Wearable active robot for body joints in series

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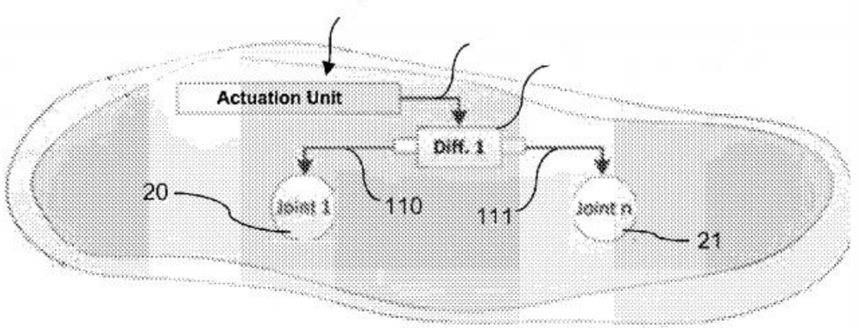
Invention

The new generations of exoskeletons are going more and more towards simple and functional solutions. A tradeoff between weight/size and the ability to perform different tasks is required. The under-implementation is an implemented solution, for instance using a system in which the number of actuators is lower than that of the joints. Following this way there is a reduction of the weight but not of the joint mobility. The current invention proposes an under-actuation group with the capability of interfacing with the actuation means, and at least one differential for the distribution of the motion, mediated by torque sensors. The invention is an under-implemented assembly for a wearable active robot: a prosthetic device or an exoskeleton to aid motion or to replace an anatomical part. The under-actuation unit consists of actuation means act to deliver power to a differential motion distribution element, which in turn is connected with two or more mono and poly-articulated exoskeletal modules. The system can also include sensors suitable for detecting the torque delivered and transfer information to the actuation unit thanks to a control unit responsible for decoding these inputs. This invention can be integrated into a wearable active robot, where there are two articulated modules, such as the joint between the pelvis and hip, knee, ankle, elbow, or more than two modules, as in the case of a polyarticulate kinematics such as an exoskeleton for the spine.

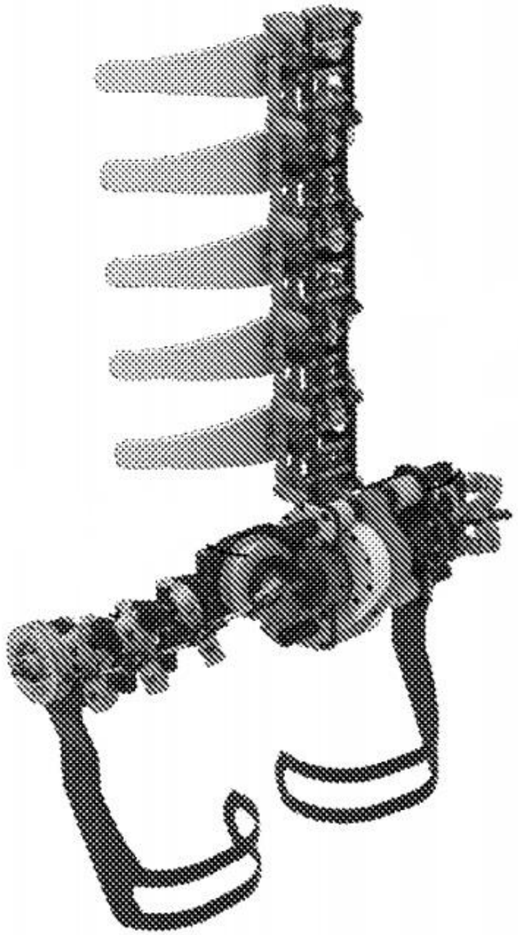
The invention has the following advantages:

- Lightweight and compact robot
- No bulky
- Control caused by external disturbances determined by commands exercised by the user
- Robot implementability, for instance using brakes associated with the differential outputs
- Applicability of the transmission assembly also to non-wearable robots or other types of machines.

Drawings & pictures



Conceptual diagram of the functioning of the exoskeleton



3D model of the exoskeleton made up with the under actuation system

Industrial applications

The invention finds applicability in the fields:

- Wearable robotics
- Rehabilitation robotics
- Assistive robotics
- Prosthetics
- Orthosis

Possible developments

The technology of the patent is in a development phase, not yet fully mature for the market with the respective products.

The TRL is still to be considered low (eg: 2/3) suitable for experimental validation prototypes.

Still numerous other insights are needed by the research team to make the technology effectively applicable to wearable robotics.

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