Validation of Real-Time Instrumentation System for Gait Adjustment

Matthew Schmidt, BS
Faculty Advisor: Stacy Morris Bamberg, ScD
Department of MECHANICAL ENGINEERING
University of Utah

Motivation
Asymmetric gait can lead to osteoarthritis, osteoporotic changes, and excessive metabolic costs. The Adaptive, Real-Time Instrumentation System for Tread Imbalance Correction (ARTISTIC) was developed to provide real-time gait feedback through audio, visual, and haptic cues. These cues are meant to aid in correcting asymmetric gait.

Testing
Feedback Testing:
Three methods of feedback will be tested and compared to determine an optimal feedback protocol:
- Negative Feedback: relays cues about prior steps
- Positive Feedback: relays cues before step is taken
- Hybrid Feedback: combines positive and negative

It is hypothesized that negative feedback will work best for subjects with slight asymmetry and that positive, more aggressive feedback will be most effective for larger gait asymmetries.

Test Subjects:
Testing will be conducted on subjects with lower limb prosthetics. To make the study more robust, subjects with both below and above the knee prosthetics will be selected. Testing will also compare response time to age of subject to confirm that the ARTISTIC is an intuitive system.

Verification
The ARTISTIC must be verified against equipment in a motion analysis lab (MAL). The Lower Extremity Ambulation Feedback System (LEAFs), a predecessor to the ARTISTIC, was verified against equipment in the motion lab at Shriners Hospital in Salt Lake City, UT. It was shown that the LEAFs was capable of identifying stance time with a low-bias error. A similar verification for the ARTISTIC will confirm its accuracy in determining stance time asymmetry.

Conclusion
Results from this research will provide insight into the best form of feedback (audio, visual, or haptic) for gait asymmetry correction. Positive, negative, and hybrid feedback will also be examined. The ARTISTIC will be shown to be an effective and reliable real-time gait correction tool.

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References