeping
- Ticketing System
- Car System
- Folding Towels
- Food Storage
- Dishwasher & Polishing

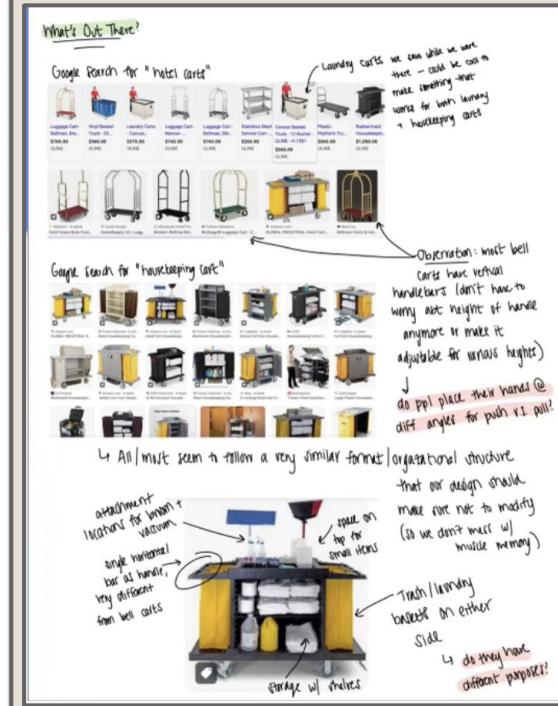
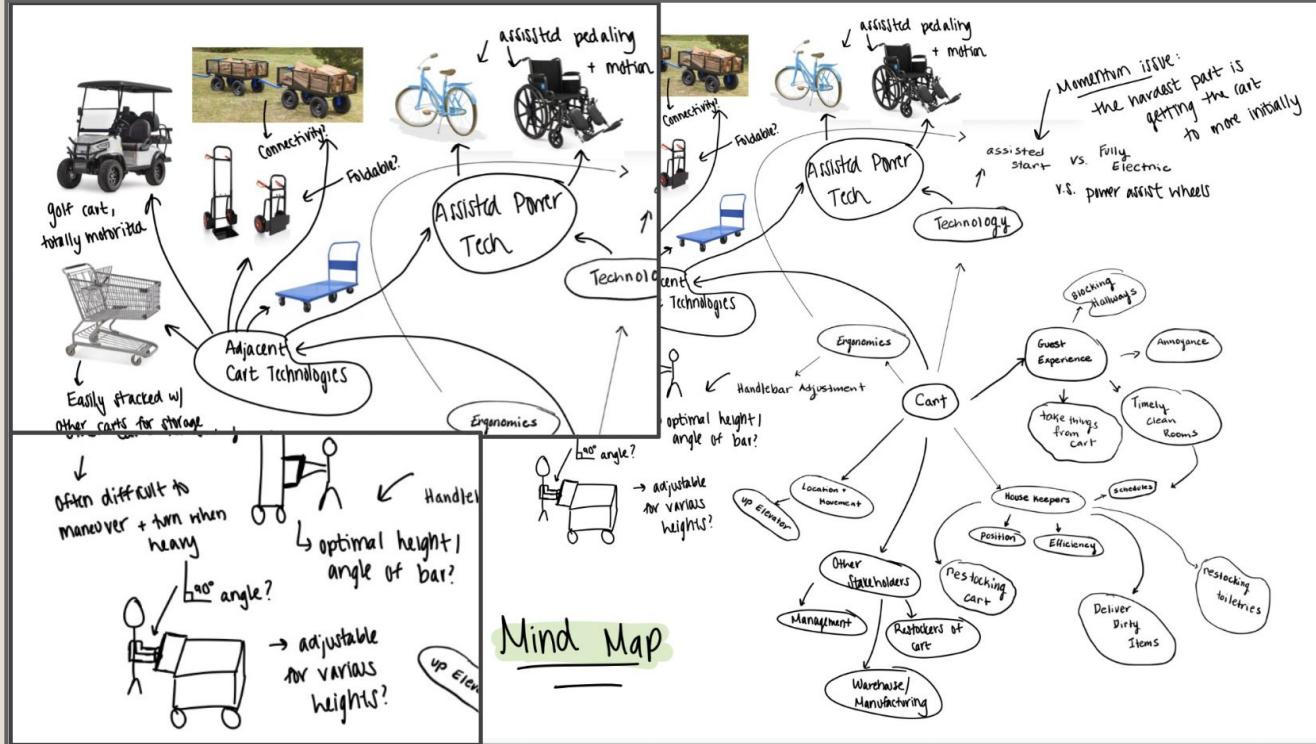


