IDENTIFICATION OF BRAIN-GENERATED ACTIVITY WITH EEG USING VISUAL STIMULI

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- *ABSTRACT: Recent techniques in digital signal processing allow detection of different kinds of mental activity from brain-generated biopotentials. Electroencephalograph (EEG) methods, as opposed to invasive measurements, have the advantage of requiring only surface biopotentials to be acquired, and are therefore more suitable for regular use of Human Machine Interface equipment in application such as classification of thought patterns for machine control by persons with motor disabilities. This work uses Principal Component Analysis (PCA) and Independent Component Analysis (ICA) of EEG signals to investigate areas (electrodes) most activated when brain is submitted to a sequence of visual stimuli. The main difference is to use of original electrodes from information given by ICA and PCA components and not the obtained components. The data was collected in the Multi-Sensing-Processing and Learning Laboratory at UTEP, using a 128-electrode acquisition system. EEG data reduction and source identification allow one to understand brain activity during different tasks and to reduce the number of dimensions in classification procedures. Using Linear Discriminant Analysis (LDA), Quadratic Discriminant Analysis (QDA) and Support Vector Machine (SVM) procedures for classification, it was verified that classification rates increase after selection of electrodes using PCA and ICA. However, there is no significant difference in classification rates when using PCA or ICA, even though the electrodes identified as most activated by each techniques are different. By applying this technique, we expect to improve classification of different tasks with respect to usual classification techniques applied to raw data and to better understand brain activation by visual stimuli..*

- *KEYWORDS: Principal component analysis; independent component analysis; electroencephalography; visual stimuli; classification.*

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