Plenary Talk

Recent Advances in Radar Imaging of Building Interiors

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Presented by

Moeness Amin, *Villanova University*

Abstract

The objectives of “seeing” through walls include the determination of the building layouts, discerning the intent of activities inside the building, or locating, tracking, and imaging of building interiors. These three areas of attributes are highly desirable for a range of applications including police, fire and rescue, first responder, and military applications. Although radio frequency is the modality of choice for these applications, it is well known that electromagnetic waves passing through a medium are subject to amplitude and phase distortion, rendering imaging through walls a complex and difficult problem that requires cross-disciplinary research in electrical engineering. Fundamentally, it is a hybrid between two main areas, statistical and array signal processing on one hand and antennas and electromagnetics on the other. There are many challenges facing through-the-wall radar imaging system development, namely, the system should be reliable, portable, light weight, small-size, and has both short acquisition time and set-up time. The system performance should be robust to ambiguities and inaccuracies in wall parameters and should properly function under non-uniform wall, multiple walls, and operator motion. Ultimately, the system should have high range and cross-range resolutions that are application specific. Finally, it must be able to detect and classify motions in the presence of heavy clutter, which may include interior back and side walls, water pipes, electrical cords, and various types of furniture items. In this talk, we discuss recent advances in through wall radar imaging and present several successful examples in imaging and indoor target tracking. We also numerate existing difficulties and the continued challenges facing this technology.