# Storyboards: A Visual Exploration

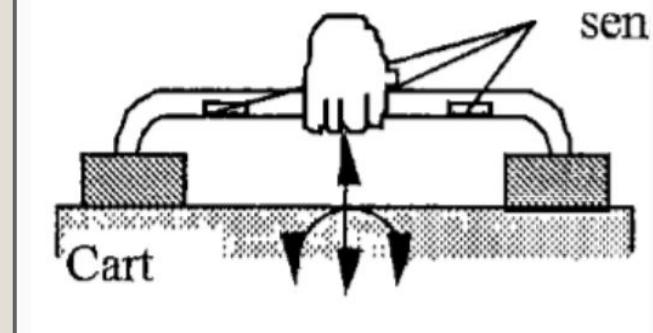
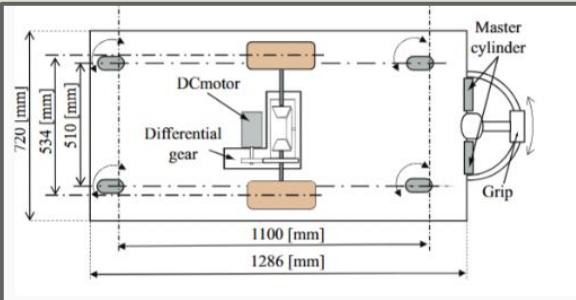
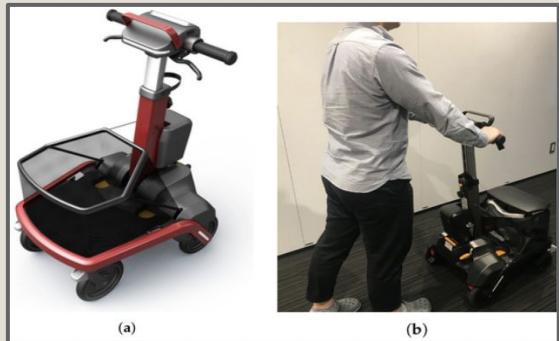
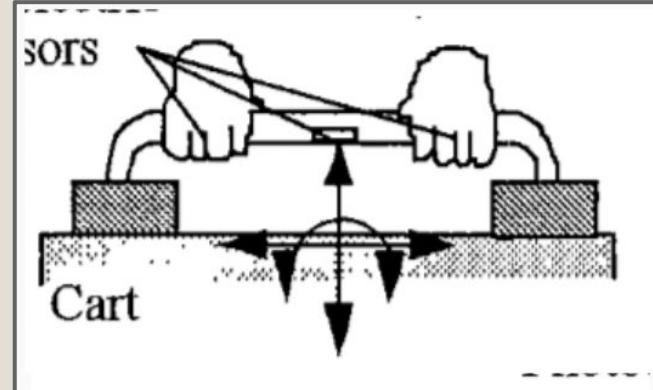
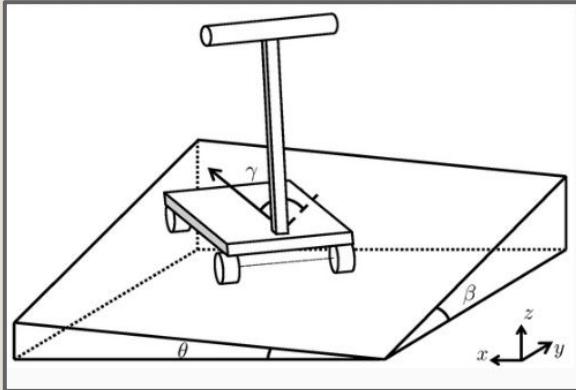
Problem Spot #3: Maneuvering a Heavy Housekeeping Cart



