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Editorial

Potential Problems in Emerging Applications of Sparse Arrays 2021

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Sparse arrays, such as coprime array and nested array, can provide enlarged aperture, enhanced spatial resolution, increased degrees of freedom (DOFs), and reduced mutual coupling, which has been considerably attractive to improve active and passive sensing in radar, navigation, underwater acoustics, and wireless communications. However, the emerging applications of sparse array also bring a series of potential problems.

The special issue focuses on recent advances in application to radar and direction position determination, array geometry optimization for high accuracy DOA estimation, off-grid solutions to super-resolution, and multidimensional sparse array signal processing joint estimation. It contains six papers, the contents of which are summarized as follows.

In the study of application to radar and direction position determination, Y. Qian et al. utilize augmented coprime array for increased degree of freedom and extended array aperture and propose optimal weighting subspace data fusion (OW- SDF) algorithm and SNR weighting subspace data fusion (SW- SDF) algorithm to improve the accuracy of direct position determination in "Direct Position Determination for Augmented Coprime Arrays via Weighted Subspace Data Fusion Method."

B. Liu et al. propose a low complexity unitary estimating signal parameter via rotational invariance techniques (ESPRIT) algorithm for angle estimation in bistatic multiple-input-multiple-output (MIMO) radar in "Computationally Efficient Unitary ESPRIT Algorithm in Bistatic MIMO Radar."

In the area of array geometry optimization for high accuracy DOA estimation and off-grid solutions to super-resolution, Y. Zhang et al. propose a novel generalized nested MIMO radar by utilizing extended two-level nested array (ENA) as transmitter and receiver and adjust the interelement spacing of the receiver with an expanding factor in "DOA Estimation of a Novel Generalized Nested MIMO Radar with High Degrees of Freedom and Hole-Free Difference Coarray." B. Zhu et al. present a sparse nested array (SNA) for electromagnetic vector sensor with extended array aperture and reduced mutual coupling effect and obtain joint direction of arrival (DOA) and polarization estimates by an improved off-grid orthogonal matching pursuit method in "Electromagnetic Vector Sparse Nested Array: Array Structure Design, Off-Grid Parameter Estimation Algorithm."

Regarding multi-dimensional sparse array signal processing, S. Chen et al. propose a joint angle and frequency estimation method based on covariance reconstruction and obtain the estimation of signal parameters via rotational invariance techniques (CR-ESPRIT) in "Joint Angle and Frequency Estimation in Linear Arrays Based on Covariance Reconstruction and ESPRIT." L. Gong et al. use two antennas to receive impinging signals and utilize the conjugate symmetry characteristic of the delay matrices to extend the sample points as well as the number of clusters and obtain TOA estimates with low computational complexity by transforming the two-dimensional (2D) spectral search to one-dimensional (1D) searches in "Joint TOA and DOA

Estimation for UWB Systems with Antenna Array via Doubled Frequency Sample Points and Extended Number of Clusters."

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Conflicts of Interest

The guest editors declare that they do not have conflicts of interest regarding the publication of the special issue.

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