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Cholesky Factorization-Based Parallel Factor for Azimuth and Elevation Angles Estimation
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Abstract
In this paper, the problem of estimating the two-dimensional direction of arrival angles with automatic pair matching for multiple non-coherent sources is presented. The proposed method employs Cholesky factorization for a Hermitian positive-definite covariance matrix in conjunction with parallel factor (PARAFAC) and trilinear alternative least squares method. The proposed method offers several advantages compared with well-known eigenvalue decomposition (EVD)-based methods. First, it provides fast execution since Cholesky factorization requires O(n3/6) number of operations, whereas EVD requires O(n3). Second, it is suitable for hardware implementation using field-programmable gate arrays. Third, it provides significantly lower memory requirements since only the lower triangular matrix of Cholesky factorization requires to be stored. Fourth, it applies PARAFAC model to the signal space with a smaller dimension compared with the conventional PARAFAC model that is applied directly to noise data without preprocessing. Hence, the proposed method provides better performance and less computational cost and processing time compared with the conventional PARAFAC model. Computer simulation results demonstrate the effectiveness of the proposed method. © 2017, King Fahd University of Petroleum & Minerals.

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