Communication

FMM-Accelerated Source-Model Technique for Many-Scatterer Problems

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***Abstract*—Motivated by the lack of scalability of the source-model technique (SMT) to many-scatterer problems, a new SMT-based method for 3-D many-scatterer problems is developed. The large time complexity of the SMT is reduced by deriving an implicit compact representation of the scattering problem via a fast multipole formulation, which divides the interactions into far and near ones while grouping and approximating the far interactions. This results in significant acceleration of classical SMT, which is demonstrated in a variety of 3-D many-body scattering problems. The improvement is notable already at the minimal number of unknowns necessary, and grows with the size of the problem.**

***Index Terms*—Computational electromagnetics, fast multipole method, frequency domain analysis, source-model technique (SMT).**

SMT impractical for problems with large N, such as many-scatterer problems.

In this communication, we accelerate the SMT for many-scatterer problems by incorporating a fast multipole formulation. Our method, the fast multipole SMT (FMSMT), retains the advantages of SMT while providing a more efficient representation of the impedance matrix. As in the FMM, far fields that are similar enough are grouped together and approximated, while near fields are computed directly. This minimizes the redundancies inherent to SMT formulations of many-scatterer problems. We establish the FMSMT as an attractive tool for solving many-scatterer problems by presenting a collection