

Optimal Relaxation Parameters for Obtaining Efficient Iterative Methods for the Solution of Electromagnetic Scattering Problems

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Abstract : The approximate solution of a time-harmonic electromagnetic scattering problem for inhomogeneous media is required in several application contexts, and its two-dimensional formulation is a Fredholm integral equation of the second kind. This integral equation provides a formulation for the direct scattering problem, but it has to be solved several times also in the numerical solution of the corresponding inverse scattering problem. The discretization of this Fredholm equation produces large and dense linear systems that are usually solved by iterative methods. In order to improve the efficiency of these iterative methods, we use the Symmetric SOR preconditioning, and we propose an algorithm for the evaluation of the associated relaxation parameter. We show the efficiency of the proposed algorithm by several numerical experiments, where we use two Krylov subspace methods, i.e., Bi-CGSTAB and GMRES.

Keywords : Fredholm integral equation, iterative method, preconditioning, scattering problem

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