ETH zürich

Licensing Opportunity

Cuff for human-exoskeleton coupling

Application

This attachment system facillitates the shared usage of rehabilitation equipment as well as industrial exoskeletons that require constant-center fixation for differently sized limbs. The attachment system combines ergonomics for the user with high stiffness for precision and low occlusion for a collision-free motion.

Features & Benefits

- retains center position
- fast adaptation between different users
- light weight, minimum footprint, convenient
- no tools or loose part handling required

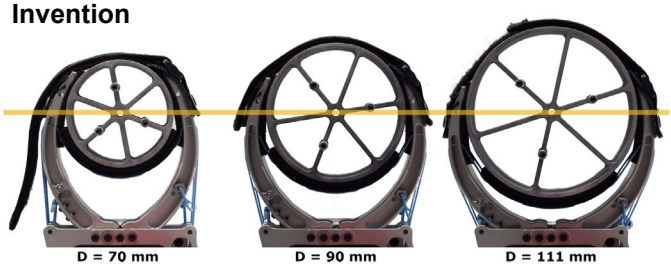
Publication

- "Human–Robot Attachment System for Exoskeletons: Design and Performance Analysis", IEEE Transactions on Robotics 39 (4), 3087-3105, 2023 https://doi.org/10.1109/TRO.2023.3268587
- Patent pending in EP, US, WO/2023/072678

Background

Fixation methods with a fixed frame require the addition of cushioning to achieve a centered position of limbs with different diameters. The centering is crucial for minimizing parasitic forces in rotations around joints. Adding cushioning is time consuming and often reduces the stiffness of the attachment, which diminshes the precision of the movement as well as the transfer of forces. The larger footprint of the cushioned cuff may also occlude the exoskeleton, leading to an increased risk of collision. Other attachment methods with integrated size adaption and centering capability require tools or other time consuming procedures to adapt.

Invention



The invented attachment system retains the center position of a limb with respect to the exoskeleton without additional effort next to the closing action. Two clamps attached to the base of the mechanism rotate open and close symmetrically. A tendon pully attached to the clamps automatically adapts the position of the support structure optimally, when the clamps move. The kinematics are designed such that the parts cannot move once the support structure has tightened around the limb. A prototype with three attachment points has successfully been developed for a robotic exoskeleton [see referenced publication].

transfer

Invented by D-HEST

ETH transfer
transfer@sl.ethz.ch
www.transfer.ethz.ch
Reference 2021-059
Y. Zimmermann, J. Song,
F. Ammann Teuscher, P. Huwiler,
P. Wolf, R. Riener

Technology Readiness Level