

3D Interferometric Imaging Using Compressive Hardware Technique

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Abstract : In this article, inverse synthetic aperture radar (ISAR) is combined with compressive imaging techniques in order to perform 3D interferometric imaging. Interferometric ISAR (InISAR) imaging relies on a two-dimensional antenna array providing diversities in the elevation and azimuth directions. However, the signals measured over several antennas must be acquired by coherent receivers resulting in costly and complex hardware. This paper proposes to use a chaotic cavity as a compressive device to encode the signals arising from several antennas into a single output port. These signals are then reconstructed by solving an inverse problem. Our approach is demonstrated experimentally with a 3-elements L-shape array connected to a metallic compressive enclosure. The interferometric phases estimated from a unique broadband signal are used to jointly estimate the target's effective rotation rate and the height of the dominant scattering centers of our target. Our experimental results show that the use of the compressive device does not adversely affect the performance of our imaging process. This study opens new perspectives to reduce the hardware complexity of high-resolution ISAR systems.

Keywords : interferometric imaging, inverse synthetic aperture radar, compressive device, computational imaging

Conference Title : ICR 2021 : International Conference on Radar

Conference Location : Istanbul, Türkiye

Conference Dates : September 27-28, 2021