Cyber-Physically Assistive Clothing to Reduce Societal Incidence of Low Back Pain

Karl E. Zelik, Vanderbilt University

Challenges

To create lightweight, low-profile, smart, assistive clothing that is practical, effective and scalable

(1) Selecting types and locations of sensors embedded in clothing

(2) Minimizing actuator bulk/weight and power demands for daily use

(3) Real-time monitoring and assessment of back injury risk

(4) Coordinating device behavior with user movement, needs and intent

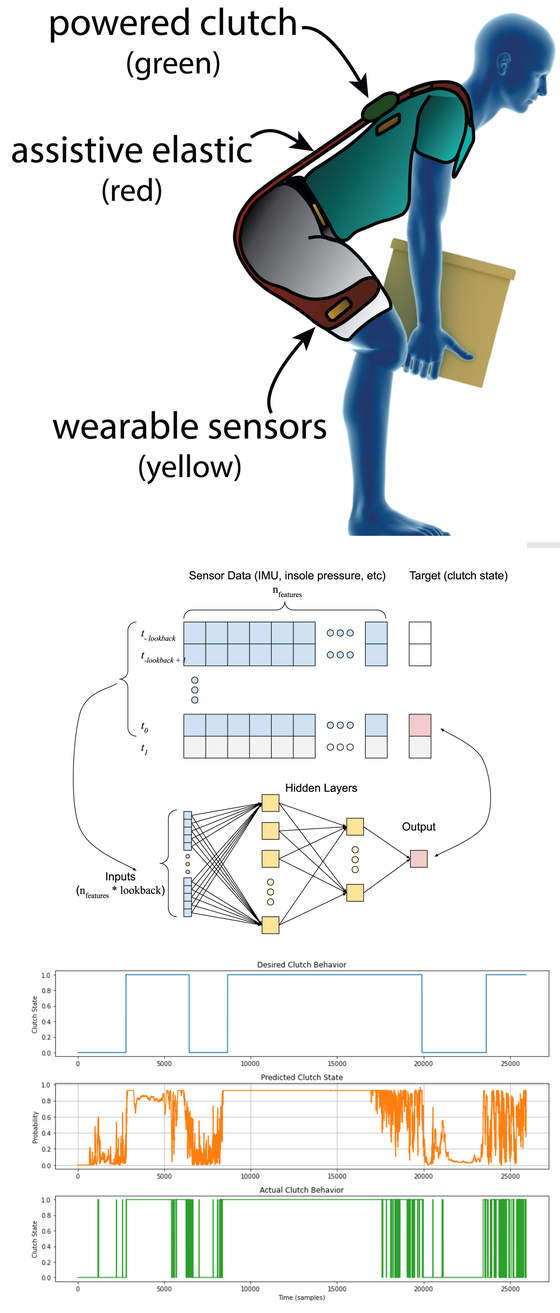
(5) Achieving extremely high control accuracy needed for user acceptance

Solution

- Develop a type of quasi-passive, mode-switching exosuit that uses wearable sensors and ML-based control to coordinate device behavior with user movement and needs.

- Relieve back strain during lifting and bending tasks, and otherwise integrate seamlessly into daily life and allow full freedom of movement.

- Innovations in using wearable sensors to monitor back injury risk and coordinate device behavior in unison with users



Scientific Impact

The device is a type of human-in-the-loop Cyber-Physical System which integrates:

- Musculoskeletal biomechanics
- Exoskeletons & human augmentation
- Machine learning & sensor fusion methods for wearables
- Low back pain prevention & care
- Soft robotics

Broader Impact

- This work has the potential to radically transform societal monitoring of low back health and the prevention of low back injury and pain due to musculoskeletal overuse.

- There are many potential design variations that can be customized to assist specific populations, occupations or individuals during certain types of tasks.

- An educational video on this research was produced and sent out to K-12 schools as part of an outreach program that reached >350 students

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PI Contact: karl.zelik@vanderbilt.edu
engineering.vanderbilt.edu/create