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SCHWERPUNKT

ARBEITSVORHABEN

Neuromechanische Synergien für die Bewegungskontrolle: Einblicke in die biomechanische Modellierung und Steuerung

One of the major roles of the neural system is to control body movement. This function has been evolving to enable animals to execute an increasing number of behaviours that contribute to their survival. Historically, systematic reductionist techniques have been used to gain functional understanding of different parts of the neural system. However, an increasing number of questions in neuroscience that address the interactions between multiple pathways with overlapping (redundant) functions are resistant to these classical techniques. The alternative is to use the computational analysis that merges bottom-up (reductionist) and top-down (holistic) approaches. The main goal of the proposed project is to use biomechanical models together with control systems techniques to study the contribution of mechanical and neural constraints to movement control. Special consideration will be given to the description and composition of synergies for the generation of movement and to the evaluation of the hypothesis that synergies were acquired sequentially during evolutionary development.

Recommended Reading

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Yakovenko, S., V. Gritsenko, and A. Prochazka. 2004. "Contribution of stretch reflexes to locomotor control: a modeling study." Biol. Cybern. 90: 146-155.
Yakovenko, S., D. A. McCrea, K. Stecina, and A. Prochazka. 2005. "Control of locomotor cycle durations." J. Neurophysiol. 94, 1057-1065.

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A hierarchical perspective on rhythm generation for locomotor control

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Sequential activation of motor cortical neurons contributes to intralimb coordination during reaching in the cat by modulating muscle synergies

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A motor cortical contribution to the anticipatory postural adjustments that precede reacting in the cat

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Strengthening corticospinal connections with chronic electrical stimulation after injury

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