hp GOAL ORIENTED A POSTERIORI ERROR ESTIMATES IN HIGH ORDER dG APPROXIMATION OF ELLIPTIC PROBLEMS

Igor Mozolevski *

Resumo

Discontinuous Galerkin (dG) finite element approximations of elliptic problems use jump penalty techniques to weakly enforce continuity of piecewise smooth functions across interfaces. To ensure the discrete stability of the method the penalty term must depend on the approximation order, so the bilinear form is p–dependent. The dual-weighted residual (DWR) error estimates applied to such discretization are also p–dependent that can limit the convergence of the error estimate. Different variants of DWR error estimates have recently been developed to account for such dependency [1]. In this presentation we develop local and global hp error estimates for symmetric version of dG method. Error analysis is based on a new error representation, introduced in [2], that not includes jump penalization and therefore is not p–dependent. We prove that the global and local goal-oriented error estimate converge with the optimal order and confirm the theoretical rate of convergence by numerical experiments. The result can be extended to another type of high-order dG Interior Penalty methods that make use of jump penalization such as Bassy and Rebay, Baumann-Oden and Local Discontinuous Galerkin methods.

Referências

[1] H. A. Carson, D. L. Darmofal, M. C. Galbraith, and S. R. Allmaras. Analysis of output-based error estimation for finite element methods. *Appl. Numer. Math.*, 118:182–202, 2017.

[2] I. Mozolevski and S. Prudhomme. Goal-oriented error estimation based on equilibrated-flux reconstruction for finite element approximations of elliptic problems. *Comput. Methods Appl. Mech. Engrg.*, 288:127–145, 2015.

*Departamento de Matemática, UFSC, SC, Brasil, igor.e.mozolevski@gmail.com