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Mission Statement

To give people an adaptable, safe and comfortable walking device compatible with various terrains

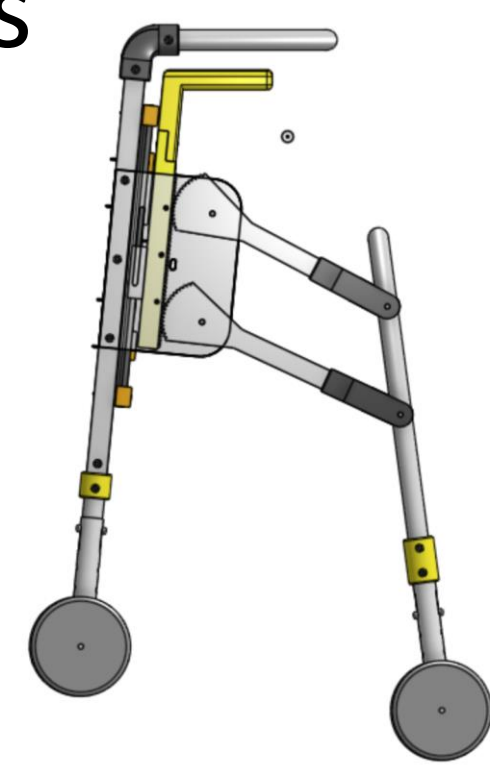
Problem

- 12.4 million people in US and EU use walkers
- **Current walkers lack** mobility aids:
 1. *Can't climb stairs/public transportation*
 2. *No suspension system*
 3. *Not environmentally adjustable*



Applications

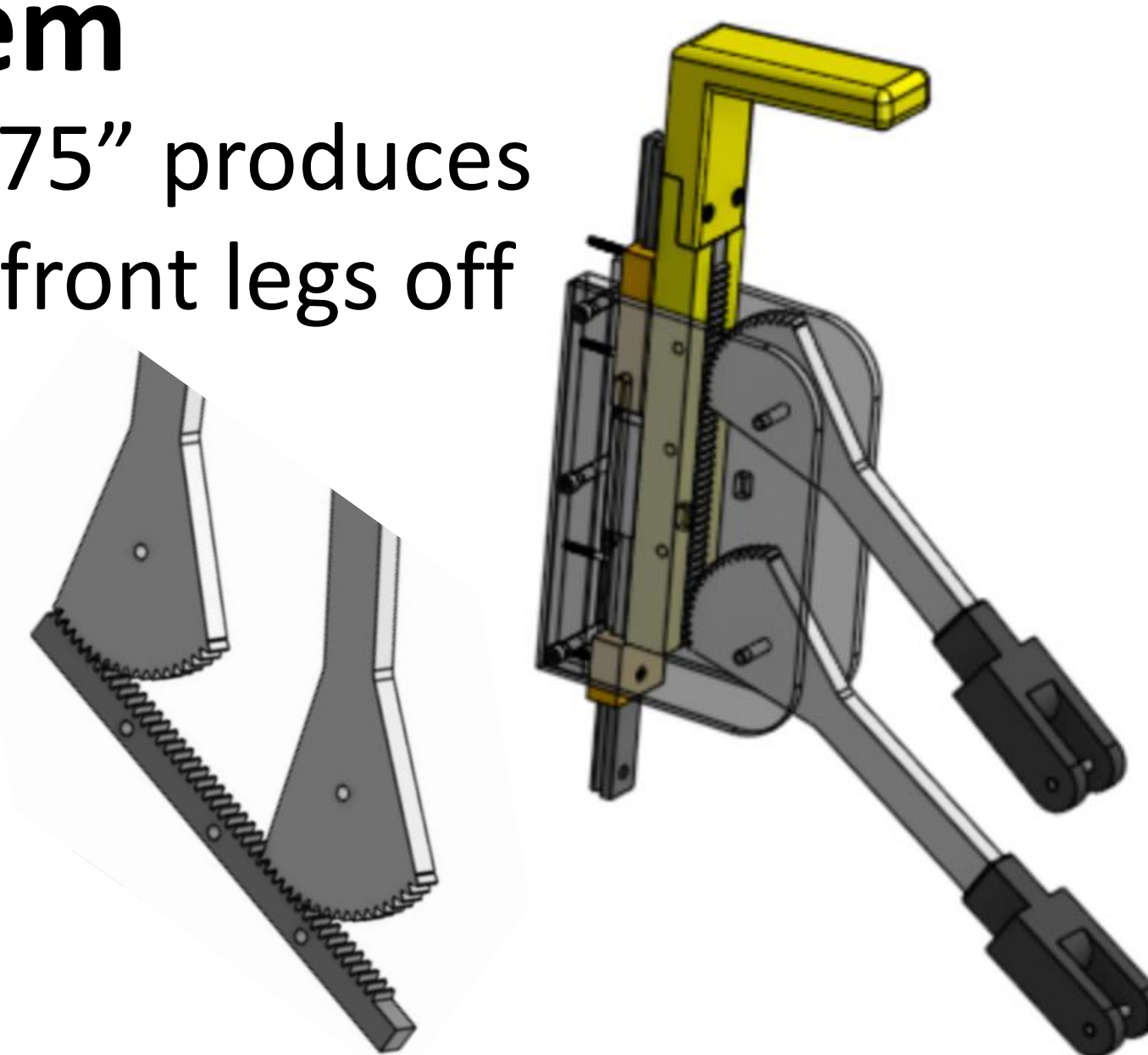
- Interchangeable between wheels and leg pegs
- Allow users to go up and down stairs
- Consists of a suspension system
- Fully mechanical
- Easy to operate
- High mechanical advantage mechanism



