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Range and bearing estimation for near-field sources
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Abstract
Most of the array signal processing methods for the estimation of the direction of arrival angle estimation (DOA) for multiple incident sources are based on the far-field assumption. When the sources are located close to the antenna array, these methods are no longer valid. In this paper, a new method is presented for the joint range and DOA estimation for multiple near-field sources. The proposed method proceeds in two steps. In the first step, we construct the Toeplitz matrix using only the second-order statistics and employ rank revealing QR factorization (RRQR) to estimate the DOA. In the second step, we reconstruct the Toeplitz matrix from the collection data only which is equivalent to first-order statistics and employ the RRQR to estimate the range. Compared with existing schemes, the proposed schemes provide several advantages. First, the computation of RRQR for n n . Toeplitz matrix require O(n 2) whereas the existing schemes requiring eigenvalue decomposition (EVD) or singular value decomposition (SVD) for an nXn cross spectral matrix. However using SVD or EVD require much more computational complexity O(n 3). Second, the proposed method is more suitable for high speed communication since it requires second or first order statistics and a single snapshot. However, the existing method involves multidimensional research or high order statistics which increase the complexity and computational load further. Third, the proposed method does not require any pair matching for the range and DOA for multiple sources. The simulation results verify that the proposed method provide good performance with less computational complexity. ©2010 IEEE.

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