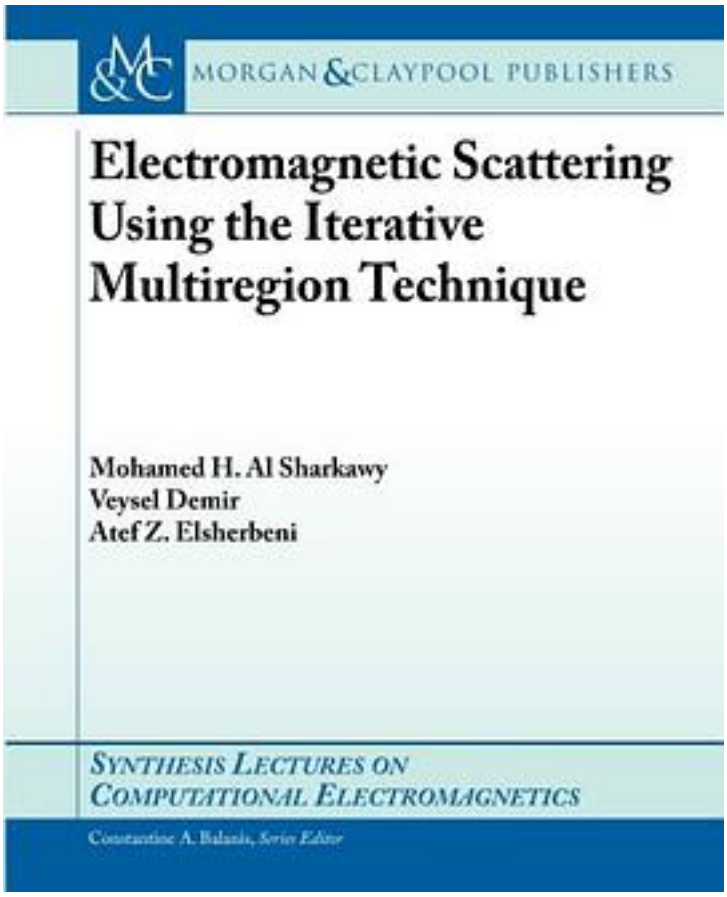
Electromagnetic Scattering Using the Iterative Multiregion Technique



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In this work, an iterative approach using the finite difference frequency domain method is presented to solve the problem of scattering from large-scale

electromagnetic structures. The idea of the proposed iterative approach is to divide one computational domain into smaller subregions and solve each subregion separately. Then the subregion solutions are combined iteratively to obtain a solution for the complete domain. As a result, a considerable reduction in the computation time and memory is achieved. This procedure is referred to as the iterative multiregion (IMR) technique. Different enhancement procedures are investigated and introduced toward the construction of this technique. These procedures are the following: 1) a hybrid technique combining the IMR technique and a method of moment technique is found to be efficient in producing accurate results with a remarkable computer memory saving; 2) the IMR technique is implemented on a parallel platform that led to a tremendous computational time saving; 3) together, the multigrid technique and the incomplete lower and upper preconditioner are used with the IMR technique to speed up the convergence rate of the final solution, which reduces the total computational time. Thus, the proposed iterative technique, in conjunction with the enhancement procedures, introduces a novel approach to solving large open-boundary electromagnetic problems including unconnected objects in an efficient and robust way.

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