

Optimization of Radar Waveforms using Ant Colony Optimization Algorithm

Catherine Onyango¹, Kibet Langat¹ and **Stephen Musyoki^{2*}**

¹ Jomo Kenyatta University of Agriculture and Technology (JKUAT), Kenya

^{2*} **Department of Electrical Engineering, Technical University of Kenya**

Abstract

Radars require highly optimized transmitted waveforms to achieve high levels of accuracy of the target measurements. Pulse compression is usually applied to achieve high resolution of these waveforms. Linear Frequency Modulated (LFM) wave forms are the most popular pulse compressed signals used in radar applications. However, the auto-correlation functions of these LFM signals exhibit high side lobe levels that lead to masking of small targets in proximity of larger targets. It is thus necessary to reduce these side lobes to a minimum. This paper develops a new window optimized using the Ant Colony Optimization algorithm and uses it to reduce the peak side lobe ratio and the integrated side lobe ratio of the LFM signals. The results obtained are compared to those obtained using the Hamming, Hann, Bartlett and the Gaussian windows where the new window is found to outperform all the existing windows tested. The effect of this reduction on the main lobe width of the signal is also analyzed. The slightest reduction in side lobes is expected to improve the signal-to-noise ratio.

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