

Polarimetric and Indoor Imaging Fusion Based on Compressive Sensing

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Project Summary:

The objective is to provide efficient image formation framework for Through-the-Wall Radar Imaging (TWRI) based on compressive sensing (CS). This framework applies the multiple measurement vector (MMV) approach. Several data measurements of common sensing topologies, such as frequencies and antenna positions, can be used for effective sparse data recovery and accurate reconstruction of the real scenes.

The research will lead to 1) imaging of indoor scenes behind various types of walls using far fewer measurements, 2) utilization of polarimetric data, underlying target polarization signatures, for improved target detection and localization, when applying compressive sensing, 3) effective integration of multi-viewing data, obtained by placing the imaging system at different positions, to yield enhanced imaging performance within the compressive sensing framework, 4) reduction of the sparsity of scenes that house spatially extend targets, such as interior walls and large furniture items. The above four capabilities are key to developing a reliable, efficient, and fast-acquisition system, whether the system is applying time-pulse or stepped-frequency sensing schemes. They address tangible features and real opportunities for the radar system designer and operator to utilize saddle properties of target RCS variations with frequency, polarization, and aspect angles.