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*Transformation optics based local mesh refinement for solving Maxwell's equations.*

A novel local mesh refinement algorithm based on transformation optics (TO) has been developed for solving the Maxwell's equations of electrodynamics. The new algorithm applies transformation optics to enlarge a small region so that it can be resolved by larger grid cells. The transformed anisotropic Maxwell's equations can be stably solved by an anisotropic FDTD method, while other subgridding or adaptive mesh refinement FDTD methods require time-space field interpolations and often suffer from the late time instability problem. To avoid small time steps introduced by the transformation optics approach, an additional application of the mapping of the material matrix to a dispersive material model is employed. Numerical examples on scattering problems of dielectric and dispersive objects illustrate the performance and the efficiency of the transformation optics based FDTD method. (Received September 16, 2013)