Comparison between P300 speller BCI and c-VEP BCI

Federica Turi*[1] and Maureen Clerc[2]

[1]Inria Sophia Antipolis - Méditerranée (CRISAM) – Institut National de Recherche en Informatique et en Automatique – 2004 route des Lucioles BP 93 06902 Sophia Antipolis, France

[2]Athena (INRIA Sophia Antipolis) – L'Institut National de Recherche en Informatique et e n Automatique (INRIA) – 2004 route des Lucioles 06902 Sophia Antipolis, France

Résumé

A Brain Computer Interface (BCI) is a hardware and software communication system that converts electro-physiological input from the user into an output that controls external devices, like a computer or a robotic prosthesis. This device allows severely disabled people with neurological neuromuscular disorders, such as amyotrophic lateral sclerosis, to communicate. Among the BCIs based on the electroencephalographic signals (EEG), we study systems based on visual evoked potentials (VEPs). Here, we compare two different VEP systems: a BCI system using time modulated VEP (t-VEP) and a BCI system using pseudo-random code modulated VEP (c-VEP). The former is based on the paradigm of the P300 speller and the latter uses, as pseudo-random sequence, a binary m-sequence and its time lag sequences.

The study is divided in two parts: in the first one we review and discuss the design of both BCI systems and we compare and analyse their advantages and disadvantages. In the second part we describe the algorithms we are implementing, that can process offline data sets for each systems, focusing on our work around the methods for the target identification. In particular, these methods apply different spatial filters to obtain the best linear combination of the EEG channels that minimizes the signal-to-noise ratio.

The objective of our research is to study different stimulus modulation designs to create a system with the highest communication performance in the field of VEP BCI.

*Intervenant