



Through-the-wall radar imaging exploiting Pythagorean apertures with sparse reconstruction



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ABSTRACT

Through-the-wall radar imaging (TWRI) is receiving a considerable attention recently due to its diverse applications. One of the impinging challenges is the multipath propagation from the surrounding environment and even targets themselves. Multipath propagation produces ghost targets which populate the scene and not only create confusion with genuine targets but deteriorate the performance of compressive sensing (CS) algorithms. Unlike genuine targets, ghost locations are aspect dependent. Successful exploitation of this feature is dictated by the subarray selection modality. Up to this far, random multiple subarrays selection is the practice in exploiting aspect dependence. This paper suggests new subarray configurations based on Pythagorean triple which is made of pairwise coprime numbers that can enhance ghost suppression process and improve image resolution. The sensing matrices of the proposed subarrays are developed and analyzed. The paper investigates the effectiveness of generating the images from all the elements in the array as opposed to generating the images by processing designed subarrays individually and then combining the results. This comparison is done in view of multipath ghost suppression exploiting aspect dependence feature. Results based on synthesized data and electromagnetic propagation simulator show the effectiveness of the proposed arrays.

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