Multipath Exploitation and Knowledge Based Urban Radar Imaging using Compressive Sensing

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Project Summary

The objective of this research is to utilize the emerging Compressive Sensing (CS) techniques to achieve fast data acquisition in wideband ground-based and airborne radar imaging systems for urban sensing applications. The capability of CS to reconstruct a sparse signal from far fewer non-adaptive measurements provides a new perspective for data reduction in through the wall radar imaging without compromising target detection, localization or imaging quality. Towards the objective of providing persistence surveillance in urban environments, such techniques will yield reduced cost, simplified hardware, and efficient sensing operations that allow fast super-resolution imaging of sparse scenes, thereby culminating in quick turnaround actionable intelligence.

The research will develop modeling of target multipath and algorithms for urban imaging which will be both integrated with CS methods. This will lead to 1) Effective utilization of prior information of the target frequency-dependent radar cross section (RCS) to guide the CS data selection schemes; 2) Mitigation of clutter and stationary targets through conversion of populated scenes to sparse scenes based on Moving Target Indication techniques; and 3) Exploitation of the rich multipath nature of the indoor environment in conjunction with CS for improved target detection and localization in sparse scene scenarios.