A Discontinuous Galerkin Time Domain framework for nanoplasmonics.

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The focusing and exaltation of light that are obtained by the illumination of a nanostructured material endow the latter with a lot of appealing properties.
The corresponding applications range from nanolasers and nanoantennas to potential cancer therapy. When the nanostructuration uses metals, plasmons
(collective oscillations of the electrons in the metal) are at the heart of the process. For some configurations, experimentalists have to rely on numerical simulations before considering any costly manufacturing.

Numerical simulations are also central for physicists that try to understand the underlying phenomena in this context. Scales, geometries and physical characteristics represent serious numerical challenges. They have to be addressed by any discretization framework in order to provide reliable and accurate results. In this work, we propose a Discontinuous Galerkin Time Domain discretization framework for the numerical modelling of several classical dispersion models that come into play in nanoplasmonics.

The set of equations consists in a linear coupling between the Time Domain Maxwell's equations and PDE or ODE's that describe the reaction of the electrons in the metal. We will give some theoretical and numerical analysis results for these models and assess our numerical approach on academic and more realistic test cases.