Passive Bistatic and Multistatic Radar Using WiMAX Signals of Opportunity

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Experiments were recently conducted at the Naval Research Laboratory to investigate the utility of commercial WiMAX signals used as radar waveforms in passive bistatic and multistatic configurations. Three WiMAX towers near the Naval Research Laboratory were utilized as non-cooperative transmitters and bistatic returns from nearby moving targets of opportunity were received. Data was collected in a bistatic configuration using a single WiMAX signal and in a multistatic configuration using WiMAX signals from two different towers. The direct path of the signal transmitted from each of the WiMAX towers was recorded and used for processing bistatic returns that were collected with a third receiver. The received data was processed using quasi-fast-time matched filtering, clutter cancellation, and a multistatic backprojection algorithm. Multistatic backprojection aids in combining and producing a composite picture from multiple transmitters.

This talk discusses the utility of WiMAX waveforms for passive radar as well as signal processing approaches to overcome the delay and Doppler ambiguity associated with communications waveforms. Quasi-fast-time matched filtering with fast-time windowing is offered as a means to overcome the velocity ambiguities associated with the structure of WiMAX waveforms. Deterministic and adaptive clutter cancellation techniques are used to reduce contributions from stationary scatterers and interference from the direct path. Bistatic and multistatic experimental results are presented to demonstrate the efficacy of the proposed techniques.

The concept of applying backprojection imaging techniques to detect moving targets will be introduced in the context of the passive multistatic experiments. A companion talk entitled “Multistatic Velocity Backprojection for Simulated and Experimental Multistatic Radar Data” will discuss this approach in greater detail.

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