BP 31: Posters: Modelling of non-linear dynamics in biological movement

Time: Tuesday 14:00–16:00 Location: Poster A

BP 31.1 Tue 14:00 Poster A

Intrinsic muscle design: influence on human motor control — •Alexandra Bayer[1,2], Syn Schmitt[1,2], Michael Guenther[1], and Daniel Fabian Benjamin Haeufle[1] — [1]Universität Stuttgart, Institut für Sport- und Bewegungswissenschaft, Allmandring 28, D-70569 Stuttgart, Germany — [2]Universität Stuttgart, Stuttgart Research Center for Simulation Technology, Pfaffenwaldring 5a, D-70569 Stuttgart

A key aspect of understanding human movement is the interaction of the control strategy with the musculoskeletal system. Recent studies have shown that Hill-type musculoskeletal models can be used as well-established biomechanical actuators. As it has never been investigated, we address the question which characteristics are relevant for actuators to perform fast goal-directed arm movements.

In our simulation study, the human arm is modeled by a non-linear musculoskeletal model and four lumped muscle-tendon complexes. Each muscle-tendon model consists of biochemical activation dynamics and four biomechanical elements (CE, PEE, SEE, SDE). The motor control system is represented by a combination of feedforward and feedback-controller. We compared the effect of different mathematical representation of the biochemical and biomechanical model parts on movement speed in fast goal-directed arm movements. Already exchanging the description of activation dynamics revealed significant differences in peak arm speed. Exchanging the models of the biomechanical structures also influences arm kinematics. We discuss the implications of these results for motor control simulation studies.