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Reduced-Complexity Direction of Arrival Estimation with Centro-Symmetrical Arrays and Its Performance Analysis

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Abstract

A fast algorithm is proposed to *dramatically* reduce the computational complexity of the multiple signal classification (MUSIC) algorithm for direction-of-arrival (DOA) estimate using a centro-symmetrical array (CSA). The CSA is divided into two sub-arrays and a real matrix is constructed with the covariance matrices of the two sub-arrays and their cross-correlation ones. This real matrix is further regarded as the data covariance one observed by a virtual array which has a real array response, and a novel MUSIC-like cost function is derived accordingly. In the developed method, only real-valued computation is required and the spectral search is compressed into half of the total angular field-of-view. Furthermore, the dimensions of noise subspace and those of search vector are both reduced, leading to about 97% complexity reduction as compare to MUSIC. The non-asymptotic statistical performance of the new DOA estimator is analyzed and a closed-form ex-

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