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论文

一种应用幅值信息的一单元定点复数ICA-R算法

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摘要
参考独立分量分析(Independent Component Analysis with Reference, ICA-R)通过引入参考信号而实现期望实值源信号的抽取。然而，目前尚无复数域ICA-R算法。该文在约束ICA框架下，利用期望源信号的幅值信息提出了一种定点复数ICA-R算法，用于抽取某个期望的复数源信号。首先，采用复数fastICA算法的差异函数和关于复数信号幅值信息的不等式约束建立了复数ICA-R模型，然后采用增广朗格朗日函数和K-T条件推导了复数ICA-R定点算法。计算机仿真和性能分析结果表明，由于利用了幅值信息，复数ICA-R的估计性能优于传统的复数fastICA算法。

关键词 参考独立分量分析；独立分量分析；半盲分离；复数信号；参考信号

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One-Unit Fixed-Point Complex-valued ICA-R Algorithm Using Magnitude Information

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Abstract
Independent Component Analysis with Reference (ICA-R) extracts only desired signals by incorporating prior information as reference signals. It can provide output signals with definite order and improved performance. However, no ICA-R algorithm in complex domain has been reported till now. Motivated by the fact that the magnitude information of a complex-valued signal is readily obtained, this paper proposes a fixed-point complex-valued ICA-R algorithm to extract a desired signal by utilizing its magnitude information in the framework of constrained ICA. Specifically, the complex ICA-R is formulated as maximizing the contrast function of a blind complex fastICA algorithm under an inequality constraint corresponding to the magnitude information, the augmented Lagrangian function and Kuhn-Tucker conditions are then used to derive the fixed-point algorithm. The results of computer simulations and performance analysis demonstrate that the complex-valued ICA-R algorithm outperforms the blind complex fastICA algorithm by virtue of incorporation of magnitude information.

Key words Independent component analysis with reference Independent component analysis Semi-blind source separation Complex-valued signal Reference signal

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