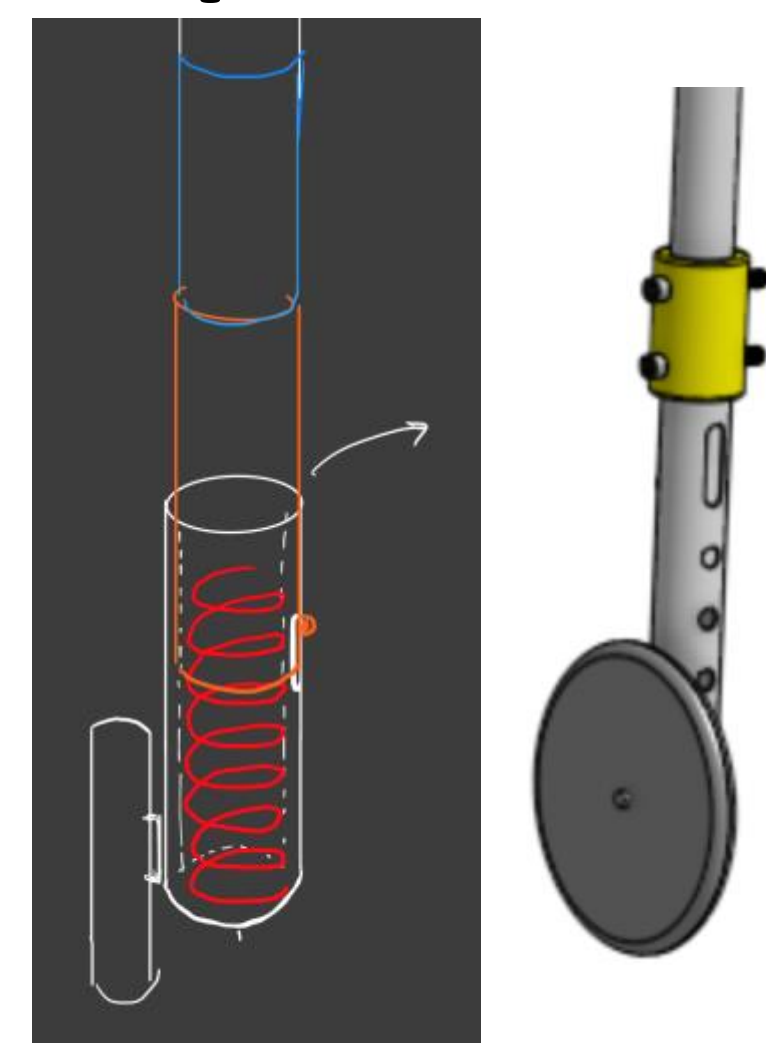
Innovations & Subsystems

Rack and Pinion System

- Handle stroke length of 2.875" produces $\pm 6.5"$ of movement of the front legs off the neutral position
- 60 gear teeth around a 4" pitch diameter pinion
- **MA = 4.52**



