
Improving DOA Estimation Algorithms using High-Resolution Quadratic Time-Frequency Distributions

Abstract:

This paper addresses the problem of direction of arrival (DOA) estimation and blind source separation (BSS) for non-stationary signals in the underdetermined case. These two problems are strongly related to the mixing matrix estimation problem. To deal with the non-stationary characteristics of signals, this study uses high-resolution quadratic time-frequency distributions (TFDs) to reduce the cross-terms while keeping a good resolution for the construction of the spatial TFDs (STFDs). The main contributions of this paper are (1) the formulation of a statistical test for the noise thresholding step to improve robustness and avoid the use of empirical parameters; this test performs multisource selection of the time-frequency points where the signal of interest is present; (2) the use of an algorithm, based on image processing methods, which performs an autosource selection for mixing matrix estimation. The paper presents results on simulated signals that demonstrate an improvement of 10 dB in terms of normalized mean square error for BSS and 7% in terms of relative error for DOA estimation over standard methods.