

INCLINATION MECHANISM FOR ARM-EXOSKELETONS WITH OPTIONAL GRAVITY SUPPORT

An inclination mechanism (IM) for passive arm-exoskeletons was developed at TU Wien. The goal was to improve the wearing comfort of upper limb exoskeletons to help persons suffering from neuromuscular diseases to regain lost functionality. The IM allows movements of the upper body, despite the attachment to the backrest and has been specially developed for combination with passive arm exoskeletons and integrated weight relief.

BACKGROUND

Persons suffering from neuromuscular diseases often have problems performing elementary activities of daily living such as eating, drinking, combing or scratching. This loss of functionality represents a massive cut in their independence and quality of life. Exoskeletons can help persons suffering from neuromuscular diseases to re-gain lost functionality. Special attention is paid to the exoskeleton's mounting - users should not feel constrained while wearing the exoskeleton.

TECHNOLOGY

The inclination mechanism (Fig.1), which can be a part of an exoskeleton (Fig.2), allows the enduser moving the trunk when seated in the wheelchair or in a normal chair wearing the exoskeleton so that she/he is not restricted in using residual functionality. A 20° inclination of the trunk in the forward and sideward directions is possible. Integrated into a passive upper limb exoskeleton, the shoulder module can be part of the four-bar linkage mechanism and remains in a vertical position aligned with the shoulder joint, independent of the inclination angle of the mechanism. If necessary the rotation and inclination of the mechanism can be locked automatically. Upper limb gravity compensation mechanisms which use external spring-package units for generating the required counter-torque for the weight of arm can guide the rope or Bowden cable through the lower tube of the inclination mechanism. The inclination is linked to the fixation module by a simple tube clamp.



Fig.1: Inclination Mechanism (IM)



Fig.2: Exoskeleton with integrated IM

ADVANTAGES

- light-weight and slim construction, improves wearing comfort
- user is less constrained, allows moving the trunk when seated
- modular buildup and easy adaption / extension
- cables can be guided through the tubes to avoid damages or safety risks
- mechanism for inclination is the link between wheelchair and exoskeleton

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APPLICATIONS:
Rehabilitation

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INVENTOR:
Markus Puchinger

CONTACT:

Angelika Valenta
TU Wien
Vienna, Austria
T: +43.1.58801.41538
angelika.valenta@tuwien.ac.at
www.rt.tuwien.ac.at