"Simulation system of spinal networks and innervated muscles in the lower limb of humans"

Andre Fabio Kohn, PhD - Universidade de São Paulo

Abstract:
The spinal cord is a complex neural machine that helps controlling the generation of commands to the muscles. A Web-based spinal cord simulator is being developed in our lab with the purpose of providing a tool for the researcher and the teacher who want to see details such as spike trains of spinal neurons, muscle force and EMG, spinal reflexes, in a large variety of situations. Spinal cord motoneurons were modeled mathematically on the basis of cat data, some classes of interneurons were included, synaptic dynamics were represented and electrical nerve stimulation was provided to reproduce experimental conditions when studying human spinal cord neurophysiology. The presentation will cover: an overall view of the simulator and the basic modeling involved; next some interesting simulation examples will be presented to show the capabilities of the simulator and emphasize the emergent properties that arise from the basic neural and muscular elements modeled. Next, some details of the mathematical modeling will be presented. Finally, I shall present the ongoing expansions that are being developed for the simulator. One of the goals for the near future will be to have the simulator control the standing posture of a human being, simplified as the problem of controlling an inverted pendulum.