B. Cesqui, H.I. Krebs, S. Micera. Rehabilitation robotics: Development of a new EMG-based control for post-stroke rehabilitation. Gerontechnology 2008; 7(2):88. Our goal is the design of a new EMG based control for post-stroke robot-mediated therapy. Results suggest that providing performance feedback could enhance recovery beyond simple knowledge of success or failure in task completion[1]. We are exploring whether activation of arm muscles can be used to a) generate goal-directed movements and b) provide the required performance feedback to enhance recovery. The EMG-based scheme must be able to determine the subject's intended directions within a few hundred milliseconds. Here we report a pilot study involving young healthy, subjects conducted to determine whether it is possible to build a static map to cluster EMG activation patterns for horizontal reaching movements. **Methods** Nine young healthy, subjects (24-44 years old) were involved in the experiment. A commercial version of MIT-MANUS, the InMotion2 robotic device, was employed in this experiment. Subjects were instructed to reach to 4 different targets situated at the tip of a cross, 14 cm from the center of the cross; movements were performed at three different hand speeds. Hand position and the activity of 7 muscles (biceps, triceps, middle posterior and anterior deltoid, pectoral and trapezium) were recorded during the experiment. The EMG signal was filtered with a band-pass filter (20-450 Hz) and amplified (gain of 1000). The raw EMG data for each movement were used to extract the Coefficient of Expressiveness[2] and EMG Histogram parameter[3]. In addition, two distinct methods of pattern recognition were used to cluster the data including supervised learning (Support Vector Machine-SVM) and a biomechanical model (BM) of the upper limb. **Results and discussion** Our results showed an 86% success in pattern recognition with a static map. Of notice, we did not tune the model to each individual subject as instead other research groups dealing with EMG pattern recognition did. Furthermore, we considered different hand speeds and did not exclude any data. While the static map achieved reasonably good results discriminating between movement directions, results pointed to the necessity of online adaptation of the mapping. It is possible to define a general static scheme of pattern activations but anomalies due to postural variability, co-activation of antagonist muscles, and speed variation deterred us from achieving perfect clusterization. We are presently exploring this new EMG based control scheme with stroke patients and its potential to provide performance feedback.

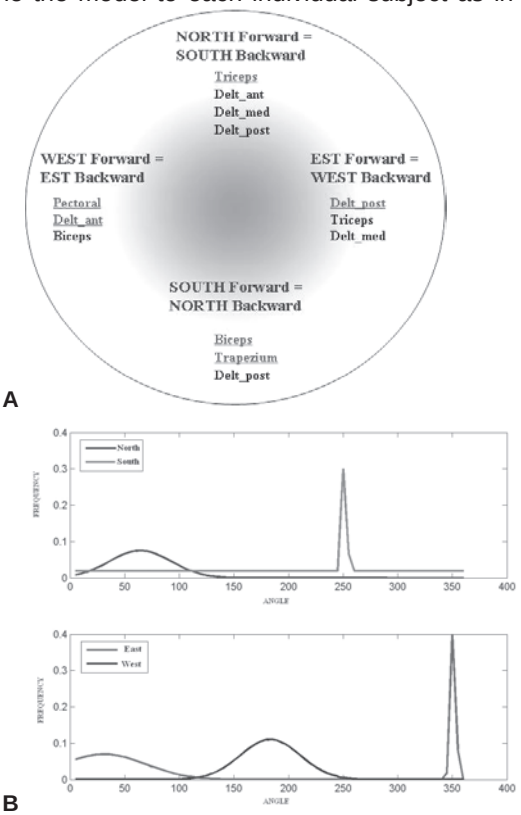

Figure 1 A: General scheme of muscles pattern of activation; B: Frequency distribution of the signals feature depending on movement directions

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