
Numerical Solutions of Electromagnetic Maxwell Systems

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In this talk we will report some of our recent results about the nodal and edge finite element methods for solving the electromagnetic Maxwell systems in physical domains consisting of more than one media. Due to the jumps in the physical coefficients of the Maxwell equations across the interfaces, electric and magnetic fields may have very weak regularities in the entire domain, and the formulation of the variational problems need some special treatments to allow non-matching grids to be used in regions of different media. Some new frameworks for the convergence analysis of finite element methods and some efficient iterative methods for solving the resulting discrete systems of saddle-point type will be presented. Applications of our results for nonlinear geodynamic problem will be discussed.

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