Project title: Microwave imaging based on RFID network

Brief Description of Design Project Goals:

Overview: The overall goal of the project is to use the commercial RFID system to perform microwave imaging in a specific capture volume, where the reader and tag antennas can be regarded as the observation points. As the RFID tag is very low cost (<$0.1), many tags can be profusely and redundantly deployed to provide the necessary spatial diversity in any imaging methods. From the multiple-input-multiple-output (MIMO) network point of view, the scatterer shape and location can be derived from the collected line-of-sight and multi-path signal profiles. The design project will start from configuring and programming the commercial RFID readers and tags to build a MIMO network, and use the extracted matrices of magnitudes and phases for still imaging. Applications derived from this technology include Internet of Things (IoT), smart buildings, body imaging, and covert object recognition.

Specific MEng Contribution: The students will start from programming the commercial UHF RFID reader to retrieve the magnitude and phase of the MIMO setup and perform signal analysis to enhance the signal-to-noise radio and the derived objection location and shape. The high-level software program will first treat the hardware RFID system as a black-box network device which can be gradually explored by the students along the development path to extract the channel characteristics. The choice of the SDK is flexible, including C/C++, Python, LabVIEW, and Matlab.

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Number of MEng Students Needed: 2 - 3

Required Skills: Programming in Windows or Linux environment and basic signal processing algorithms. Knowledge for RF systems will be appreciated, but not required.

Estimated Project Time Frame:

2018-19 Academic Year, Two (2) Semesters