Implementing a cognitive fatigue paradigm in a Brain Computer Interface system

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Context

Current implementations of BCI systems are restricted mostly to research due to some limitations like transfer rate, accuracy, robustness, the effects of increasing mental workload during extended use and mental fatigue. The latter has been described as decreasing in performance during a long-lasting task affecting attentional processing. Regarding attentional processing, it has been widely demonstrated to change the Electroencephalogram (EEG) density of alpha activity from anterior to posterior areas. The literature indicates an increasing alpha band power when attention decreases and a decreasing one over frontal lobes when mental workload increases.

Objective

The objective of the project will be design a BCI paradigm that allows the performance of attentional processing during the task, and run the experiment to test the feasibility of the design. The main questions of the project will be related with the nature of the stimuli (e.g., if characters, pictures, position on the screen), implementation of the paradigm such a way that allows the appropriate signal processing to identify the physiological resources affecting attentional during the task.

Approach

Literature review regarding on BCI, mental workload and attention processing must be done at the beginning, so the student can identify and determine a reliably paradigm that allows evaluating the alpha component associated with attention. Design the BCI paradigm using the appropriate paradigm, perform EEG recording (under supervision) and implement machine learning to analyze data.

Profile

A student with experience in machine learning, preferably with some knowledge of Matlab and, with an interest in human cognition.

Literature
