RECENTS RESULTS ON HYBRID DISCONTINUOUS GALERKIN FINITE ELEMENT METHODS

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This mini-symposium is concerned with recent progresses in the design of advanced finite element methods, such as hybrid discontinuous Galerkin methods. The interests include new formulations, numerical analysis (error estimation, convergence studies) and numerical tools for their implementations (efficient time integration, multiscale and adaptive strategies).

Discontinuous Galerkin (DG) methods are suitable alternatives for solving a wide class of engineering problems. Robustness, local conservation and flexibility for implementing *hp*-adaptivity strategies are well known advantages of DG methods stemming from the use of finite element spaces consisting of discontinuous piecewise polynomials. They can be locally conservative, and capable of dealing naturally with discontinuous physical properties.

Hybrid finite element methods are characterized by the introduction of new unknown variables, the Lagrange multipliers, defined an the edges of the elements to weakly impose continuity on the element interfaces. They combine the advantages of discontinuous Galerkin methods with the element based data structure and reduced computational cost.

Recently, hybridization techniques has been explored for a large class of DG formulations, for which their main disadvantages, a high number of globally coupled degrees of freedom and lower sparsity of the stiffness matrices, are significantly reduced. These hybrid DG formulations have improved stability, robustness and flexibility of the DG methods. In the context of hybrid DG methods, multiscale and adaptive techniques have also being devised with more flexibility of their implementations.

Keywords: finite elements, hybridization, mutiscale, adaptivity, numerical analysis

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