6th European Conference on Computational Mechanics (ECCM 6)
7th European Conference on Computational Fluid Dynamics (ECFD 7)
11 – 15 June 2018, Glasgow, UK

POWER ASSISTANCE EVALUATION METHOD FOR AN UNDERACTUATED LOWER LIMB EXOSKELETON

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Key Words: *Lower Limb Exoskeleton; Underactuated mechanism; Bio-mechanics; Simulation.*

Abstract: Wearable lower limb exoskeleton has comprehensive applications such as load-carrying augmentation, walking assistance, and rehabilitation training by using many active actuators in the joints to reduce the metabolic cost generally. The traditional fully actuated exoskeleton is bulky and requires large energy consumption, and the passive exoskeleton is difficult to provide effective power assistance. To research on an underactuated lower limb exoskeleton, the exoskeleton dynamics was modeled and the human-exoskeleton hybrid model was analyzed via ADAMS and LifeMOD to provide an evaluation method for power assistance. Moreover, the human-exoskeleton co-simulation method was utilized to verify the assisting performance and control effect. By exploiting load-carrying simulation with/without exoskeleton, we can see that the upper toque peak and power required by human are obviously reduced by power assistance and the joint angle curves without exoskeleton are in accordance with the joint angle curves with exoskeleton almost. In conclusion, the designed exoskeleton is compatible with human motion and feasible to provide effective power assistance in load-carrying walking.

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