# Benchmarking: A Thorough Survey of Current Research & Markets



# Benchmarking: A Thorough Survey of Current Research & Markets



# Initial Prototyping - Makeshift Cart

Making  
makeshift carts  
and  
experimenting  
with different  
handle types to  
gain intuition

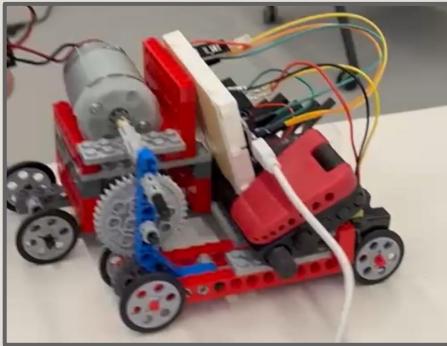


# Initial Prototyping - Shopping Trip



Gaining inspiration from existing carts and handles

# Initial Prototyping – Mini Cart and Shelf Cart

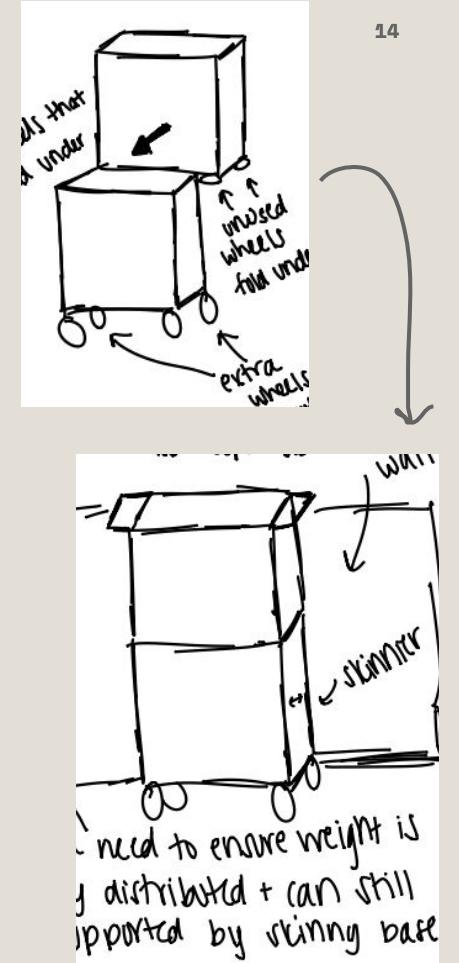


As we waited for main components to arrive, we made the most of our time by making mini prototypes to test different features

