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Underdetermined Blind Source Separation by a Novel Time-Frequency Method

Qiao Su[a,*], Yuehong Shen[a,*], Yimin Wei[a,*], Changliang Deng[a,*]

[a] *College of Communication Engineering of PLA University of Science and Technology, Yudao Street, Qinhui District, Nanjing, 210007, China*

Abstract

This paper proposes a novel underdetermined blind source separation (UBSS) method based on short-time Fourier transform (STFT) to separate non-stationary sources. This method relaxes the premise in the subspace algorithm presented by Aissa-El-Bey *et al.* and allows that the number of active sources is no more than that of sensors by exploiting the statistic characteristic of sources and sparsity of non-stationary signals in time-frequency (TF) domain simultaneously. It first estimates the indexes of active sources in TF domain accurately by calculating the average power of sources at every TF point (except the point with the trivial energy contribution) and then obtains the estimation of source STFT by pseudo-inversion operator, which can avoid calculating the eigenvalue of covariance matrix of the mixtures and seeking the minimum of the object function based on subspace projection. Thus, the proposed algorithm has low computational cost and high separation quality. Simulation results validate the superiority of the proposed algorithm in comparison with the existing subspace-based algorithms.

Keywords: underdetermined blind source separation (UBSS), short-time Fourier transform (STFT), statistic characteristic, sparsity

* *Email address:* qiaosu810@foxmail.com (Qiao Su), yuehongshen829@163.com (Yuehong Shen), wei_yimin73@sina.com (Yimin Wei), c_l_deng@sina.com (Changliang Deng)