Information technologies for rehabilitation

Lecture

CO74-001-e

Robotic systems for motor neurophysiology: From the neural control of movement to neuromotor rehabilitation

P. Morasso
Italian Institute of Technology, Genoa, Italy

Robotic haptic interfaces have been used since the mid 1980s for characterizing the mechanical impedance of the upper limb, thus, highlighting the strong degree of anisotropy of the musculoskeletal system, which contrasts with the apparent “Cartesian” isotropy of hand trajectories. In this context, it came to the fore the concept of internal control model, namely the idea that the brain must be able to develop/learn computational representations of the body dynamics and of the interactions of the body with the outside world. However, it is difficult to study experimentally such spontaneous process and thus, the next logical step was to exploit the same haptic robots also for generating artificial dynamic environments that allow controlled experimental analysis of such process. This is a necessary prerequisite for a rational introduction of robotized haptic interaction in the field of neuromotor rehabilitation, which we suggest to address as a process of training the subjects to reconstruct/repair the internal control models, damaged by pathological processes. A logical consequence is to conceive the rehabilitation robot more as a cybernetic device for facilitating sensorimotor learning rather than a mechatronic system aimed at purely passive handling. This means, in particular, that the robot must be designed and controlled in such a way to integrate quantitative measurements with motor actions and must interact with subjects in a bi-directional way. Robot technology in rehabilitation is promising but its rational use requires a better common understanding between physiatrists and physiotherapists, on one side, and robot engineers, on the other.

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Oral communications

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Driving fitness assessment in Portugal

M. Henriques, S. Domingues, M. Martín, B. Condeça

a Centro Hospitalar Lisboa Norte, Hospital de Santa Maria, Lisboa
b Centro de Medicina de Reabilitação de Alcoitão

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