Exoskeletons
Perspectives in Assistive Technology, Stanford 2019
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Principal Controls Engineer
Who am I?

BS
Mechanical Engineering

MS, PhD
Mechanical Engineering

Principal Controls Engineer
Who is Ekso Bionics?

- Ekso Bionics® develops technology to enhance human mobility, strength, and endurance.
  - Lower extremity exoskeletons for military & medical
  - Upper extremity Ekso Vest for industrial applications
  - ZeroG arm for industrial applications
Industrial applications
Medical Applications
Current Exos

- EksoGT, Ekso Bionics
- ReWalk 6.0, ReWalk Robotics
- Indego, Parker Hannifin
- Rex, Rex Bionics

FDA approved
Diagnoses

• Spinal Cord Injury
• Stroke

• Multiple Sclerosis
• Traumatic Brain Injury
• Parkinsons
• Etc.
Benefits

• Gait Training
  • Repetitive stepping
  • Varied assistance
  • Balance training

• Long-Term Use?
  • Bone Density?
  • Bowel & Bladder Function?
  • Pain?
  • Circulation?
  • Emotions?
Designing an Exoskeleton
Brainstorm

• What would you consider when designing an exoskeleton for gait rehabilitation to be used in a rehab center?
• What features are important?
• How do you figure out if your design works?
Size Adjustment

• Exoskeletons must adjust to fit their user
• Fit is critical for maintaining comfort and safety
• Fast and accurate adjustments needed in clinical setting
Padding & Fit Kit

- Elimination of pressure points
- Ensure that the user stays aligned with the device
Donning & Doffing

User must be able to get in/out of the device safely and easily
Safety - Fail Safe

- Hard stops & soft stops
- Adjustable settings for SW Joint limits
- Normally-on brakes
Other Features
Thank you