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Classification of EEG Signals Based on Dynamic Connectivity Analysis

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Abstract : In this article, the classification of target letters is performed using data from the EEG P300 Speller paradigm. Neural networks trained with the results of dynamic connectivity analysis between different brain regions are used for classification. Dynamic connectivity analysis is based on the adaptive window size and the imaginary part of the complex Pearson correlation coefficient. Brain dynamics are analysed using the relative intersection of confidence intervals for the imaginary component of the complex Pearson correlation coefficient method (RICI-imCPCC). The RICI-imCPCC method overcomes the shortcomings of currently used dynamical connectivity analysis methods, such as the low reliability and low temporal precision for short connectivity intervals encountered in constant sliding window analysis with wide window size and the high susceptibility to noise encountered in constant sliding window analysis with narrow window size. This method overcomes these shortcomings by dynamically adjusting the window size using the RICI rule. This method extracts information about brain connections for each time sample. Seventy percent of the extracted brain connectivity information is used for training and thirty percent for validation. Classification of the target word is also done and based on the same analysis method. As far as we know, through this research, we have shown for the first time that dynamic connectivity can be used as a parameter for classifying EEG signals.

Keywords : dynamic connectivity analysis, EEG, neural networks, Pearson correlation coefficients
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