Solution of volume-surface integral equations using higher-order hierarchical Legendre basis functions

The problem of electromagnetic scattering by composite metallic and dielectric objects is solved using the coupled volume-surface integral equation (VSIE). The method of moments (MoM) based on higher-order hierarchical Legendre basis functions and higher-order curvilinear geometrical elements is applied to transform the VSIE into a system of linear equations. The higher-order MoM provides significant reduction in the number of unknowns in comparison with standard MoM formulations using low-order basis functions, such as RWG functions. Due to the orthogonal nature of the higher-order Legendre basis functions the continuity condition at the interface between metal and dielectric can be satisfied explicitly, which further reduces the number of unknowns as well as improves the accuracy of the solution. Numerical results for a metallic sphere with dielectric coating show excellent agreement with the analytical Mie series solution. Scattering by more complex metal-dielectric objects are also considered to compare the presented technique with other numerical methods.

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