The DARPA VisiBuilding Program

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ABSTRACT

The Defense Advanced Research Projects Agency (DARPA) is actively performing sense-through-wall research through the VisiBuilding program. The ultimate desire of through-wall sensing is to provide detailed information in areas that cannot be seen through conventional measures. Borrowing from successes in geological and medical imaging environments, researchers have attempted to apply radio frequency (RF) and other sensing modes to penetrate wall materials and make intelligent decisions about the contents of rooms and buildings. The DARPA VisiBuilding program is developing knowledge-deriving architectures for providing: 1) a detailed understanding of the building structure to provide actionable information on building layouts, and provide reasonable floor plans of the structure, 2) detection and localization of anomalous quantities of materials within the building structure, and 3) detection and localization of people within a building. VisiBuilding research is focused on exploiting propagation and backscatter off urban structures, developing operational concepts for sensor position and utilization, and deriving model-driven algorithms that best match hypothesized structural models with the actual sensed data. Electromagnetic propagation modeling of building structures has shown the ability to identify and characterize key structural features upon which more complete building models can be inferred. Sensor architectures are being developed to provide the aspect and frequency diversity to pull these structural components out form the extensive multipath interference, and new signal processing algorithms and model-based reasoning approaches have shown great promise in sensing through buildings layer by layer. This talk will focus on key VisiBuilding developments and important new directions for future research in this exciting interplay between electromagnetic propagation, signal processing, and knowledge-based reasoning algorithms.