A Hybrid High-Order method for creeping flows of non-Newtonian fluids

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Abstract :

In [1], we develop a Hybrid High-Order method for a modified Stokes problem adapted to non-Newtonian fluids. It is a generalization of the Hybrid High-Order methods implemented to the nonlinear elasticity problem in [2] and to the Navier-Stokes problem in [6] based on the works [3, 4]. The space discretization hinges on local reconstruction operators from hybrid polynomial unknowns at elements and faces. The proposed method has several assets: it is able to handle general polyhedral meshes possibly containing nonmatching interfaces, it allows arbitrary approximation orders, it has a dimension-independent implementation, it allows seamless treatment of nonconforming mesh refinement, it offers stability for inf-sup condition. We gives a detailed error estimate in Sobolev-like norms using a discrete Korn's inequality on broken polynomial spaces for the non Hilbertian case. For the sake of simplicity, we will focus on the power-law fluids since their shear stress-strain rate function verifies the assumptions required to obtain the error estimate.

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