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Novel actuation system for an active orthosis

A novel actuation system for a knee orthosis has been designed and patented. This new technology allows to actuate or lock knee rotation during gait, by means of a single motor and a ball-screw transmission. The system is low-weight, compact and easy to adapt to commercial passive orthoses. Partners to further develop the system and/or to establish commercial agreements along with technical cooperation are sought.

The Challenge

The design of the actuation system arises from a research project aimed at designing patient-tailored active orthoses to assist the gait of incomplete spinal cord-injured (SCI) subjects. The design approach of such assistive devices is based on the concept of minimally modifying the available passive orthoses by adding simple, low-cost and energetically efficient mechatronic modules at the joints. Previous prototypes have been developed and tested on actual SCI subjects.

The Technology

The actuation system transmission is composed of a bar linkage and a ball-screw joint, resulting in a compact design. This transmission configuration provides an added value with respect to existing solutions because it allows to lock the knee joint thanks to the irreversibility of the ball-screw joint. Current commercial solutions lock the joint by braking with the motor, which is energetically inefficient, or use shape-locking mechanisms, which require a considerable torque to unlock the joint, thus increasing the power consumption and time of response. Furthermore, the design conception allows to easily adapt series elastic systems, which are beneficial for control, energy efficiency and to protect mechanical parts.

Innovative advantages

- The ball-screw transmission system is irreversible, which allows to lock the joint with low energy consumption of the motor.
- The transmission mechanism allows to easily adapt series elastic systems, which filter the required power, thus reducing energy consumption, and protect the user and the system against impacts.
- The system is modular and easily adaptable to standard customized orthopedic material.

Current stage of development

The system has been designed and the prototype is in the development stage.

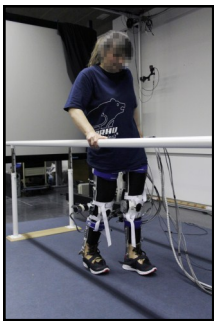
Applications and Target Market

The system has been conceived to actuate the knee joint of a knee-ankle-foot orthosis (KAFO) that assists the gait. The same system can also be used, with slight modifications, to actuate other human articulations. This actuation system can be applied in assistive devices intended for neuromotor pathologies (e.g., spinal cord injury, stroke, cerebral palsy), mobility problems in aged population, or rehabilitation of musculoskeletal joint injuries (e.g., cartilage or ligaments injuries). The target market of this technology is companies that develop this kind of assistive devices.

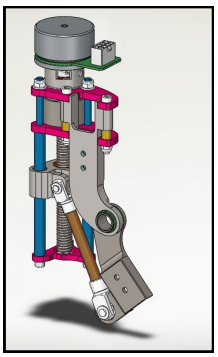
Reference number

MKTXXXXXX_H

Actuation system with self-locking ball-screw transmission for an active orthosis



Experimental test on an SCI subject wearing an active orthosis with a previous actuation system design



New developed actuation system

Business Opportunity
Technology available for licensing with technical cooperation

Patent Status
PCT application

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