Entropy-Based Relevance Selection of Independent Components Supporting Motor Imagery Tasks

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Abstract

Brain-Computer Interfaces provide an alternative control of devices through the human brain activity. This paper proposes a trialwise channel filtering by selecting the subset of independent components with the largest entropy. The proposal holds two free parameters: The order for the Renyi entropy weighs the component quantization according to its probability, and the percentage of retained entropy that rules the number of independent components to reconstruct the spatially filtered EEG channels. Both free parameters are tuned using a subject-dependent grid search for the best classification accuracy. The proposed approach outperforms against heuristic channels selection in a binary classification task using the dataset IIa of the BCI competition IV. Attained results prove that using ICA as a spatial filtering allows the feature extraction stage to build more discriminative spaces, reducing the influence of noninformative components. As an advantage, the resulting spatial filtering maintains the physiological interpretation of the EEG channels.

Keywords: *Component selection, Renyi entropy, Brain Computer Interface*

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