Radar Cross Section Control of Metallic Targets Using Physical Optics and Genetic Algorithms

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Abstract

We propose a method to minimize the radar cross section (RCS) of large metallic targets using physical optics and shape optimization based on genetic algorithms. In order to compute the RCS of the target, its surface is discretized into triangular patches. The physical optics scattering from a metallic triangular patch is known analytically. The scattered electric field is computed at the observation point using superposition. The genetic algorithm is then used for the shape optimization within applicable geometrical constraints. As a simple example, the radar cross section of a small metallic target is examined in Fig. 1 at 10 GHz and 10 degree grazing angle. The RCS of the original design is shown in the lower part while its RCS after shape reconfiguration with genetic algorithm is shown in the upper part. It is observed that the peak and the average backscattered RCS have been reduced considerably. We are also including the triangular impedance patches in the code to account for the coated metals.

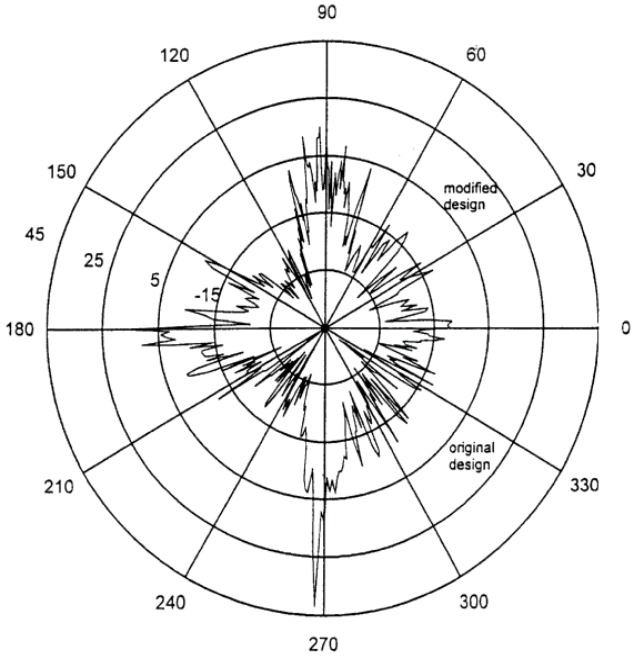

Fig. 1 - Comparison of the RCS before and after shape optimization.