

# RETRACTABLE MOBILITY SYSTEM - HANGING CHAIR

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Capstone Sponsor: Adaptable House Project

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\*image provided by Mary Meyer

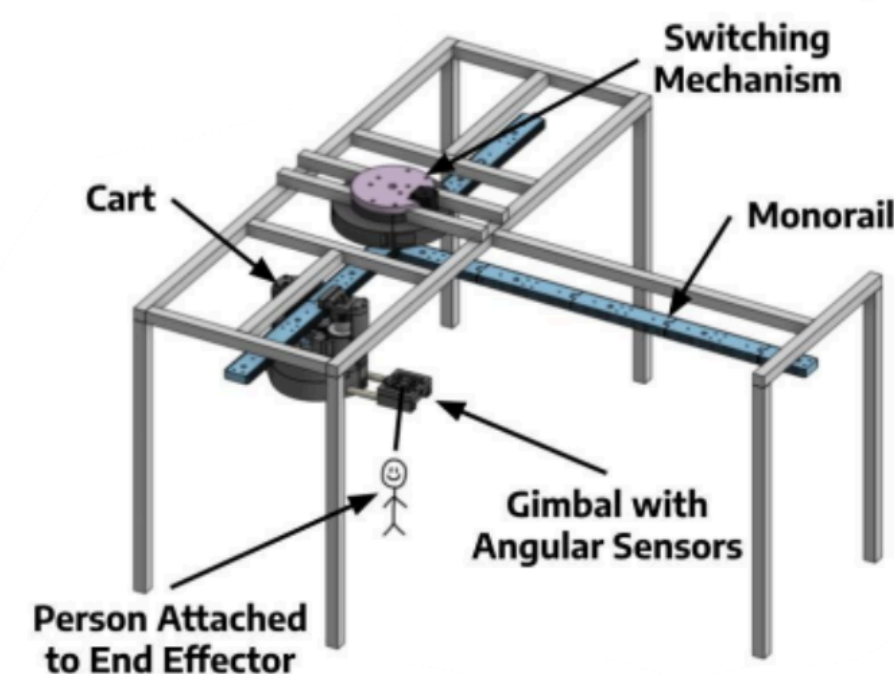
## BACKGROUND

The Adaptable House project is intended to be a research-driven living space designed to adjust to the fluctuating physical needs of its residents. Current home mobility aids are bulky and fixed, often obstructing living spaces.

## PROBLEM STATEMENT

We are designing a retractable hanging chair that provides robust weight-bearing support for recovery but stows seamlessly into the ceiling when not in use.

## GOAL: CLINICAL TO RESIDENTIAL



## DESIGN REQUIREMENTS

- Safe Weight Bearing
- 360° Freedom
- Minimal Sway
- Manual Retraction
- Easy Entry/Exit

