# Exercise Technology for Disabled People

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# Presentation Overview

- Introduction
- IPRO Progression
- Problem and Objectives
- Approach
  - Behavioral
  - Engineering
- Final Design
- Future Considerations
- Conclusions

# Introduction

- Handcycle use
- Varying designs
- Tandem idea

- IPRO Team Members

# IPRO Progression

- Began in Spring 2000
- Original goal - investigate the technical and market feasibility of concept
- Fall 2000 built rough prototype of tandem handcycle

# Problem and Objectives

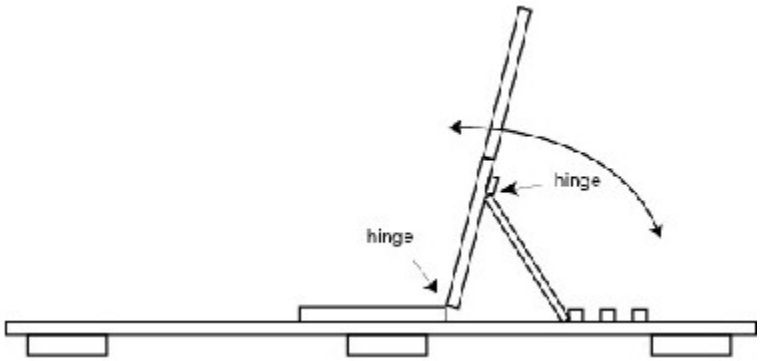
- Original semester goal – build a tandem handcycle from scratch

**Revised Goal**

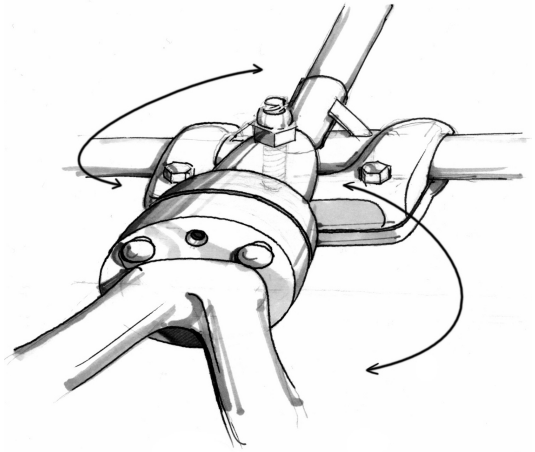
- Design and create a hitch and an attachment for a purchased handcycle
  - Design focus on comfort and safety for users
  - Allows for easy transportation and storage
  - Take into account future considerations

# Approach

- Behavioral




- Engineering



# Behavioral Approach

- Attended adaptive sporting event
- Interviewed
  - distributors
  - users of handcycles
- Tested different handcycles
  - Gain understanding of structural design and general mechanics
- Ergonomic research
- Built and tested behavioral prototype
  - Seven individuals tested
  - All able-bodied
  - Reinforced importance of safety

