A hybridizable discontinuous Galerkin method for solving nonlocal optical response models
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We propose Hybridizable Discontinuous Galerkin (HDG) methods for solving the frequency-domain Maxwell's equations coupled to the Nonlocal Hydrodynamic Drude (NHD) and Generalized Nonlocal Optical Response (GNOR) models, which are employed to describe the optical properties of nano-plasmonic scatterers and waveguides. Brief derivations for both the NHD model and the GNOR model are presented. The formulations of the HDG method for the 2D TM mode are given, in which we introduce two hybrid variables living only on the skeleton of the mesh. The local field solutions are expressed in terms of the hybrid variables in each element. Two conservativity conditions are globally enforced to make the problem solvable and to guarantee the continuity of the tangential component of the electric field and the normal component of the current density. Numerical results show that the proposed HDG methods converge at optimal rate. We benchmark our implementation and demonstrate that the HDG method has the potential to solve complex nanophotonic problems.

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