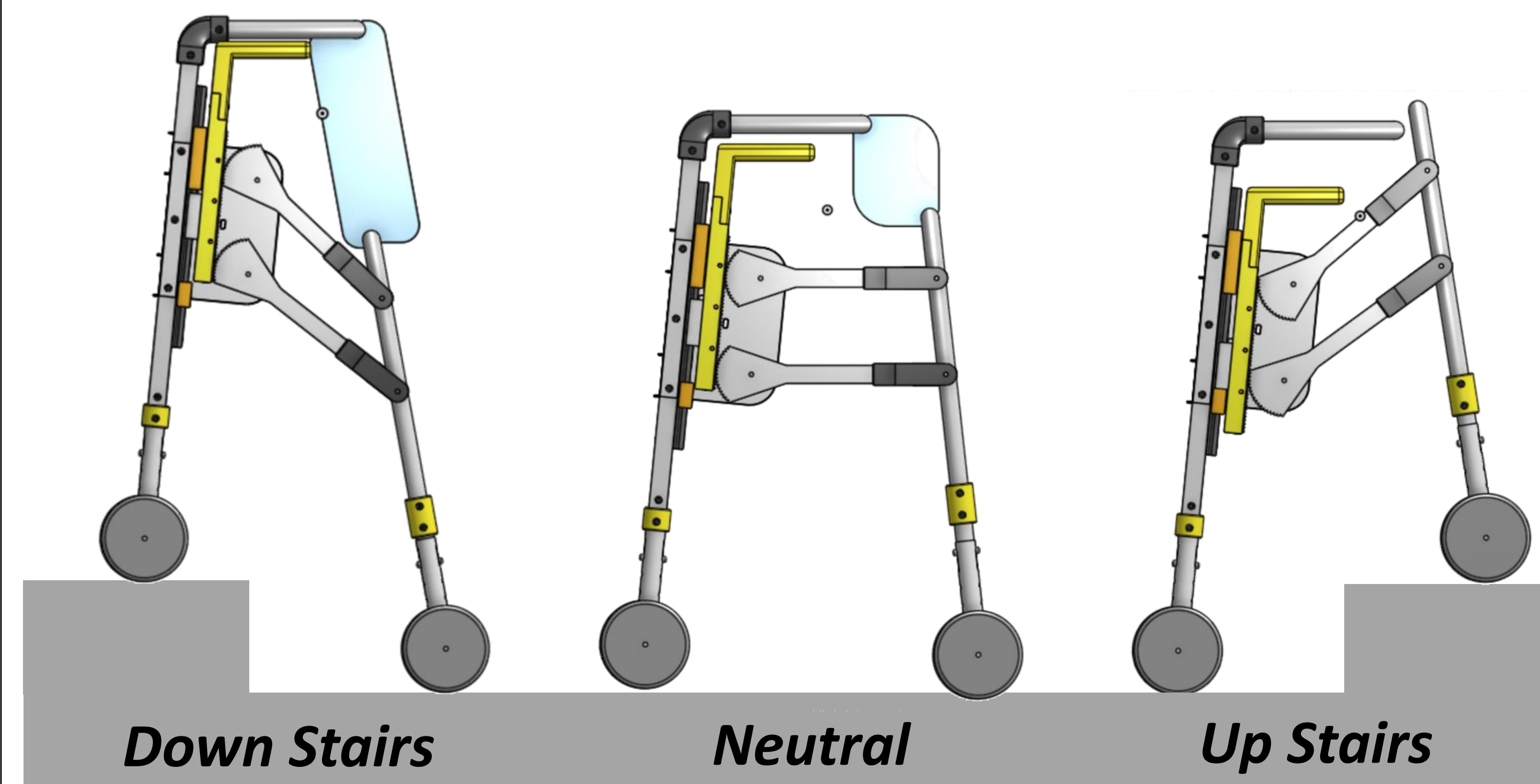
Suspension



- 1" diameter x 4" length springs in all four legs
- 1" slot to allow unidirectional motion
- Wheel and peg leg extensions are compatible with the suspension

