**Reconfigurable array based compressive sensing millimeter wave system**

Min Liang[(1)], Ying Li[(1) (2)], Mark A. Neifeld[(1)] and Hao Xin*[(1)]
(1) Department of Electrical and Computer Engineering, University of Arizona, Tucson, AZ 85721 USA
(2) Department of Electrical and Computer Engineering, University of Science and Technology of China, Hefei, China

The theory of compressive sensing tells us that one can recover certain images or signals from much smaller number of measurements than conventional sampling approach when the signal is sparse in certain basis. The fundamental idea behind compressive sensing is that rather than sampling at high rate first and then compressing the sampled data, it would be much better to directly sample the data in a compressed format. The techniques for compressive sensing has been experiencing rapid growth in recent years and attracted much attention in electrical engineering, optics, signal processing, statistics and computer science.

In this work, a design of Fisher Linear Discriminant (FLD) algorithm based millimeter wave imaging system for threat object detection is investigated. FLD algorithm is used to obtain the projection patterns to distinguish the threat objects and non-threat objects. A reconfigurable array is used to realize the required projections patterns. An iterative beam synthesis process is used to obtain the amplitude and phase distribution of the reconfigurable array to realize the projection patterns required by FLD algorithm. By measuring the reflected signal of the projection pattern, one can distinguish the threat objects and non-threat objects. Figure 1 plots the simulated receiver operating characteristic (ROC) curves of a gun detection system with different SNR. Compared to conventional approach for threat objects detection from an image, this FLD based detection method does not require full reconstruction of the entire image of the object and the number of measurements is therefore much smaller.

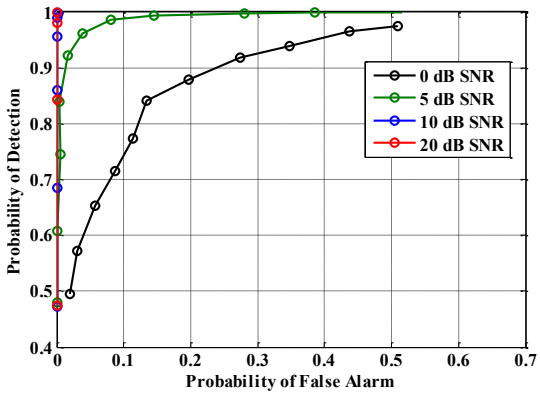


Figure 1. Simulated receiver operating characteristic (ROC) curves of a gun threat detection system.