Mechanical Engineering
Carnegie Mellon University

The Pos-Chair

Senior Capstone Design Project
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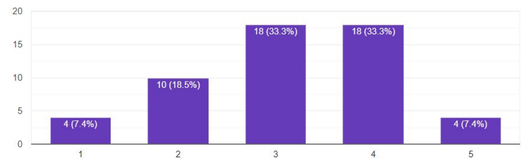
Design Opportunity

- Poor posture is a common problem
- Current posture aids fail to holistically address posture correction
- Need a product to assess and provide feedback to correct seated posture

Market Research

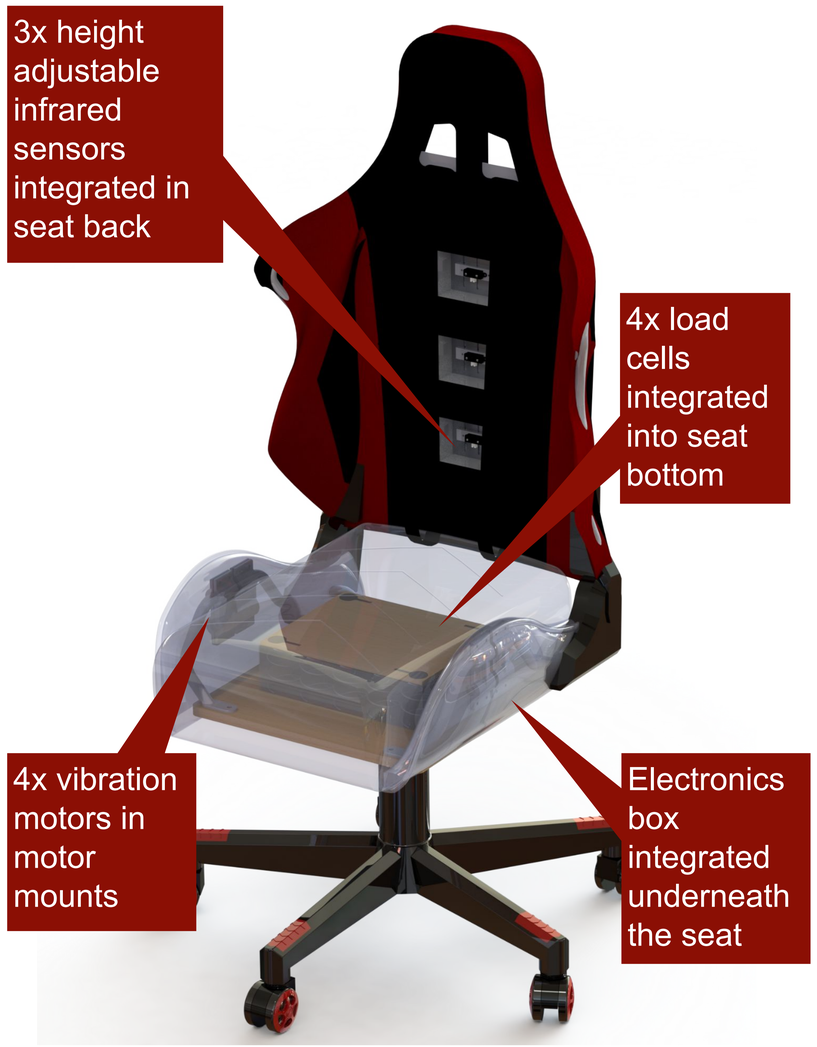
- Targeted Stakeholders: Students, office workers, medical professionals



Interest Level of Intended User Group

Design Requirements

- Accurate sensing with ≤ 20% error
- ≥ 8/10 user ratings on clear feedback, increased posture, and ease of setup
- Capacity from 5% female to 95% male height and weight

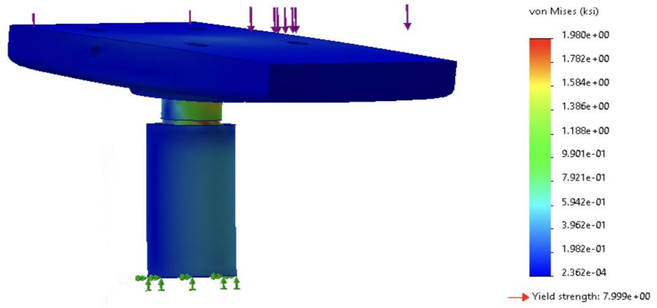


Stress Analysis

Goal: Determine maximum load capacity of the chair for different material selections
Variable: Material
Constraints:

- Existing chair geometry
- Loads (250 lbf) and supports

Result: FOS 3 with 4130 Steel

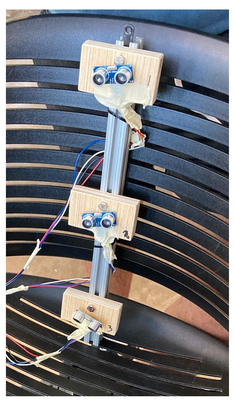


Battery Life Analysis

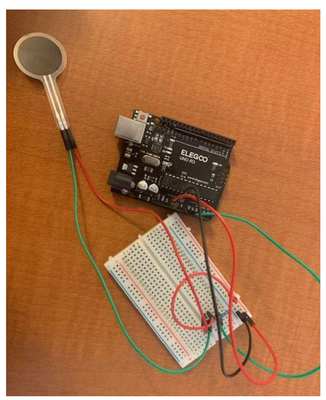
Net Power Consumption: 0.552 Watts
Total Battery Energy: 144 Whr
Assumption: 8 hr/day on time
1 Charge Battery Lifetime: 32 work days

Prototype 1

- Ultrasonic sensors on a rail
- FSR sensor testing
- Basic back posture visualization



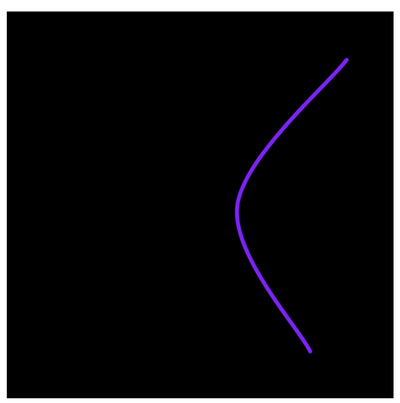
Ultrasonic Sensors



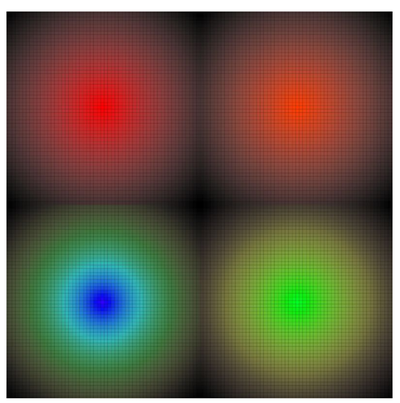
FSR Sensors

Prototype 2

- IR sensor, load cell, and vibration systems functioning independently and on chair
- Visualization of back posture and seat map



Back Visualization



Seat Map

Final Prototype

- Systems integrated with visualization
- Posture benchmarks tuned
- User customizable features

IR Adjustability

Full Chair