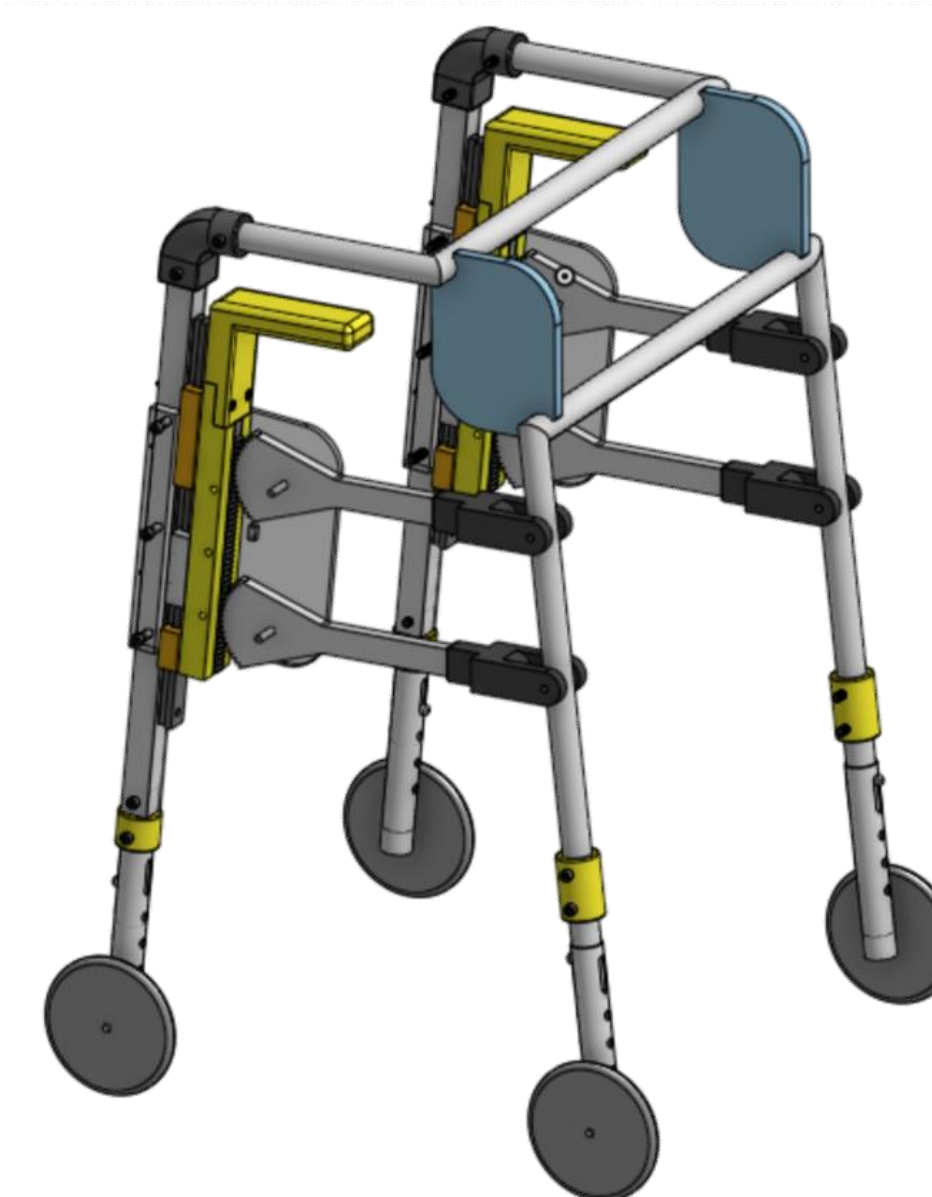
Design & Prototype

Design



Specifications

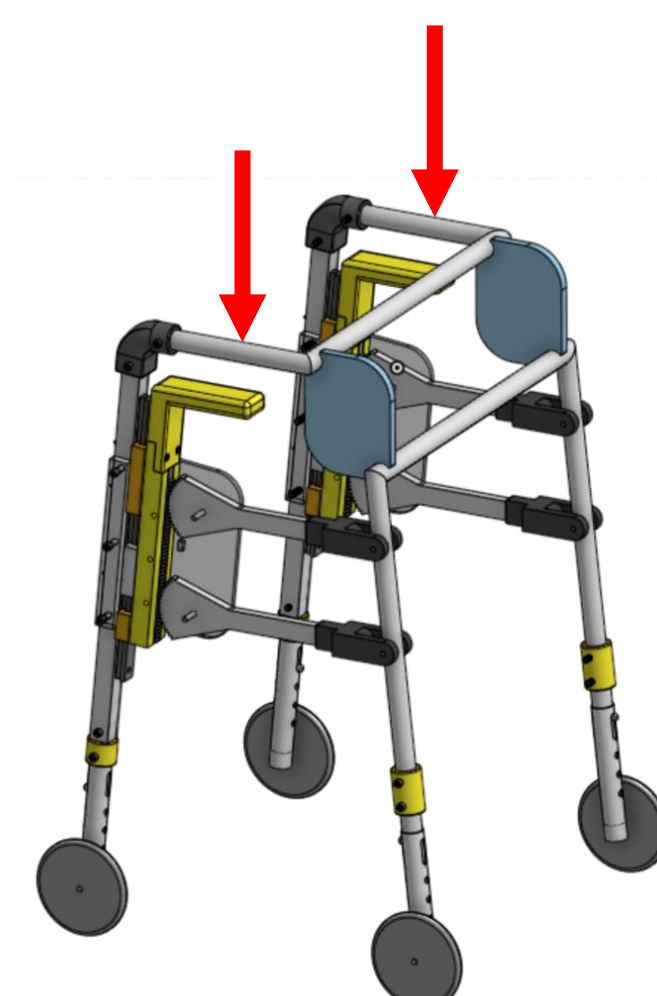
- Width of stair: 11.25"-12.5"
- Height of stair: 5.375"-7.75"
- Support 300 lbs
- Walker weight: 16 lbs
- Height of walker: 34.5"
- Width of walker: 19"
- Change in walker width up/down stairs: 2.5"



Manufacturing Technologies Used

1. **Carbon 3D Printing:** critical coupling parts
2. **ABS 3D Printing:** non-weight bearing coupling parts
3. **Waterjet:** rack and pinion
4. **Laser cutter:** side plates on back legs
5. **Welding:** top bar and front legs
6. **CNC Mills:** Wheel and suspensions
7. **Traditional Manufacturing:** other parts

