

Improvement in detection with forward scattering radar

ABSTRACT

Forward scattering radar (FSR) has advantages over traditional monostatic radar such as an enhanced radar cross section. Enhancement of the radar cross section can increase the detection range of the FSR system. This feature has renewed interest in FSR. The latest development of the FSR system for ground application does not consider a rough environment and there is no advanced signal processing technique for the detection procedure, which have delayed the deployment of FSR. Therefore, this paper analyzes a signal processing technique that extracts the Doppler signal scattered from a moving target under the influence of ground clutter, receiver noise and surrounding noise. The scattered Doppler signal is processed for target detection. Two methods, namely the use of the Hilbert transform and wavelet technique, are evaluated. Results show that target detection using a Hilbert transform is applicable only for certain conditions but target detection employing the wavelet technique is more robust against clutter and noise. An inclusive comparison of various wavelet threshold selection rules for different types of wavelet filters and levels of decomposition is conducted to study the effect on target detection with FSR. Two sets of field experiments were carried out to validate the proposed method, and target signals under the influence of large clutter were successfully detected using the proposed method with a confidence level exceeding 75%.

Keyword: Forward scattering radar; Signal denoising; Automatic target detection