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ABSTRACT

A method of classifying the sources of electrical signals emitted by the human cortex - control

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The purpose of the dissertation was to develop algorithms for classifying the sources of electrical signals related to recognizing the intentions of left-and-right-hand movements. These intentions were recognized on the basis of electrical signals emitted by the human cortex. The signals were read as EEG signals with the use of the Emotiv Epoc headset. A matrix of t-statistics was used to present the features of these signals.

In order to locate the sources of the signals coming from the human cortex, the inverse solution was used, and the use of t-statistics enabled the application of classification algorithms based on the graph theory (the spanning tree is the classifier). With the use of the least squares method some approximation of these sources was made. Signal classification algorithms are based on desynchronization and synchronization (ERD / ERS) phenomena.

It has also been shown that the signals read from the 14 EEG electrodes from the Emotiv headset allow the correct operation of the classification algorithm developed by the author.

The author implemented the algorithms for classifying motion intentions in the Matlab environment, developed the C ++ shared library retrieving raw data from the Emotiv headset electrodes and storing the raw files in sub-catalogs that correspond to subsequent measurements based on the Emotiv Epoc SDK, and also developed the program analyzing measurement results in VBA in Excel.

In order to use the classification results obtained in practice, the author designed control programs for communication via Wi-Fi and Bluetooth with an external device.

Key words: control, EEG, EEG signal sources, inverse problem, EEG signal classification, spanning tree.