Responsive cable robot for guiding motion in physical therapy and rehabilitation

Technology #cu14305

Patients with physical deformities, amputations, injuries, or neurological disorders may require physical therapy to recalibrate their walking gait and increase motility. A common strategy for gait adjustment involves introducing a perturbation during controlled walking exercises, which the brain's motor control system uses to recalibrate in a process known as motor adaptation. This technology is an active tethered pelvic assist device (A-TPAD), which aids patients undergoing gait motor adaption therapy by both supporting body weight and providing precise, feedback-controlled force perturbations. The device is a cable robot consisting of an anchoring harness, cables, sensors, and motors, which adjust the cable tension in response to patient movement to ensure the desired perturbation is maintained.

Active robot response enables wide dynamic range of support and applications

Typical devices for gait motor adaptation therapy typically offer either body weight support or controlled perturbation for guidance, which limits their utility. The A-TPAD simultaneously supports body weight while providing a programmable guidance, and thus has a wider range of use in terms of application and patient needs. In addition, the A-TPAD can offer a wide dynamic range of resistance, so a single device can cater to the amount of load that any patient can handle. Furthermore, the active feedback of the system could be used to respond to sudden uncontrolled patient motion, such as falling, to minimize injury. Additionally, the force generated by the patient is measured by the A-TPAD for active feedback, and may be useful as a quantitative diagnostic metric.

The A-TPAD has been tested with a healthy human subject, and was able to accurately and steadily apply a load of 10% body weight during normal gait.

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Applications:

• Physical therapy for recovery after injury or amputation
• Improve gait for patients with neurological disorder
• Preparative measure for patients with an upcoming surgery or amputation
• Provides quantitative measure of force induced during walking

Advantages:

• Combines body weight support with corrective perturbations
• Protects against patient slips or falls
• Wide range of applied load

Patent information:

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