

论文

用于共道通信系统的FastICA算法性能分析

姚俊良, 杨小牛, 李建东, 李钊, 张琰

西安电子科技大学 综合业务网理论与关键技术国家重点实验室

摘要:

FastICA算法是目前最常用的盲源分离算法之一, 较好的分离和收敛性能使其在无线通信里有很好的应用前景。本文主要研究在有噪声的共道通信环境下, FastICA算法的性能分析。首先提出一个基于ICA的通信系统结构, 接着介绍一种噪声分解方法, 并结合预白化过程得到一个新的信号模型表达式。基于这个新的信号模型, 分析得出FastICA算法全局分离矩阵参数的统计表达式。最后, 使用容量指标来衡量分析结果的正确性, 并且给出基于FastICA算法的通信系统频谱利用率。

关键词: 盲源分离; 独立分量分析(ICA); FastICA算法; 频谱利用率

Performance Analysis of the FastICA Algorithm in Cochannel Communication System

YAO Jun-Liang, YANG Xiao-Niu, LI Jian-Dong, LI Zhao, ZHANG Yan

State Key Lab. of Integrated Service Networks, Xidian University, Xi'an

Abstract:

The FastICA algorithm is one of the most successful algorithms in blind source separation. It has a bright future in wireless communication due to its good performance in accurate separation and convergence. This paper analyzes the performance of FastICA algorithm when applied to noisy co-channel communication system. Firstly, we propose a model of ICA-based communication system, which adopts the FastICA algorithm to separate co-channel signals. In order to facilitate the analysis we first decompose the noise into two complementary subspaces, and get a new form of original signal through pre-whitening. Based on the analysis result above we obtain the analytic closed-form expressions of global separating matrix. Finally, a capacity index is brought forward to confirm the validity of our analysis and show the performance of ICA-based communication system. Some computer simulations that support the theoretical analysis are also included.

Keywords: blind source separation independent component analysis FastICA frequency utilization

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通讯作者:

作者简介:

作者Email: yaojunliang1@163.com

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