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On the robustness of a hybridizable discontinuous Galerkin method for curved domains

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Abstract

A technique for solving Dirichlet-boundary value problems in curved domains was introduced in [1] for the pure diffusive case. The domain is approximated by a polygonal subdomain and the boundary condition is transferred to the computational boundary by using suitable defined extension operators. Since the computational domain is polygonal, a hybridizable discontinuous Galerkin method (HDG) was implemented to approximate the solution. Later, [2] obtained optimal error estimates for this technique under assumptions on the distance, d, between the boundary and the computational domain. In this work we present numerical evidence suggesting that, if d is of order $h/(k+1)^2$, the method is robust with respect to the meshsize h and the polynomial degree k. In addition, for convection-diffusion problems, the method is also robust if d is of order $\min\{h, Pe^{-1}\}/(k+1)^2$, where Pe is the Péclet number.

Key words: hybridizable discontinuous Galerkin, curved domains

Mathematics subject classifications: 65N30

References

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