Superconvergence in a DPG method for an ultra-weak formulation

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Abstract

In this work we study a DPG method for an ultra-weak variational formulation of a reaction–diffusion problem. We improve existing a priori convergence results by sharpening an approximation result for the numerical flux. By duality arguments we show that higher convergence rates for the scalar field variable are obtained if the polynomial order of the corresponding approximation space is increased by one. Furthermore, we introduce a simple elementwise postprocessing of the solution and prove superconvergence. Numerical experiments indicate that the obtained results are valid beyond the underlying model problem.

Keywords

DPG method, Ultra-weak formulation, A priori análisis, Duality arguments, Postprocessing solutions, Superconvergence