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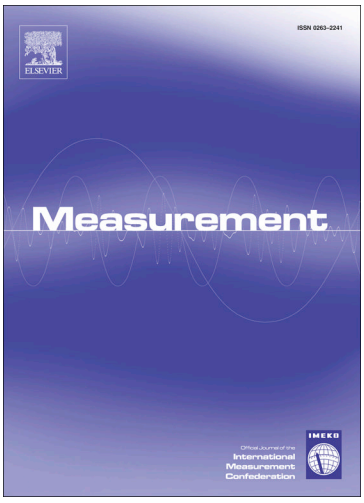

Features based on analytic IMF for classifying motor imagery EEG signals in BCI applications

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Features based on analytic IMF for classifying motor imagery EEG signals in BCI applications

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Abstract

Brain-computer interface (BCI) system works as a reliable support system for disabled people to communicate with real world. The augmentation in reliability of BCI systems is possible by successful classification of different motor imagery (MI) tasks. In this work, the analytic intrinsic mode functions (AIMFs) based features are proposed for classification of electroencephalogram (EEG) signals of different MI tasks. The AIMFs are obtained by applying empirical mode decomposition (EMD) and Hilbert transform on EEG signal. The features namely: raw moment of first derivative of instantaneous frequency, area, spectral moment of power spectral density, and peak value of PSD are computed from AIMFs. The features are normalized to reduce the biased nature of the classifier. The normalized features are applied as inputs to least squares support vector machine (LS-SVM) classifier and performance parameters are computed using different kernel functions of LS-SVM classifier. The radial basis kernel function for IMF1 provides better MI task classification accuracy 97.56%, sensitivity 96.45%, specificity 98.96%, positive predicted value 99.2%, negative predictive value 95.2%, and minimum error rate detection 4.28%. The propose

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