Test Procedure



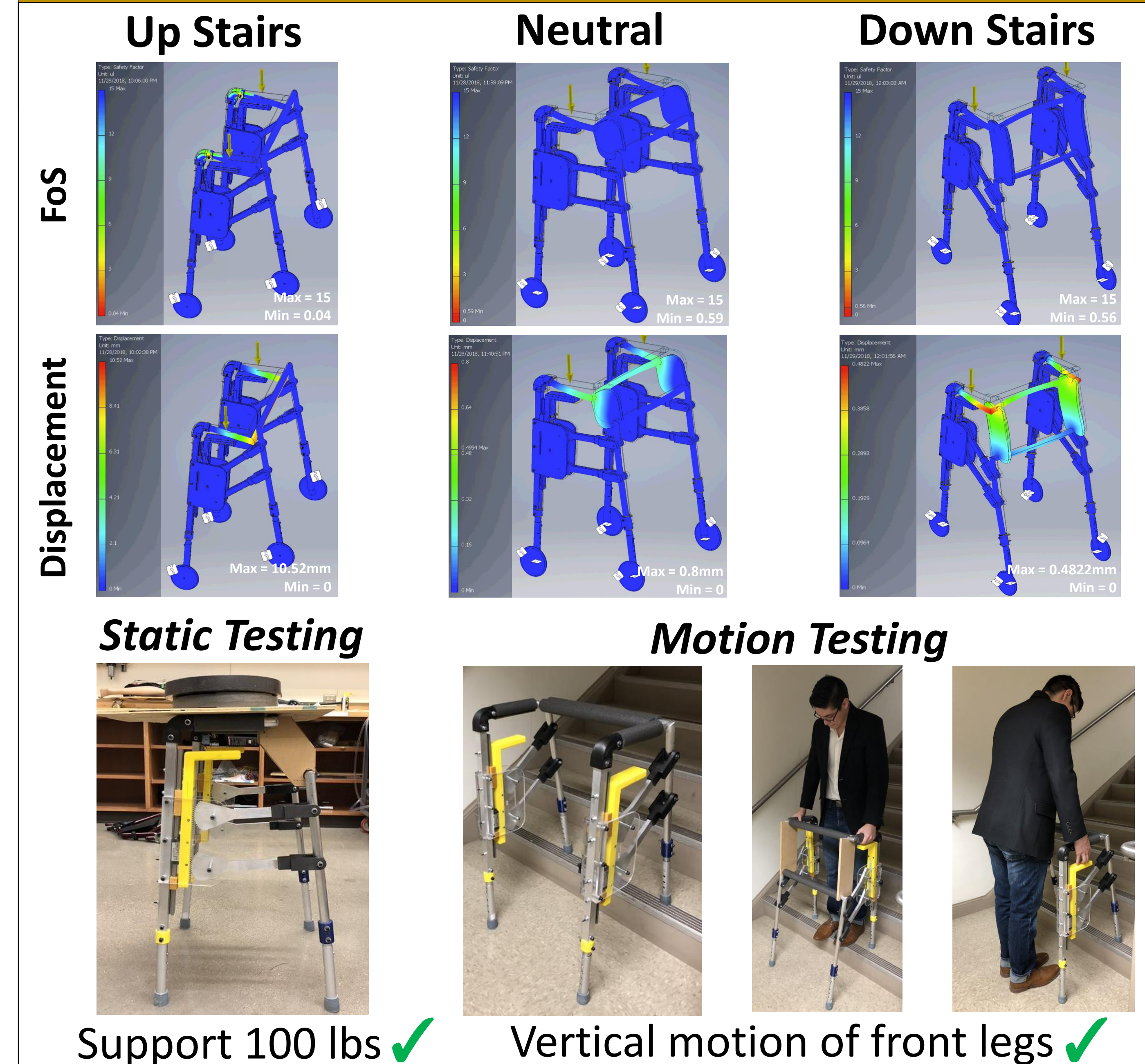
Static Testing

- Applied loading force of **100 lbs** to frame

Motion Testing

- Verified range of handle stroke
- Verified linear mobility

FEA & Test Results



Financial Analysis

Market

- 12.4 million seniors 65+ in US and EU are walker users
- 5% of market share -> **620,000 people over 14 years**
- **44,000 units of production per year**

Prototype Cost	Predicted Product Cost	Selling Price	Profit Margin
\$331	\$131.90	\$250	\$5.2m/year

Future Improvements

- Implement braking system
- More effective and user-friendly locking system
- Simplify user interface
- Collapsibility/Height adjustability
- Reduction of building components