HDG-NEFEM with degree adaptivity for Stokes flow

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ABSTRACT

The hybridisable discontinuous Galerkin (HDG) is a new class of DG methods that is gaining popularity due to its reduced computational cost and superconvergent properties, compared to other DG methods [1, 2, 3]. The main advantages of HDG, and other DG methods, are found when a high-order functional approximation is considered. However, the potential of high-order isoparametric elements is known to be limited by the accuracy of the geometric approximation of curved boundaries [4].

This work proposes the combination of HDG and NURBS-enhanced finite element method (NEFEM) for the solution of Stokes flow problems using degree adaptivity. The ability of NEFEM to exactly represent the boundary of the domain by means of its NURBS boundary representation is used to ensure that the geometric description is independent on the degree of the polynomials used in the functional approximation. As a result, the degree adaptivity process is only driven by the error of the functional approximation and not by the error of both the functional and the geometric approximation.

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