Application of Stochastic Optimization Methods to the Inverse Scattering of 2-Dimensional Scatterers

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The application of stochastic optimization techniques for the reconstruction of 2-dimensional scatterers by the scattered fields is studied in the paper. The method of moment (MOM) used in the frequency domain and finite-difference time-domain (FDTD) technique is employed for electromagnetic analyses for both the forward and inverse scattering problems, while the reconstruction problem is transformed into optimization one during the course of inverse scattering. Then, four techniques including particle swarm optimization (PSO), asynchronous PSO (APSO), dynamic differential evolution (DDE) and self-adaptive DDE (SADDE) are applied to reconstruct the locations and shapes of buried conducting cylinders or the permittivities of buried inhomogeneous dielectric cylinders. The statistical performances of these algorithms are compared. The results show that SADDE outperforms PSO, APSO and DDE in terms of the ability of exploring the optima. However, these results are considered to be indicative and do not generally apply to all optimization problems in electromagnetics.