# Engineering Approach

Brainstorming of Ideas

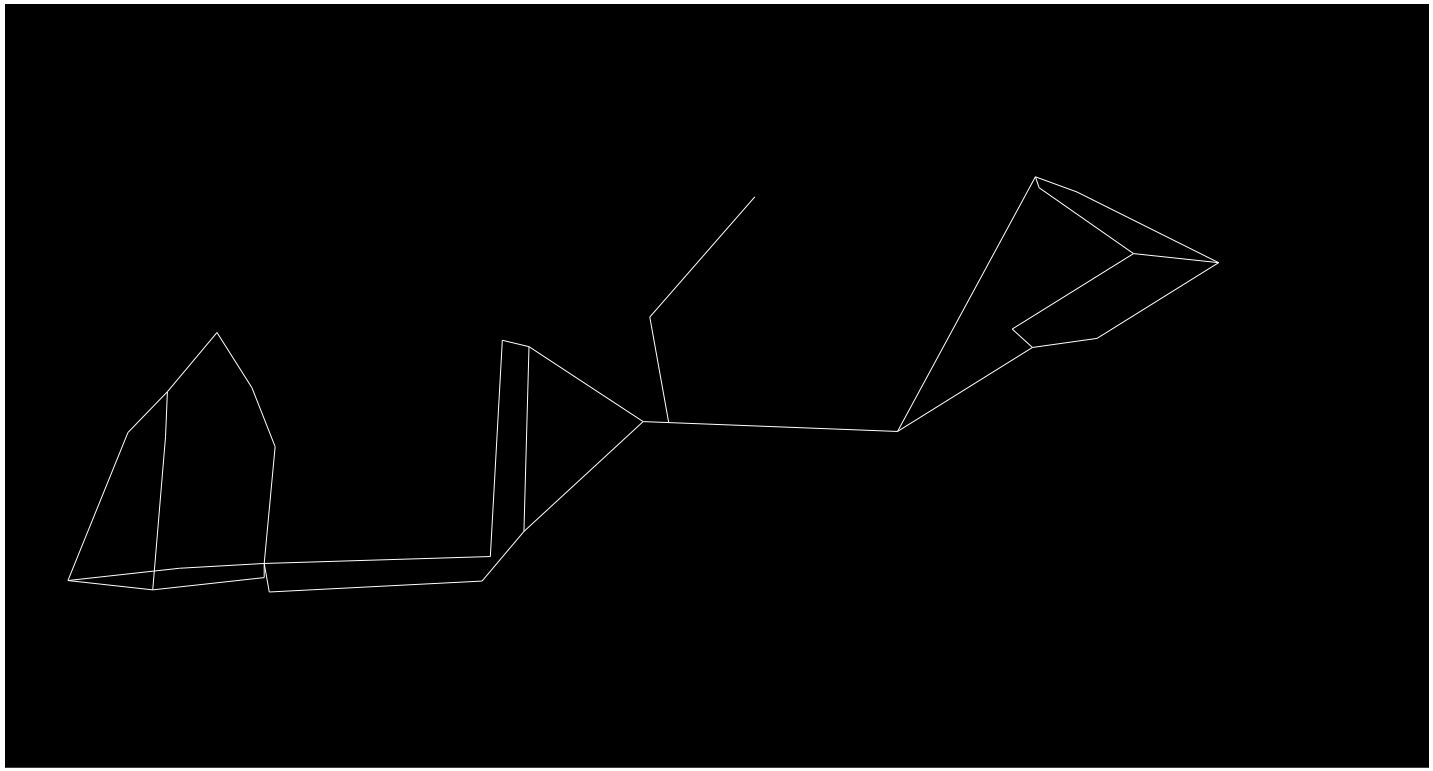
- Improve existing prototype or start from scratch
- Hitching Assembly
  - Produce roll and yaw motion
  - Modular design
- Back tire placement
- Hand pedal placement
- Single or Double chain drive

## Process of Narrowing Ideas

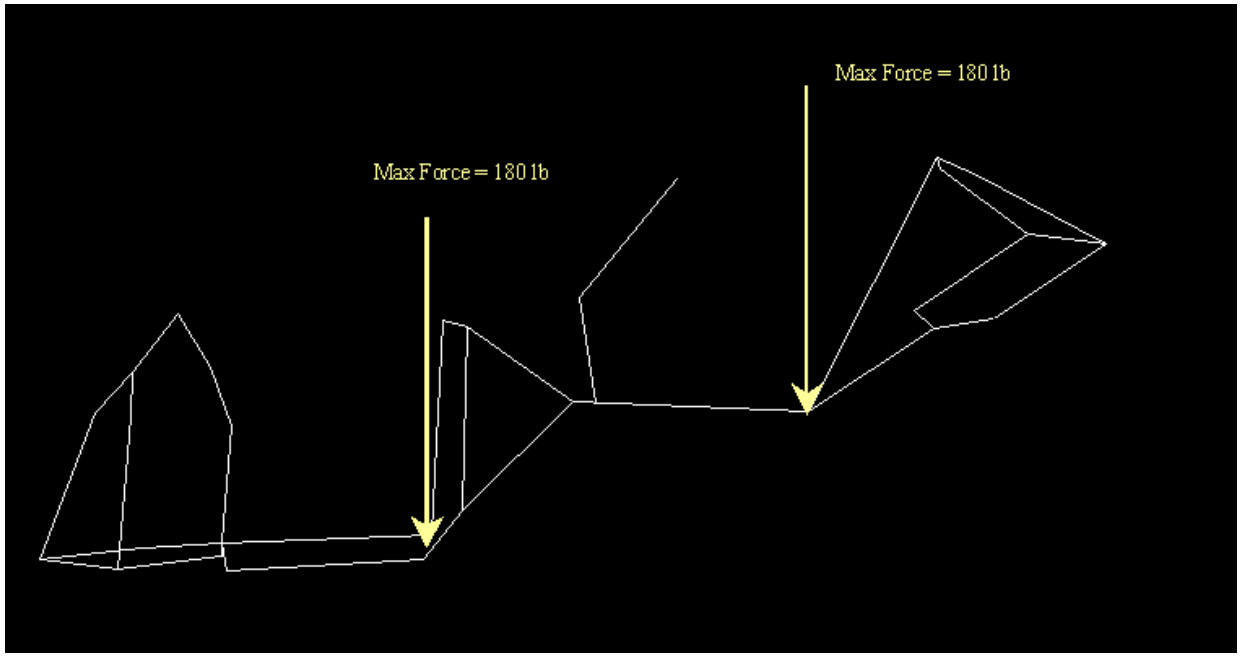
- Results from Behavioral Prototyping
  - Seat incline of 45°
  - Seat Tilt from side to side
- Center of Gravity
- Similar geometries as front of frame
  - Tire distances, seat-to-pedal distances
- Hitching Assembly
- TIME!!!

