The weighted edge finite element method for Maxwell equations with strong singularity

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Maxwell equations are used in mathematical models of electromagnetic fields, for example, in plasma physics, electrodynamics and engineering of high-frequency devices. As a rule, in practical problems the computational domain is nonconvex with reentrant corners or edges on its boundary. Such geometry singularities leads to strong electromagnetic fields in their neighborhood, and a solution of Maxwell equations is strongly singular, i.e. it does not belong to the Sobolev space $H^1(W_2^1)$. In the present talk we develop the weighted edge finite element method (FEM) based on the conception of R_ν-generalized solution (see, example, [1-3]) of the Maxwell equations with strong singularity due to a reentrant corner on the boundary. Numerical experiments of model problems showed that the rate of convergence of the numerical solution to the exact one is more than one and a half times better in comparison with the results established in papers of other mathematicians. Another advantage of this method is simplicity of the solution determination which is an additional benefit for numerical experiments.

References:

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