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Parallel Factor-Based Model for Two-Dimensional Direction Estimation

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Abstract

Two-dimensional (2D) Direction-of-Arrivals (DOA) estimation for elevation and azimuth angles assuming noncoherent, mixture of coherent and noncoherent, and coherent sources using extended three parallel uniform linear arrays (ULAs) is proposed. Most of the existing schemes have drawbacks in estimating 2D DOA for multiple narrowband incident sources as follows: use of large number of snapshots, estimation failure problem for elevation and azimuth angles in the range of typical mobile communication, and estimation of coherent sources. Moreover, the DOA estimation for multiple sources requires complex pair-matching methods. The algorithm proposed in this paper is based on first-order data matrix to overcome these problems. The main contributions of the proposed method are as follows: (1) it avoids estimation failure problem using a new antenna configuration and estimates elevation and azimuth angles for coherent sources; (2) it reduces the estimation complexity by constructing Toeplitz data matrices, which are based on a single or few snapshots; (3) it derives parallel factor (PARAFAC) model to avoid pair-matching problems between multiple sources. Simulation results demonstrate the effectiveness of the proposed algorithm. © 2017 Nizar Tayem et al.

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