



PRAXIS DER FORSCHUNG WS 2023/24 – PROJECT PROPOSAL

Evaluation of passive knee exoskeletons for skiing with AI based motion capture and VR technology

Project

Exoskeletons – also called wearable robots - are designed to improve mobility and are worn by directly on the human bodies to assist or completely replace their muscle strength. Exoskeletons come in very different shapes and for different parts of the body, e.g. lower limb, upper limb or back exoskeletons. They can provide support in the case of different impairments, prevent injuries and pain, or even augment healthy and fit persons in their motions to make them faster or stronger. Considering the way they are powered, exoskeletons can be passive (i.e. driven by mechanical elements like springs and dampers), and active, i.e. driven by motors.

The proposed project studies the Againer (www.againer-ski.com) exoskeleton which is a passive knee exoskeleton powered by an adaptive pneumatic spring to provide support during downhill skiing. According to the manufacturer it is supposed to „increase performance of your leg muscles and reduce pressure in in the legs and back“.

The goal of the project is to perform a thorough evaluation of the Againer exoskeleton in situation that are as realistic as possible without going onto a skiing slope but staying in the motion capture lab. This involves a biomechanical evaluation of the joint angles during motions like squatting and jumping with AI based motion capture technology, and potentially further biomechanical measurements, such as EMG etc. It also includes a more qualitative assessment of the Againer within a VR skiing environment of your choice.



www.againer-ski.com

Different steps in the project:

- Perform literature search on exoskeletons and suitable evaluation studies
- Evaluate different evaluation technologies and measurement techniques and decide on a suitable approach for this topic
- Plan a motion capture study with several human participants including the definition of protocols, measurements and subsequent analysis steps
- Apply for ethics approval of the planned study, including aspects of data protection
- Recruit participants and perform the motion capture experiments in our lab
- Perform a quantitative analysis of the experimental data

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