IMAGE RECONSTRUCTION OF IMPENETRABLE CYLINDERS USING CUBIC B-SPLINES AND GENETIC ALGORITHMS

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We discuss a new method for the shape reconstruction of perfectly conducting cylinders from measured radar scattering data. The method is based on modeling the perimeter of the cylinders by uniform cubic B-splines. With an appropriate choice of the number of control points, smooth curves as well as sharp edged contours can be modeled. The direct problem is formulated by an integral equation approach and numerically solved by the method of moments. The inverse problem is formulated based on an optimization of the spatial coordinates of the control points corresponding to the optimal shape matching the measured scattered data. A simple genetic algorithm is applied for the inversion of the measured data. We apply the proposed algorithm to the inversion of measured data obtained from radar measurements of real targets. The performance of the method is examined in the presence of noise, as well as in a limited angular view.

ROBUST ESTIMATION OF TARGET ORIENTATION FROM SCATTERING DATA USING A GENERALIZED REGRESSION NEURAL NETWORK (GRNN)

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We propose a new method for the robust estimation of target orientation using measured radar cross-section data. The method is based on a Generalized Regression Neural Network (GRNN) scheme. GRNN belongs to the family of radial basis neural networks. It is a memory based network which provides estimates of continuous variables and converges to the underlying optimal linear or nonlinear regression surface.

The network is trained by the FFT modulus of bistatic radar cross-section data sampled at the receiver positions for all angles of incidence. Noisy data, produced by displacing the receivers, were added to the training data set to enhance the robustness

of the method. The target value to be trained was the angle between the target orientation and the incident wave. Numerical results based on simulated and actual measurements are presented and the system robustness is verified against measurement noise, sensor misplacements, target deformations, and frequency scaling.