# Computer Modeling

- Generated a frame design in Autocad as a stick drawing



- Imputed design into stress analysis programs.
- Incremental Loads were increased at two locations on the frame up to 180 lbs.

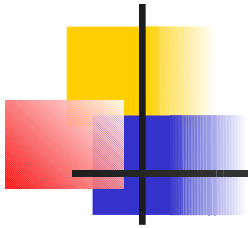


# Final Design I

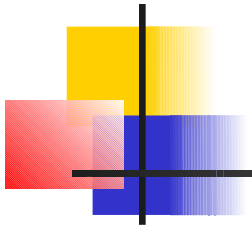
- CONSIDERATIONS
  - Number of rear wheels
  - Placement of rear wheel
  - Overall length
  - Materials
  - Ergonomics

# Final Design II

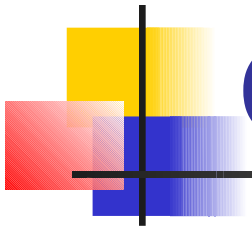
- Testing
  - Took all variables into account
  - Strength testing
- Attachment Method
  - Hinge allows sway
  - Seat allows rocking
  - Comfort and appearance



# Future Considerations



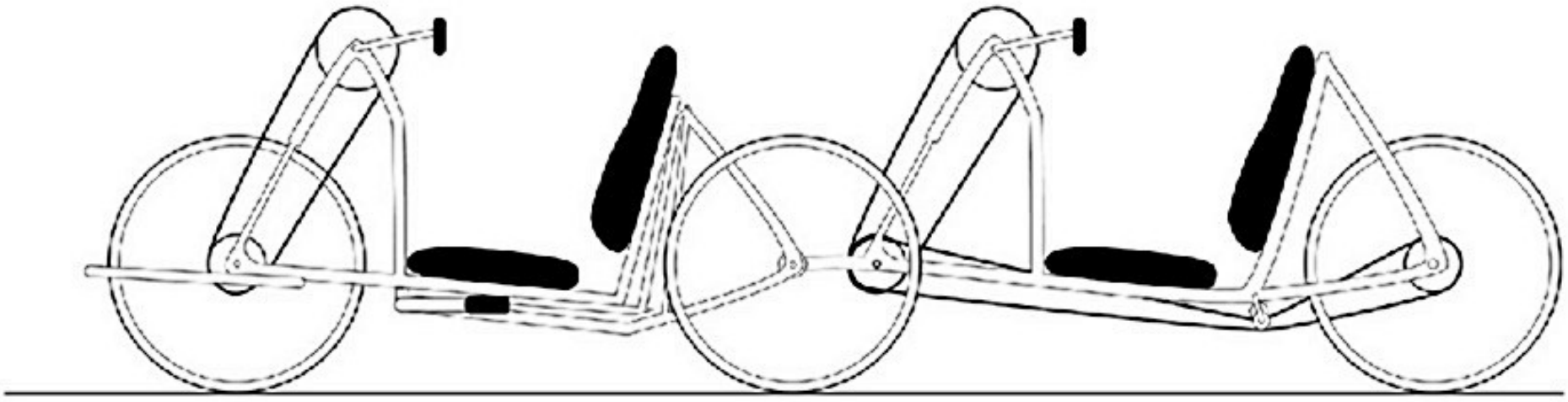
- Summer 2001
  - Build Prototype
- Fall 2001
  - Testing
    - Consumer
    - Dynamic Loading
  - Modify initial design



# Conclusions

# Acknowledgements


- Linda Mastandrea
- Stephanie Kanter
- Dean Rzewnicki
- Creative Mobility and Staff
- IPRO Office

Questions and/or Comments??

Thank You!