1 à 1.5×. Le temps de double appui augmente chez les sains de 15 % pour la médiane (extrêmes 3 à 18 %) contre seulement 5 % (3 à 11 %). Plusieurs patients et témoins ont eu des difficultés à négocier le tournant devant le mur avec rW ou à se lever en utilisant son aide.

Discussion. – L’augmentation des temps de parcours et de la durée du pas plus importante avec les sujets sains témoigne probablement d’un effet moindre sur la marche du rôle de stabilisation. La tendance à l’augmentation de la proportion de double appui pourrait signifier une pousée plus importante des sujets sains contre le rW (vitesse maxi fixe). Ceci est congruent avec l’observation clinique de variations des angles tronc verticale et tronc-axe épaules-poignets. L’échec d’un patient, les difficultés aux tournants et au lever avec rW évoquent un problème d’interface homme-machine. Nous proposons une vitesse adaptée et une interface améliorée.

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English version

CO30-001-e
Non-invasive brain computer interfaces
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Keywords: BCI; Non invasive; Severe disability
Non-invasive brain computer interfaces are systems for recording EEG activity from electrodes placed on skull and use this signal to control devices such as augmentative communication keyboards or electric wheelchairs. For this, the interfaces use computer devices able to automatically extract some features from EEG activity. When features occur in response to a stimulus, interfaces are described as asynchronous, otherwise we speak of asynchronous interface. Three major types of response can be recorded: the P300 ERPs, the steady state potential, the frequency responses. These interfaces do not require surgery for their implantation and as such are defined as non-invasive. Their acquisition frequency are very low and their use shall mobilize all the patient’s cognitive resources. These characteristics mean that for now this type of interface is transiently used only in extreme motor disabilities: ALS, locked in syndrome. But a new tendency is emerging in the recent literature in the field. These interfaces are used to condition the brain activity in a rehabilitative purpose. The conference will illustrate these issues and will endeavor to show the interest and limitations of non-invasive brain computer interface.

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CO30-002-e
Motor neuroprostheses: Basic principles and applications
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Keywords: BCI; Invasive; Microelectrodes; Motor control; Severe disability
Since the late 1960s, behavioural neuropsychology has been focusing on understanding the organization of the primate motor system, as well as to decode some of the neural code enabling voluntary movements. After a brief review of the cortical areas involved in the control of voluntary movement and especially in the control of hand movement directed towards a visual target, I will describe the coding theory of motion by neural populations. I then explain how these fundamental developments on the coding of the movement were the basis of a series of recent work on motor neuroprostheses. The results of recent years show that it is possible for a patient with severe disabilities (quadriplegia after cervical spinal cord damage, for example) to control by thought various technical aids such as a robot arm, a computer cursor, a wheelchair or other devices.

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CO30-003-e
Electric wheelchair navigation using virtual reality: From intention to action
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Keywords: Electric wheelchair; Simulator; Virtual reality; Assistance; Rehabilitation
Objective. – The ISIDORE simulator for electric wheelchair mobility has been developed with a triple aim: to help the doctors give out a driving license for operating an electric wheelchair, to place the patient in a virtual environment in order to move about safely and to be able to observe both the patient’s behavior and to quantify important parameters to help the therapist develop actions of rehabilitation.

Material and method. – ISIDORE is a platform, which can be used with any electric wheelchair available on the market. It has a microcomputer, which can collect and process data from the movements of the wheels. To assess their performance moving around in a virtual environment (VRTOOLS) will be used with an IMMERAPOD station. Then the patient will be able to move freely in a familiar environment (hospital, rehabilitation center, foyer for the disabled or a private home) and his or her trajectory will be compared to an optimized one. Then, studying the discrepancies will help set up or upgrade a number of additional (visual, sound…) devices to provide a better accessibility.

Results. – The patient can use three different steering modes: a manual mode with total control; an automatic mode where the wheelchair behaves like a mobile robot going from a starting point to a given target and a semi-automatic mode where the user only has to rely on the wheelchair when facing awkward positions (blocked passages, going through doors or obstacles to be avoided).

Discussion. – The piloting assistance can exploit the inference of intentions: the preliminary intention (for the mental representation of what the user wants to do; the intention in action for the supervision of the action process at a macroscopic level and the driving intention for the control of the action in progress. It will then become possible to improve the assistance thanks to a database of fuzzy logic rules using the data from different sensors (angles and speed of lever command movements, head and eyes movements and so on).

Further reading

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Rapid development of assistive technologies for quadriplegics
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Keywords: Disability; Human machine interface; Technical aids
Technical aids enable many quadriplegics to perform tasks they could not do otherwise: read their emails, change TV channel, etc. According to Laffont (2008), the ability to control its environment is crucial to the quality of rehabilitation, and family. Other works (Pino, 2000; Verdonck, 2009) studied the significance of the uses of assistive technologies by persons with tetraplegia. Five major categories were identified as: autonomy, freedom, security, time for oneself and relationships with others.

This work suggests that these aids should be seen as a “fundamental human right” and reaffirm the need to work with users. Nevertheless, there is a large proportion of technical aids on the market is little or no use. This low acceptance rate is due to several reasons summarized by Philips (1993) and Scherer (1996): lack of attention in the selection of aid, difficulty in obtaining aid, performance and change needs of the patient.