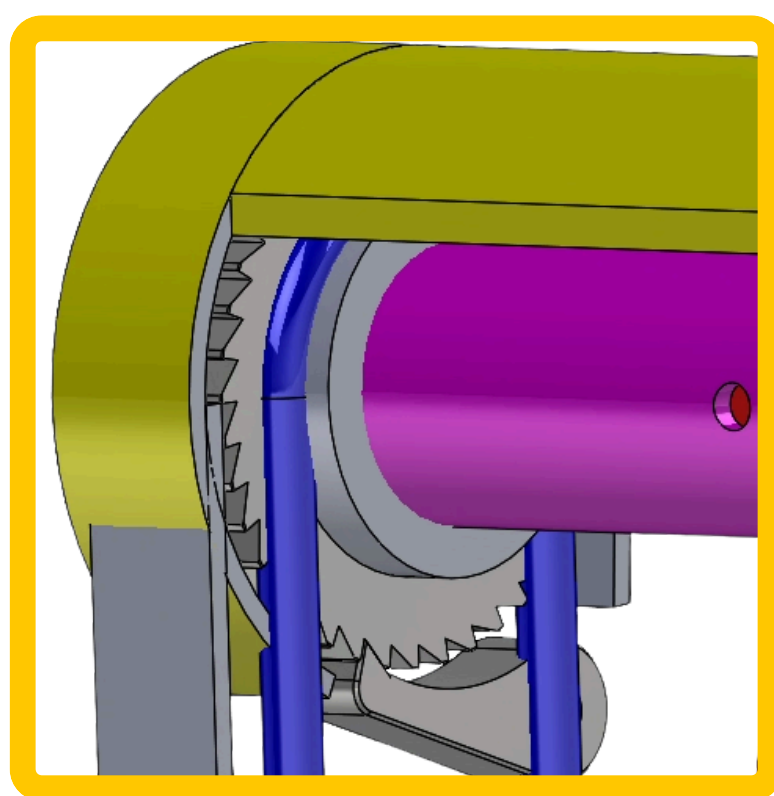
## DESIGN PROCESS

User Research

MECHANICAL  
PROTOTYPING

PROTOTYPE  
OPTIMIZATION

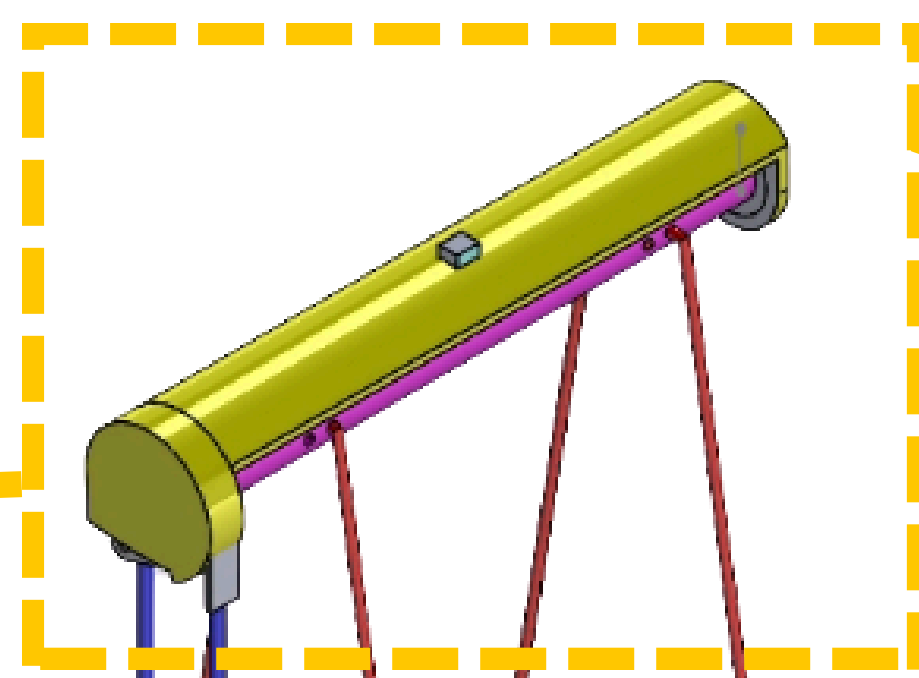
MODEL  
VALIDATION



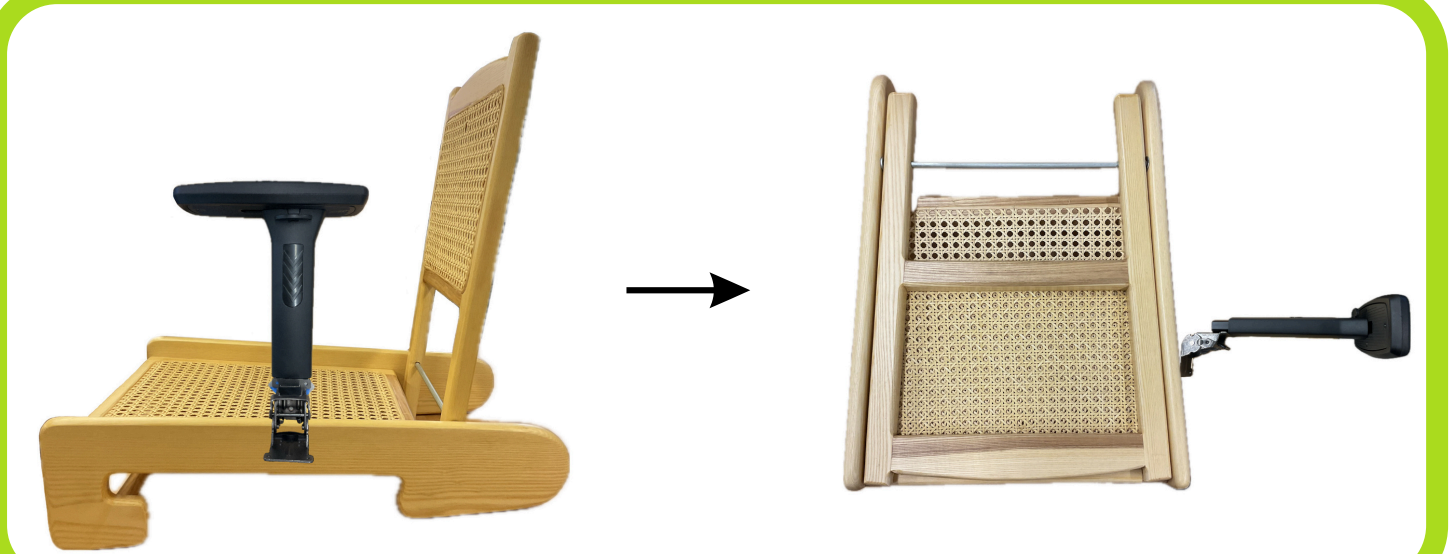
GEAR AND PAWL



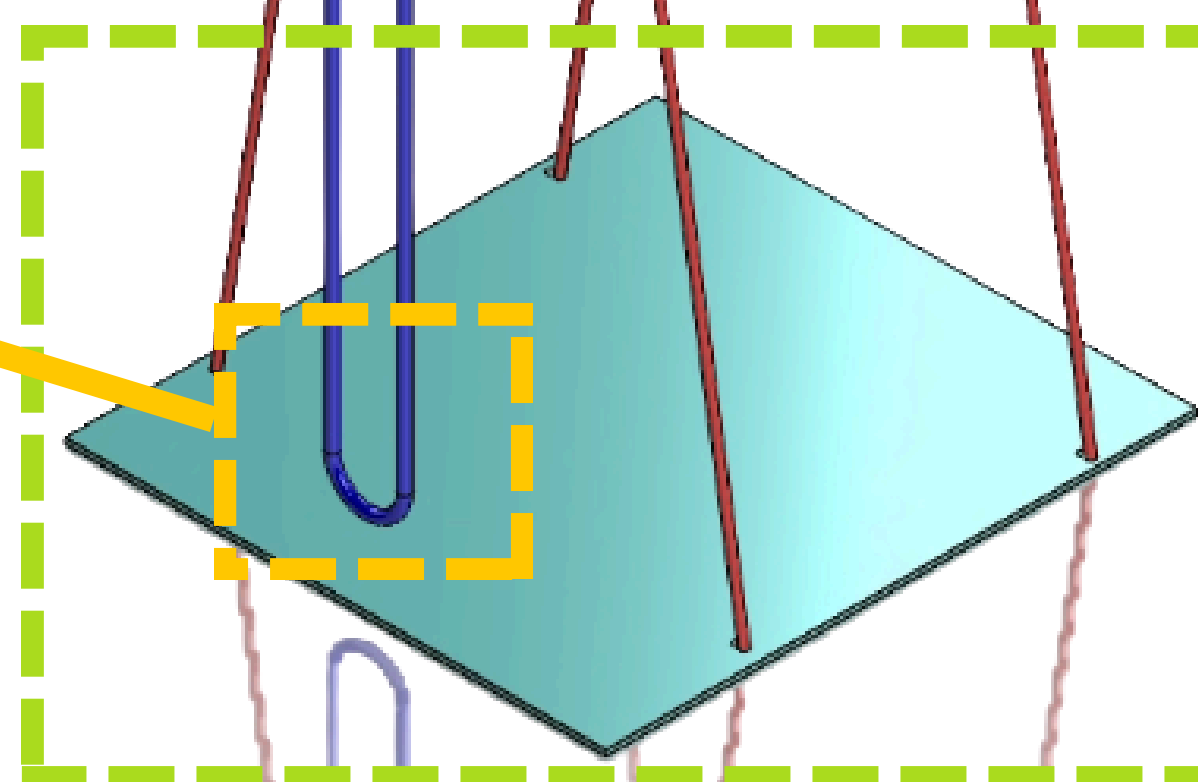
ACTUATION MECHANISM



CENTRAL PULLEY ALIGNMENT



COLLAPSIBLE CHAIR



## RESULTS/VALIDATION

Mechanism Logic	Half-scale model successfully held load; zero back-driving under weight.
Stability Testing	Central pulley configuration able to reduce lateral sway
Intuitive Operation:	Manual ball chain interface mirrors window blind logic
Ease of Use	Full stowage achieved in under 30 seconds

## CONCLUSION & FUTURE WORK

**Our Design:** The design demonstrates that a manual, retractable system can provide robust mobility support without the clinical footprint or power requirements of traditional lifts.

### Learnings:

- **System Integration:** Integrating a chair support into existing infrastructure is difficult without intersecting with existing mobility modes
- **Sway:** Loads limited to one suspension point lack the rigidity needed that floor lifts provide
- **UX:** Current manual interface is hard to use with those that have difficulty using their hands
- **Retraction Geometry:** Maintaining structural integrity while folding components into overhead space is difficult, requiring trade offs with stability

### Future Work:

- Explore alternative routes for retractability.

## ACKNOWLEDGEMENTS

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