SHIFTS OF ATTENTION'S DIRECTIONS ARE HIGHLY PREDICTABLE BY EEG FRAME RECOGNITION: BRAIN-COMPUTER INTERACE AND THEORETICAL PERSPECTIVES

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Non-invasive EEG-based brain-computer interfaces (BCI) allow controlling different devices on the basis of electrophysiological patterns' dissociation. Until now, users must optimize the distinction between their EEG productions in order to associate one specific request to a given external command.

Given that attention shifts precede most of the perceptual processes, we ask here if conversion from EEG into commands can be improved by using electrophysiological indicators of visuo-spatial attention location. Indeed it has been recently suggested that, in addition to alpha band desynchronization contralateral to the attention position, endogenous shifts of attention correlate with brain high frequencies modulations (> 30 Hz).

In our experimental setup, close to ecological conditions, subjects loudly say when they covertly shift their attention either to the lower-left or to the lower-right monitor's corner. The experimenter marks each redirection in simultaneous 64 channels EEG recordings. Offline analysis consists in a wavelet coefficients' estimation of raw data over 16 electrodes and 18 frequencies distributed among 7 to 96 Hz. Coefficients' scalp topography for each frequency (frame) is triggered by its lateralized distribution over central and posterior electrode sites, and simultaneously classified as contralateral to left or right attention location.

Results show that gamma range frequencies best predict subjects' attention locations, with a maximum frames average classification of accuracy above 80%.

This pilot study provides strong evidences that BCI investigations could take the full advantage of attention shifts correlates in brain gamma band frequencies. Advances for attention theories will also be discussed.

243 words