

Master 2013

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Removal of Ocular Artifacts from EEG Recordings Using Eye Tracker Data.

ABSTRACT - Masterthesis

Electroencephalography (EEG) plays an important role in research on brain activity and gives scientists valuable information about the functionality of the brain. However, EEG is contaminated by artifacts which can be physiological or nonphysiological. One of the important sources of physiological artifacts is ocular artifacts (eye movements and blinks).

The objective of this master thesis is to investigate the usage of adaptive filters alongside with the data provided from an eye-tracker as the reference to remove these artifacts from EEG signals. Adaptive filters have long been used for the purpose of artifact removal in many applications. However, the linear adaptive filtering is mainly well performing in a linear situation. Non-linearity of a system leads us to use other types of filters such as kernel adaptive filters. The next concept used in this thesis is using the data from an optical eye-tracker as the reference for the adaptive filters. Eye tracking data provided by optical eye tracker, has no interference with EEG signals and can be a better alternative for reference electrodes around the eyes. In this research work, we investigated the effect of non-linearity by generating synthetic artifacts and using linear and nonlinear approaches. We investigated the parameters of two types of adaptive filters and their effect. In the next steps we carried out the experiment on real recorded data and compared the results using learning curves which is an important measure to compare performance of adaptive filters. The results showed comparatively better performance for kernel adaptive filters in comparison to least mean square adaptive filters in artifact removal.