

基于邻接矩阵分解的脑电特征提取与分类方法

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摘要：

针对脑-机接口研究中运动想象脑电信号的特征提取问题, 本文提出了一种基于脑功能网络邻接矩阵分解的新方法。首先采用多通道运动想象脑电信号构建脑功能网络, 然后对相应的邻接矩阵进行奇异值分解, 依据矩阵奇异值特征向量定义了脑电的特征参数, 最后输入支持向量机分类器, 对BCI Competition IV Data Sets 1中的六组数据进行分类识别。实验结果表明, 基于脑功能网络邻接矩阵分解的特征提取和支持向量机分类器的方法能够以较高识别率区分不同的运动想象任务, 为脑电特征提取研究提供了新的思路。

关键词：脑功能网络; 邻接矩阵; 特征提取; 运动想象

Feature Extraction and Classification of EEG based on Adjacent Matrix Decomposition

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Abstract:

In view of feature extraction of motor imagery electroencephalography (EEG) in the study of brain-computer interface (BCI), a novel method is proposed based on adjacent matrix decomposition of functional brain network in this paper. First, multi-channel EEG signals were used to construct the functional brain network (FBN). Secondly, the singular value characteristic vector was obtained by means of singular value decomposition on the corresponding adjacent matrix, and then the characteristic parameters of EEG were defined based on it. Finally, the parameters were used as input vector for support vector machine (SVM), and then six datasets of BCI Competition IV Data Sets 1 were used for classification. Experimental results show that different motor imagery tasks are successfully identified by the method of SVM classifier combined with feature extraction which is based on adjacent matrix decomposition of FBN. This method provides a new idea for the study of extracting EEG features.

Keywords: Functional brain network; adjacent matrix; feature extraction; motor imagery

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