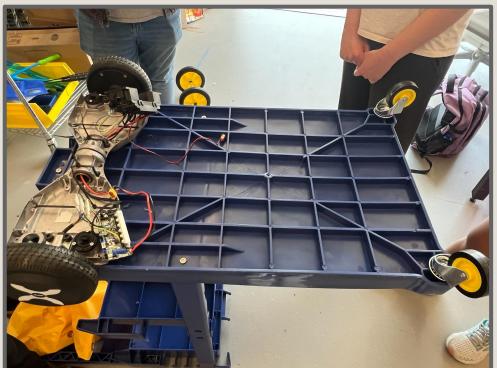


# Learning from Feedback

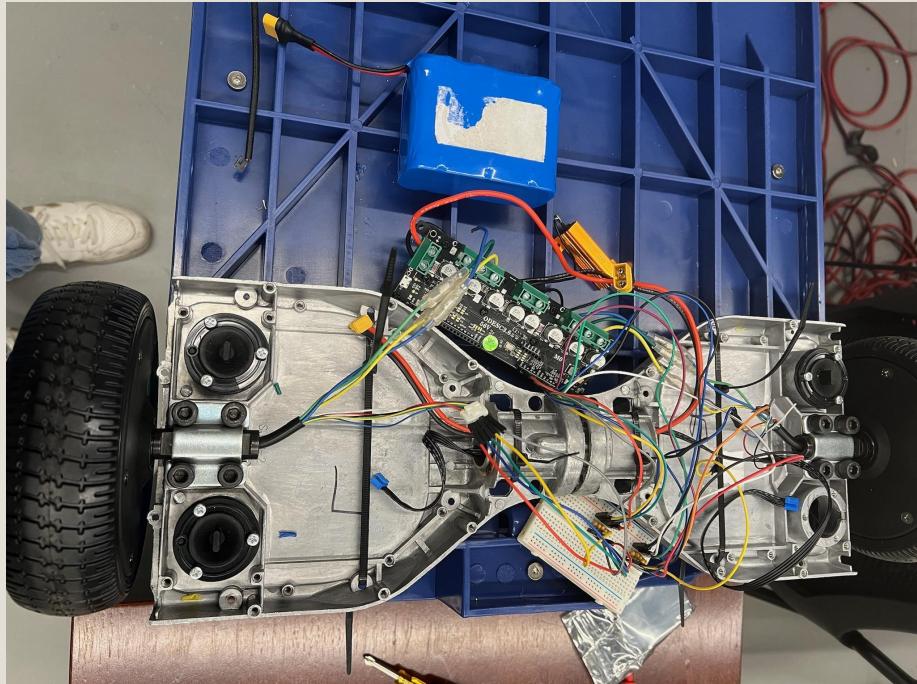
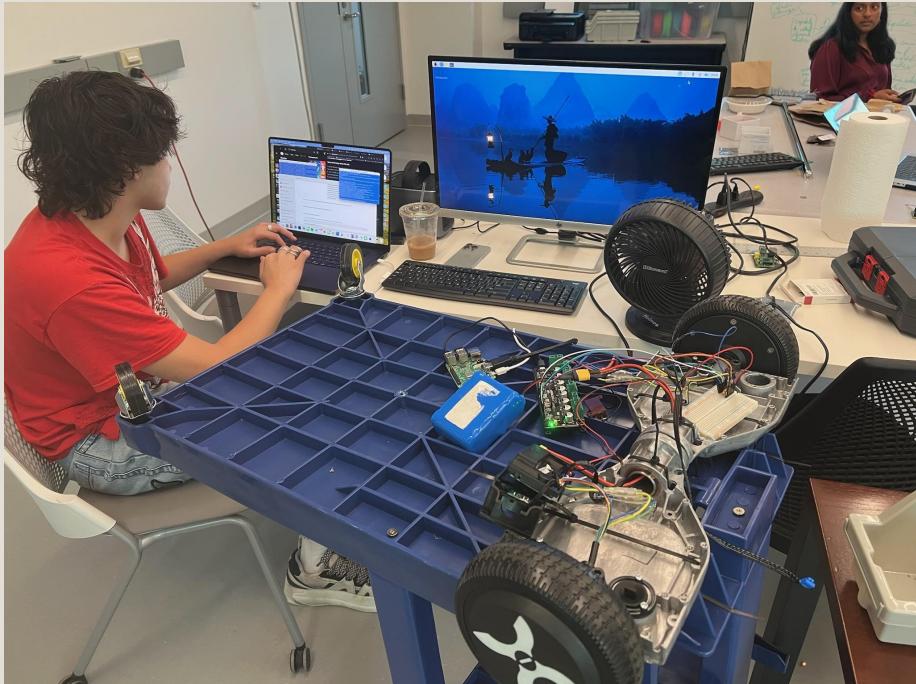
- ❑ RobustAI
  - ❑ Be careful with obstacle detection - can annoy the housekeepers but stakeholders tend to like the feature
- ❑ Getty's Group
  - ❑ Add some sort of collapsible design when the cart is auto-parking, so it takes up even less space in the hallway
  - ❑ Vending machine-style interface for guests looking for items
- ❑ Hospitality Union
  - ❑ Make sure the attachment is not too heavy, since a broken robotic hospitality cart is often worse than a regular one
- ❑ Frank Bu
  - ❑ Concentrate on a smaller design space (e.g. handing over control of the cart to the robot)



