SENSORY-MOTOR INTERACTIONS BETWEEN MUSCLES INVOLVED IN COMPOUND MUSCULOSKELETAL FUNCTION

Utku Ş. Yavuz, PhD
Institute of Applied Mechanics, University of Stuttgart

Animal and human gait comprises a complex sequence of muscle contractions, continuously modified to adapt to an unpredictable environment. This continuous adaptation during movement is the result of integrated neural information from sensory feedback and central nervous systems. In this circuit, the muscle spindles feedback takes a major role in the modulation of voluntary control, resulting in a dexterous, smooth and safe movement of the joints. Moreover, the spindle feedback provides a robust coordination between heterogenic, antagonist and inter-limb muscles to maintain the stability of ankle joint during gait and postural control. However, it is still not well defined, how the synaptic transmission of sensory information contributes the multi-directional force execution at joint. In my presentation, I will review some of our recent studies decoding the spinal pathways that contributes to control of net joint torque. The alternative approach to investigate the sensory-motor interaction involving in this compound joint torque is combining the experimental techniques and simulation technologies. In this context, I will present a new class of musculoskeletal model driven by experimentally obtained alpha motor neuron discharges. Finally, I will discuss the potential evolution of these findings in neuro-rehabilitation.