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PRELIMINARY RESULTS OF A DISCONTINUOUS GALERKIN IMMERSED BOUNDARY METHOD COMBINING PENALIZATION AND ANISOTROPIC MESH ADAPTATION

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Immersed Boundary Methods (IBM) are nowadays an attractive alternative to the classical body-fitted approach, mainly because they greatly simplify the mesh generation process, especially in the case of flows with moving boundaries. In these methods, the simulation of a flow with immersed boundaries is carried out on a mesh that covers the entire domain, not conforming to the geometry of the immersed boundaries. A modification of the equations in the vicinity of the bodies is then needed to incorporate the boundary conditions.

We propose an IBM in which the wall boundary conditions are taken into account through the addition of a source term to the Navier-Stokes equations, with a penalization technique. The accuracy of the definition of the solid boundaries, localized via a level set method but not explicitly discretized, is then improved combining anisotropic mesh adaptation and unstructured simplicial meshes.

The method was already proposed by some of the authors for a Finite Element (FE)/Finite Volume (FV) scheme [1] and Residual Distribution Schemes (RDS) [2] while it is now extended to the Discontinuous Galerkin (DG) context. Results on classical two- and three-dimensional test cases will be presented to show the promising features of the method.

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