Abstracts

A Block Iterative Technique to Expand MMP's Applicability to EM Problems of Higher Complexity

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The present multiple multipole (MMP) approach exhibits limitations with problems of higher complexity. Its dense and strongly overdetermined system of equations is badly conditioned even for smaller problems such that only expensive, more stable QR decomposition methods can generally be applied. With growing complexity and size of the problem, the matrix often becomes near-rank deficient. Additionally, the performed row and column weighting is unsatisfactory if the averaged power density values vary strongly throughout the boundaries. Some of these limitations can be avoided by using the iterative technique introduced here. It is shown that these systems of equations can easily be built and partitioned according to physical considerations in such a way that diagonally dominant block matrices are obtained. For many problems, a few block Gauss-Seidel or successive block overrelaxation (SBOR) steps produce a sufficiently converged solution. Even more significant than the numerical advantage is the fact that this technique opens new possibilities for the modeling and the validation of solutions and therefore considerably facilitates and extends the applicability of the MMP code to a larger spectrum of problems. Furthermore, the alternating procedure presents new possibilities for directly coupling MMP with other codes, such as finite difference (FD) and method of moments (MoM).

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