电子与信息学报 2009 31 (2): 314-318 ISSN: 1009-5896 CN: 11-4494/TN

论文

脑-机接口中基于ERS/ERD的自适应空间滤波算法

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收稿日期 2007-9-13 修回日期 2008-4-8 网络版发布日期 2009-2-24 接受日期

摘要
在与运动相关的脑-机接口(Brain-Computer Interface, BCI)研究中，如果样本规模小，共同空间模式(Common Spatial Patterns, CSP)滤波算法对离群点(可能为噪声)敏感，鲁棒性不好。为此该文提出自适应空间滤波(Adaptive Spatial Filter, ASF)算法，抽取滤波后脑电信号的方差作为特征，并寻找最优滤波器使两类特征中心的比值最大。与CSP不同，ASF是迭代算法，具有软判决机制，能够依据历代更新后的滤波器，自适应地降低离群点对各类特征中心计算带来的影响。采用BCI competition 2003和2005中两套数据集进行实验，结果表明：尤其是在训练样本少的情况下，相对于CSP，ASF所提取的特征分类效果更好。

关键词 脑-机接口(BCI) 特征提取 共同空间模式(CSP)滤波法

分类号 TN911.7 R318

Adaptive Spatial Filter Based on ERD/ERS for Brain-Computer Interfaces

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Abstract
For motor related Brain-Computer Interface (BCI), if the sample size is small, Common Spatial Patterns (CSP) algorithm is sensitive to outlier data and lacks of robustness. In this paper, an Adaptive Spatial Filter (ASF) algorithm is proposed to take filtered samples' variances as the features and seek the spatial filter to maximize the ratio of two classes' means. Unlike CSP, ASF is an iterative algorithm and have soft determination. ASF can adaptively decrease outliers' effects according to the updated filters. Using two datasets from BCI competition 2003 and 2005, the experimental results show that ASF outperforms CSP, especially when training samples are few.

Key words Brain-Computer Interface (BCI) Feature extraction Common Spatial Patterns (CSP) algorithm

DOI:

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