Inducing Self-Selected Human Engagement in Robotic Locomotion Training

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- We describe a technique for shaping human gait using least-effort tendencies
- Adaptive assistance from a robotic orthosis alters the energy-cost landscape
- Subjects self-selected energetically optimal gait parameters
- Results show potential for improving active engagement in robotic therapy

Podium 4.1

- The role of pelvic rotations in human gait remains uncertain.
- During robotic design, decisions needed on which degrees of freedom (DoF) to permit and actuate, requiring an understanding of the role of each DoF.
- Role for pelvic obliquity in reducing lateral movement of the upper body proposed, hypothesis tested experimentally.
- Pelvic rotations reduced when walking in robotic orthosis.
- Trend for decreased lateral movement with increased pelvic obliquity.

Podium 4.2

Robotic-Locomotor Training as a Tool to Reduce Neuromuscular Abnormality in Spinal Cord Injury

The Application of System Identification and Advanced Longitudinal Modeling

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- Robotic-locomotor training (LOKOMAT) were given to incomplete spinal cord injury subjects.
- Neuromuscular properties of ankle were characterized with system identification technique.
- Growth Mixture and Random Coefficient Regression analyses were used to identify recovery patterns of neuromuscular abnormalities associated with spasticity.
- Results demonstrated that LOKOMAT can effectively reduce neuromuscular abnormalities, with greater improvements for subjects with higher baseline abnormalities.

Podium 4.3

Development of an Energy Harvesting Backpack and Performance Evaluation

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- Developed a new energy harvesting backpack that integrates motion from both lower limbs into a single mechanical driven train.
- Evaluated the performance and metabolic consequences of this energy harvesting device.
- 5 healthy young adult subjects participated in seven treadmill walking activities conducted at 1.2m/s.
- Metabolic costs were measured in four walking activities: (1). Normal walking. (2). Weight-only. (3). Mechanical engagement. (4). Electrical engagement.
- Device generates 15W electricity during walking.

Energy Harvesting Backpack

Podium 4.4

Experimental Effective Shape Control of a Powered Transfemoral Prosthesis

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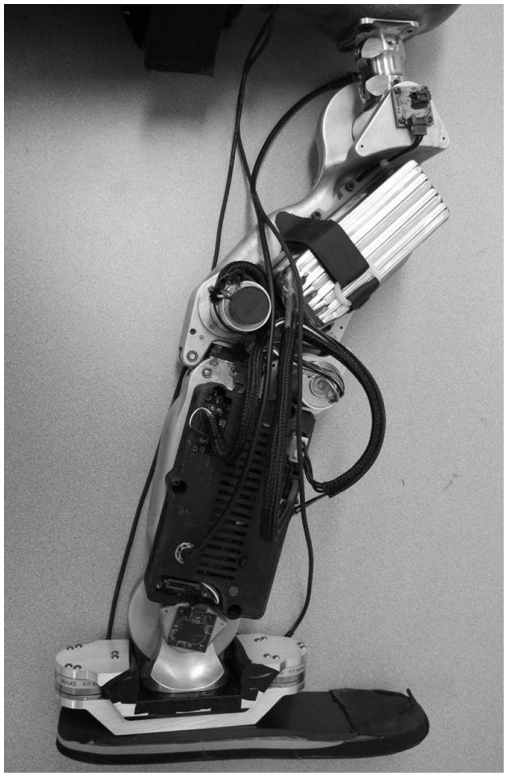
- The human leg conforms to an *effective shape* during walking
- The effective shape is a standard measure for gait analysis and prosthesis alignment
- Recent simulations suggest a novel effective shape control strategy could improve robustness and clinical viability of powered prosthetic legs
- We experimentally implement effective shape control on the Vanderbilt leg

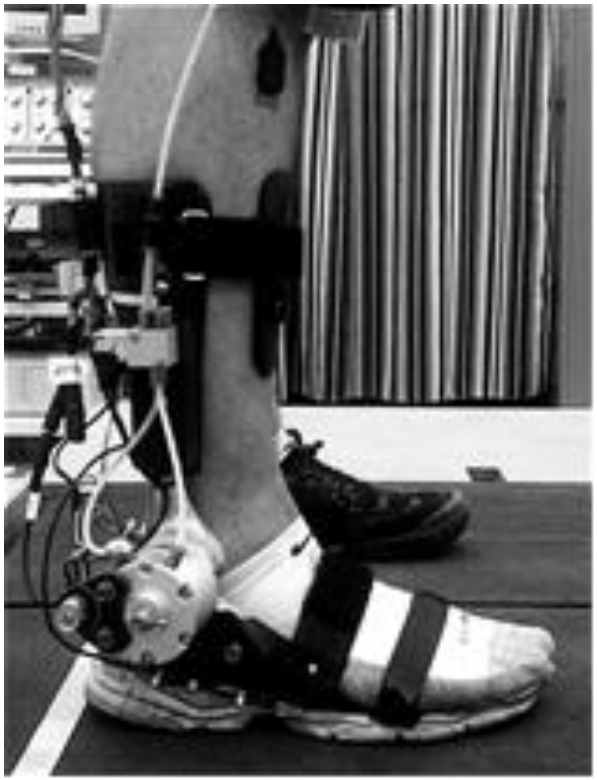


Podium 4.5

Modulation of Anticipatory Postural Adjustments of Gait Using a Portable Powered Ankle-Foot Orthosis

M Petrucci, E Hsiao-Wecksler: University of Illinois Urbana-Champaign (UIUC)
C MacKinnon: University of Minnesota (UMN)

- Pilot study was performed to determine the efficacy of using robotic assistance to facilitate gait initiation.
- Powered orthosis helps drive user through the proper sequence of postural adjustments prior to talking a step.
- Results suggest potential application in Parkinson's disease to help alleviate freezing of gait symptoms.



Podium 4.6