Implementation of the Discontinuous Galerkin method in the framework of the cgFEM for the resolution of Maxwell's equations

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ABSTRACT

The resolution of physical problems involving the propagation of waves through a domain constitutes a great challenge for the field of computational mechanics due to the hyperbolic nature of the partial differential equations that govern these phenomena. The use of the Discontinuous Galerkin technique [1] in conjunction with high order interpolations has proved to be an effective alternative to model this kind of systems, since this procedure minimizes the numerical dispersion and dissipation with respect to lower-order methods [2]. By implementing this methodology within the framework of the Cartesian Grid FEM [3], it is possible to take advantage of the features of geometry independence and hierarchical structure of mesh in order to eliminate the existent problem of generating high-order geometry-conforming meshes [4] and improve the general performance of the method.

In this paper, the DG-cgFEM is developed and its application to solve Maxwell's equations in time domain is presented. The results obtained for scattering problems demonstrate that this procedure allows to effectively simulate the physical phenomenon. Likewise, additional analysis are carried out in order to determine the convergence and stability characteristics of the proposed scheme.

Acknowledgements: The authors thank the Generalitat Valenciana (PROMETEO/2016/007) and the Ministry of Economy and Competitiveness (DPI2017-89816-R) and the Ministry of Science, Innovation and Universities (FPU170/3993) of the Government of Spain for the financial support.

Keywords: *cgFEM, Discontinuous Galerkin, high order approximations, Maxwell's equations*

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