Identification Of LPI Radar Signals By Higher Order Spectra And Neural Network Techniques

Abstract

LPI radars use continuous wave, wide bandwidth low power signals of the order of a few watts making its detection difficult. The important advantage of LPI radar is to go undetected, while maintaining a strong battlefield awareness. Common spectral analysis and conventional methods fail to detect emissions of LPI radars and even normal radars in noisy environments. This leads us to use higher order spectral analysis (HOSA) techniques enabling us to extract much more information from the same intercept and hence facilitating detection. This paper reports the results of HOSA techniques (bi-spectrum, bi-coherence and tri-spectrum) and artificial neural networks (ANNs), applied to LPI radar signals. Bi-phase Barker coded signals of different lengths, P1, P2, P3 and P4 polyphase coded signals and Frank signal are analysed using HOSA techniques to produce 2-D signatures of these signals. An artificial neural network (ANN) is trained on these signatures so that it will be able to detect and identify the LPI radar signal whose type is unknown when received. The results obtained clearly indicate the promising capability of these techniques to identify the type of LPI signal even with SNRs as low as -3 dB.

Keywords

Spectral analysis
Emitter identification
Artificial neural networks
Back-propagation
Communication technology
Higher order
HOSA
Low probability of intercept radar