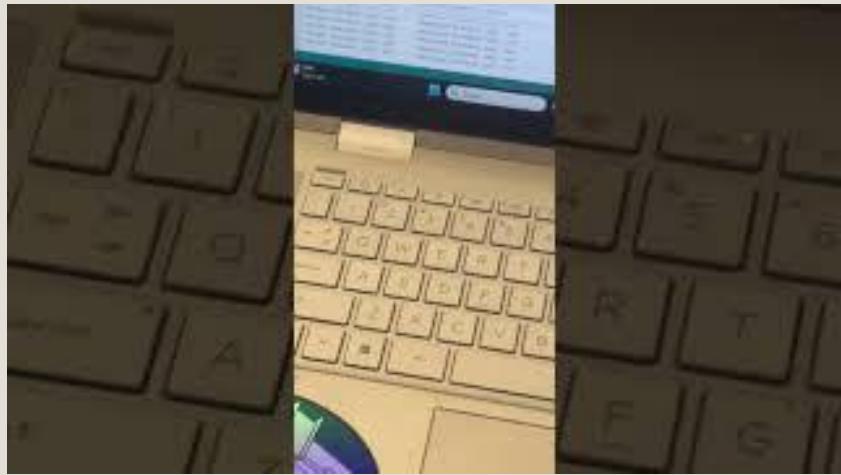
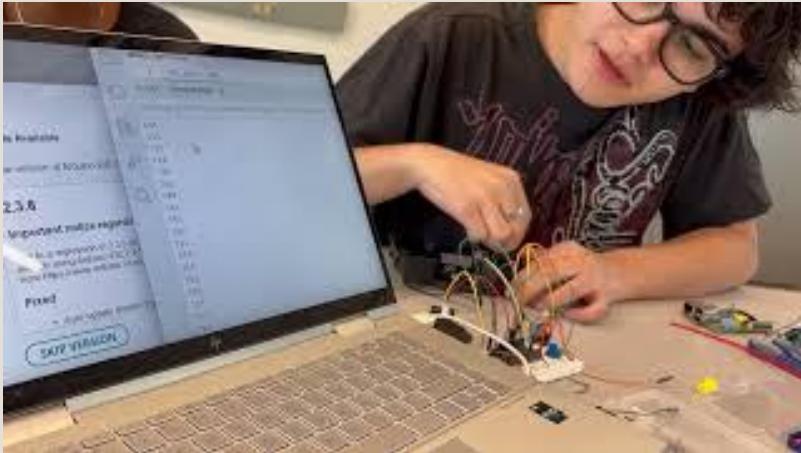
# Retrofitting Cart with a Hoverboard



# First Moving Prototype



# Additional Features



# Reflections

- ❑ Designing for a Workplace
  - ❑ Understanding the company's values & building them into the design
  - ❑ Interviewing workers & learning how to extract information from them  
(don't rely just on what they say, but observe & record subtleties)
- ❑ Working w/ Mechanical & Electrical Components
  - ❑ Planning ahead to avoid bottlenecks in the development process
  - ❑ Troubleshooting circuitry w/ multimeters & online forums
- ❑ Making Design Decisions
  - ❑ Testing as early on as possible to get feedback from the start
  - ❑ Zooming in to focus on minute details, such as the feel of the handle
  - ❑ Zooming out to look at the bigger picture of the product's place in the market & in the target consumer space

# NEXT STEPS

01

WIZARD OF OZ TESTING

03

REFINING PROTOTYPE & DESIGN

02

ADDING PRESSURE SENSORS

04

TESTING & REVISING

# Questions?

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