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A method for dynamic anchoring of soft exoskeletons using localized active compression

A system of local active compression anchors to enhance exoskeleton mobility and functionality

IP Status: US Patent Issued; Patent No. 12,023,292

Applications

- Rehabilitation for mobility disorders
- Assitance transporting heavy physical loads (soldiers or factory workers)
- Soft exoskeletons
- Space suits

Key Benefits & Differentiators

- **Dynamic and designer-defined body anchoring:** Integration of active compression techniques into garments allows selection of anchoring locations rather than being limited to anatomically defined anchors i.e. the torso
- **One-size-fits-all:** Active compression approach adjusts for user variability

Technology Overview

Exoskeletons provide physical support via wearable technology to a wide range of users including patients rehabilitating from mobility disorders, soldiers, factory workers, and even astronauts. To effectively apply force to move the body using an exoskeleton, actuators must be anchored to provide leverage for the desired motion and to couple the limb mass to the actuator. There are two traditional methods for on-body anchoring. Anchors can be directly attached to the body, but this requires rigid materials. Alternatively, local, natural anthropometric landmarks can be used as fixture points such as a belt that wraps around the waist and supports lower-body systems on the protrusion of the pelvis. This approach allows for flexible materials but limits the scope of actuation based on available anchor points.

Researchers at the University of Minnesota have developed a new method of soft exoskeleton design and implementation that utilizes dynamic garment tightening to produce transient anchor points. Specifically, this system uses separate, circumferentially-integrated active materials (e.g., shape memory alloys (SMAs)) designed as constrictive actuators to temporarily tighten strategic regions of the garment to provide friction-based anchoring. Friction can hold a garment in place independent of local anthropometric landmarks, creating a local anchor. This dynamic and adaptable approach expands the realm of possible actuation movements and actuator placements.

Phase of Development

TRL: 3-4
Prototype developed

Technology ID
20180224

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