算法研究

基于JADE和平行因子分解的欠定混合盲辨识算法

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摘要：

针对源信号个数未知的欠定混合盲源分离问题，本文提出了一种基于特征矩阵联合近似对角化（Joint Approximate Diagonalization of Eigenmatrices, JADE）和平行因子分解的欠定混合盲辨识算法，该算法不需要源信号满足稀疏性要求，仅在源信号满足相互独立和最多一个高斯信号的条件下，通过将JADE算法中的样本四阶协方差矩阵叠加成三阶张量，再对此三阶张量进行平行因子分解来完成源信号数和混合矩阵的估计，由于平行因子分解的唯一辨识性在欠定条件下仍然满足，该算法能够解决欠定盲源分离问题。并对该欠定混合盲辨识算法进行了深入的分析。通过仿真实验，计算估计矩阵与混合矩阵的平均相关误差，结果表明本文提出的算法在适定和欠定混合时均具有很好的辨识效果，而且实现简单，可满足实际应用的要求。

关键词： 欠定混合； 盲辨识； 特征矩阵联合近似对角化； 平行因子分解； 联合对角化；平均相关误差

Algorithm for blind identification of underdetermined mixtures based on JADE and parallel factor decomposition

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Abstract:

To solve the problem of the underdetermined blind source separation when the number of source signals unknown, this paper proposes a algorithm for blind identification of underdetermined mixtures based on joint approximate diagonalization of eigenmatrices (JADE) and parallel factor decomposition under the assumption of statistical independence between the source signals and at most one of the signals be Gaussian, do not need the sources are (quite) sparse. The novel blind identification algorithm stack the sampled quadric-covariance matrices in a third-order tensor firstly, and then parallel factor decomposition this tensor to estimate the number of the source signals and the mixing matrix. Because the parallel factor decomposition still satisfy unique identifiability in underdetermined situation, the proposed algorithm can solve the underdetermined blind source separation problem successfully. The simulation results illustrate that the performance of the algorithm is very better for determined and underdetermined mixed. The algorithm is relatively simple and effective, which can satisfy the demand of engineering application.

Keywords: underdetermined mixtures   blind identification   joint approximate diagonalization of eigenmatrices (JADE)   parallel factor decomposition   joint diagonalization   mean relative erro

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