

Complex Movements and Terrains Require *Agile***,** Fluent Human–Exoskeleton Teams



Industrial





Military

Prototype an Exoskeleton that Fluently Transitions over Speeds and Terrains for Individual Operators



State Prediction 8.0 7.0 8.0

Ho Chit Siu Ryan J. McKindles Jennifer Sloboda RAAINS - 11/13-15/19 Leia A. Stirling Paul Stegall

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Long Short-Term Memory Networks Predict Movement Type (below), though Perform Poorly during Mode Transitions (white)



Transition Labels–Acceleration-Based Heuristics

Slow Down Transition

in Acceleration Differences

Unsupervised Clusters Align with Activity Type



PCA & t-SNE Revealed Distinct Activity Clusters, **Potential Low-Dimensional LSTM Input**

IMU: Inertial Measurement Unit **EMG: Electromyography (Muscle)** PCA: Principal Component Analysis t-SNE: t-Distributed Stochastic Neighbor Embedding

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