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TU Bergakademie Freiberg

Exo-BiomechSim – part of EVO-MTI

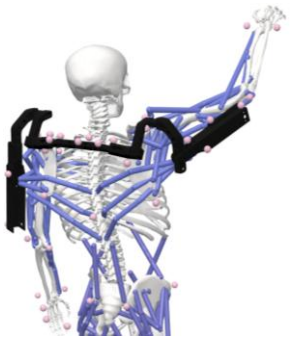
Development of a biomechanical simulation model including data and processing pipeline for the development and evaluation of exoskeletons

BACKGROUND

Support systems are being used in an increasing amount of life situations. One example for support systems are exoskeletons, which, depending on their design, are intended to relieve the strain on the workforce during physically demanding activities or support users during rehabilitation. Corresponding systems must be designed with regard to the support situation - for example physiological requirements, movement sequences, purpose of use and general conditions. The development and evaluation process of corresponding systems is carried out using simulation, design and evaluation methods and tools, as well as on the basis of individual skills and experience. In the project EVO-MTI, a digital environment for the design, evaluation and optimization of human-machine systems with humans in the power flow, human-technology interaction (HTI) and system components such as physical interfaces for power transmission is designed.

FOCUS OF WORK

The evaluation of the effects of exoskeletons on the musculature and internal structures of the human body, i.e., the biomechanics of humans, is of central importance in the optimization of human-machine interaction. Humans can be represented in the virtual world by so-called digital human models. A sub-group of them are the biomechanical or musculoskeletal human models, which enable the representation of the biomechanics of the human and allow the simulation of effects on the humans' biomechanics. In order to respect the exoskeleton influence on biomechanical aspects in EVO-MTI, a data and simulation pipeline using biomechanical simulation models is to be set up. The pipeline should allow an evaluation of the biomechanical parameters of humans for different application scenarios and different exoskeletons or their support characteristics, which can then be used to optimize exoskeletons.



KEY MESSAGES

As part of EVO-MTI, in this sub-project, a simulation pipeline is being set up using a biomechanical and coupled technical simulation model. The pipeline enables the mapping of the biomechanical effects of different work activities depending on the individual properties and characteristics of different exoskeletons. The simulation pipeline offers the integration of further, in this case biomechanical, factors into the digital design and development of human-machine systems and thus an additional opportunity to optimize the human-machine interaction.

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