

A Generalized Sparse Bayesian Learning Algorithm for Near-Field Synthetic Aperture Radar Imaging: By Exploiting Improprity and Noncircularity

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Abstract : The near-field synthetic aperture radar (SAR) imaging is an advanced nondestructive testing and evaluation (NDT&E) technique. This paper investigates the complex-valued signal processing related to the near-field SAR imaging system, where the measurement data turns out to be noncircular and improper, meaning that the complex-valued data is correlated to its complex conjugate. Furthermore, we discover that the degree of improprity of the measurement data and that of the target image can be highly correlated in near-field SAR imaging. Based on these observations, A modified generalized sparse Bayesian learning algorithm is proposed, taking improprity and noncircularity into account. Numerical results show that the proposed algorithm provides performance gain, with the help of noncircular assumption on the signals.

Keywords : complex-valued signal processing, synthetic aperture radar, 2-D radar imaging, compressive sensing, sparse Bayesian learning

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