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The Characteristic Basis Function Method (CBFM): A Numerically Efficient Strategy for Solving Large Electromagnetic Scattering Problems

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Abstract: The objective of this paper is to describe a numerically efficient strategy for solving large electromagnetic scattering problems. This novel approach, termed as the Characteristic Basis Function Method (CBFM), is based on utilizing Characteristic Basic Functions (CBFs)-special functions defined on macro domains (blocks)-that include a relatively large number of conventional sub-domains discretized by using triangular or rectangular patches. The CBFs can be derived either analytically (from PO solutions), or by applying the conventional MoM. Use of these basis functions leads to a significant reduction in the number of unknowns, and results in a substantial size reduction of the MoM matrix. This, in turn, enables us to handle the reduced matrix by using a direct solver, without the need to iterate. Numerical results that demonstrate the accuracy and time efficiency of the CBFM for several representative scattering problems are included in the paper.

Key Words: Characteristic Basis Functions, Method of Moments, Electromagnetic Scattering, Radar Cross Section, Electrically Large, Integral Equation Method, High-Frequency, Spectral Domain

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