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An adaptive isogeometric model based on the immersed boundary method

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One of the important research focuses in isogeometric analysis is an accurate representation of computational domains in numerical simulations. The immersed boundary method allow us to go beyond restrictive 4-sided tensor product domains and develop more complex single patch geometries. Following the formulation presented in [1] the derived simulation method is free of user defined penalties and stabilization parameters, and the final system of equations is symmetric for symmetric problems. A small number of additional degrees of freedom (DOF) is introduced along the domain boundary to impose weak boundary conditions. The method also allows us to design trimmed geometries, thus further expanding the practicability of the model.

The immersed formulation can be defined on splines over regular triangulations as well [2]. Adaptivity of the mesh is achieved by employing hierarchically nested sequence of splines spaces, together with a posteriori error estimators and automatic local refinement strategies [3].

Several numerical examples demonstrate the optimal convergence of the adaptive scheme.

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