NRI: INT: Wearable Robots for the Community: Personalized Assistance using Human-in-the-loop Optimization

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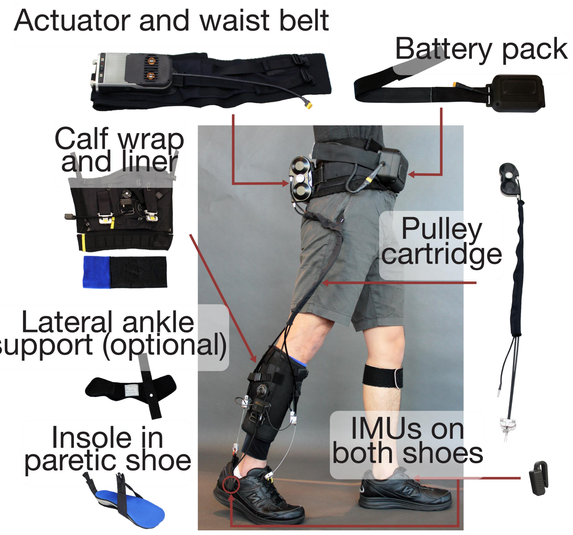
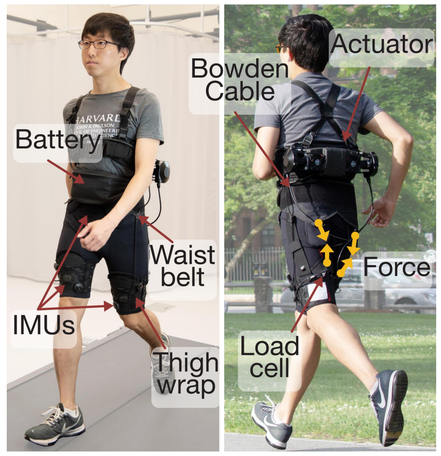
Soft exosuits

Rehabilitation poststroke



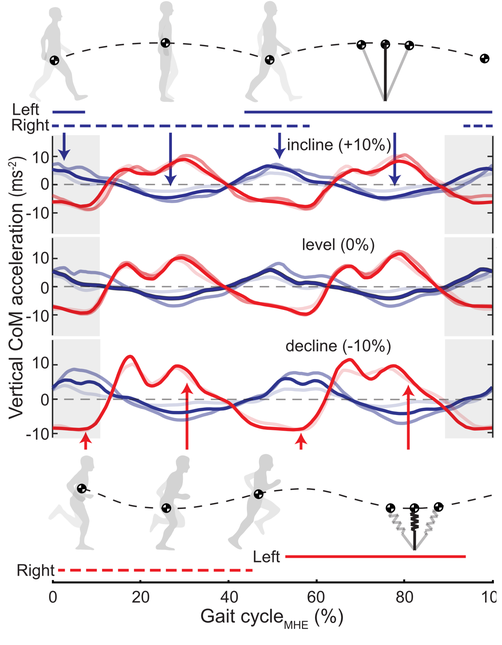
Exosuits for non-impaired populations

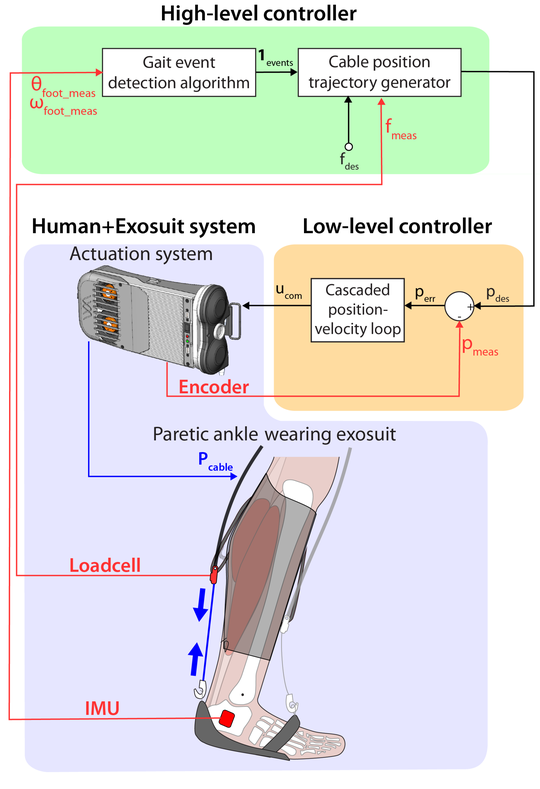


Our group's **soft exosuits** can improve gait quality in people poststroke [1-4] and enhance the mobility of healthy individuals during multiple activities [5-8]

Suit-human system

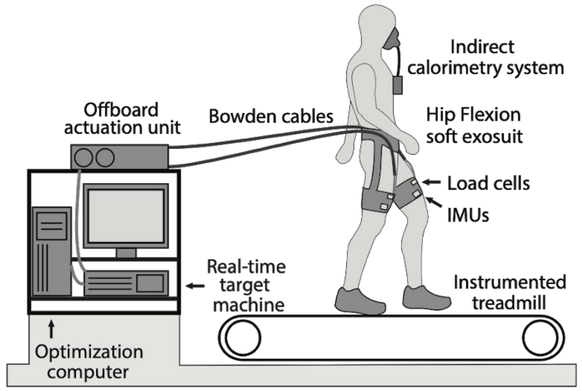
- Inertial measurement units placed on the foot and torso to detect walking and running
- Body-worn actuators connected to Bowden cables apply torques in parallel to biological muscles





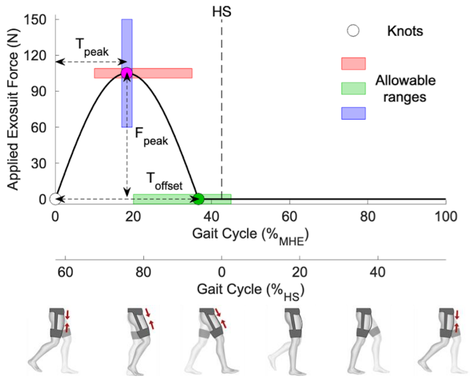
Isolating the metabolic and biomechanical effects of hip flexion exosuit assistance using human-in-the-loop optimization

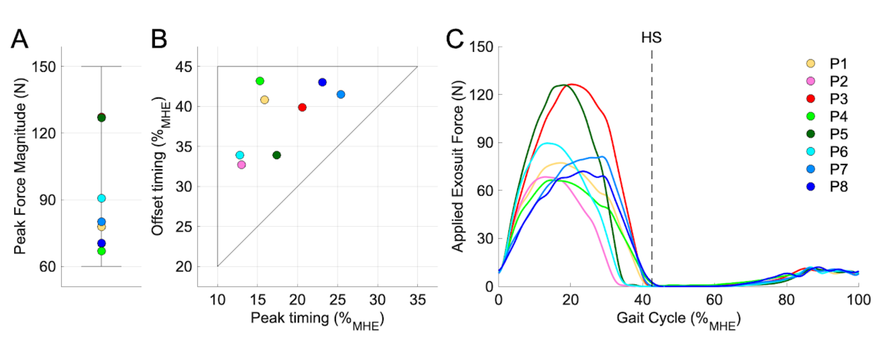
Experimental setup with hip flexion exosuit



HIL optimization using metabolic measurement and showing parameters varied

Varied force profile peak timing, offset timing and peak force magnitude. Found diverse parameter values across participants.





Validated that higher force not always better with a sweep of force magnitude

Low forces can lead to significant metabolic reductions. Metabolic reduction of 9.5% comparing optimal force profile compared to assistance off.