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Parallel TSQR-TLS and QR-TLS factorization for joint time delay and frequency estimation

(2013) *Conference Record - Asilomar Conference on Signals, Systems and Computers*, art. no. 6810258, pp. 195-199. Cited 1 time.

Abstract

In this paper we present two methods for joint estimation of time of arrival (TOA) and frequency of arrival (FOA) for multiple incident sources based on the subspace decomposition techniques called QR-TLS and TSQR-TLS. The proposed methods employ a pair of spatially separated sensors to receive the multiple incident source signals. A data matrix is constructed in a form of a Henkel matrix from the multiple snapshot of the received signal. The information of both TOA and FOA of the multiple incident sources is extracted from the data matrix by applying QR technique in the first method and a recent idea of tall skinny QR (TSQR) factorization in the second method. The estimates of the TOA and FOA are obtained from the signal subspace by applying total least squares (TLS) method. The simulation results are presented to assess the performance of the proposed method. The effect of parametric variations on the performance has also been analyzed. Further, the computational times of the proposed methods are also compared with each other. © 2013 IEEE.

2-s2.0-84901271356

Document Type: Conference Paper

Publication Stage: Final

Source: Scopus