Scientific/Educational Workshop

Workshop information

Workshop responsibles :
Ning Lan
Bethel Osuagwu

Workshop title :
Neurorehabilitation Based on Novel Electromyographic Metrics for FES and Assistive Technologies

Workshop goals :
To introduce new electromyographic and kinematic metrics that can help guide neurorehabilitation based on muscle synergies, coherence and 3D modelling.
To highlight application of these new metrics to improve hand, upper and lower extremity function following activation of neuromodulation (eg. FES, NMES), biofeedback and robotic technologies .
To describe how these new metrics can promote better individual-based neurorehabilitation of muscle function following stroke and spinal cord injury.

Abstract :
Neural injuries from stroke and spinal cord injury (SCI) disrupt the both activity levels and the pattern of muscle activation during movement. A major challenge for neurorehabilitation following CNS injury is to re-establish normal activity from several muscles in a coordinated manner pattern, while facilitating mechanisms of adaptive neuroplasticity, rather than compensation of task control. In clinical post-stroke and SCI intervention, new technologies such as multi-channel FES/NMES offer a solution for non-invasively targeting specific groups of muscles, leading to rehabilitation of hand, upper and lower extremity function. Better detection of movement intention and simultaneous activation of many muscles is an essential strategy for activity-based neurorehabilitation, and could be enhanced with more sensitive kinematic measures. The speakers of this workshop have extensive experience of neuromodulation, biofeedback and robotic technologies, and share the vision of leveraging better movement metrics, such as muscle synergies, coherence and kinematic modelling to better guide individual-based rehabilitation after stroke and SCI. The latest progress using this approach showing initial research results, obtained from the hand, upper and lower limbs, will demonstrate the clinical application of these new metrics for neurorehabilitation. The first speakers will present FES based techniques designed to improve hand function and motor neuroplasticity during the early stage of SCI and stroke, using neuroprosthetics, robotic devices and virtual environments. The following speakers will highlight the neurophysiological basis of muscle synergies, how this activity can change during skill learning, and how synergy-activated FES interventions

can enhance upper and lower-limb motor performance following stroke. Finally, the utility of motor modules in myoelectric control of artificial prosthetic and/or rehab devices will be described.

Speakers:

Milos Popovic,
Bethel Osuagwu,
Angel Gil

Giacomo Severini
Vincent C. K. Cheung
Dario Farina
José L. Pons
Chuanxin Minos Niu
Ning Lan