Mathematics > Numerical Analysis

A posteriori error estimator based on gradient recovery by averaging for convection-diffusion-reaction problems approximated by discontinuous Galerkin methods

Emmanuel Creusé (INRIA Lille - Nord Europe), Serge Nicaise (LAMAV)

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We consider some (anisotropic and piecewise constant) convection-diffusion-reaction problems in domains of R2, approximated by a discontinuous Galerkin method with polynomials of any degree. We propose two a posteriori error estimators based on gradient recovery by averaging. It is shown that these estimators give rise to an upper bound where the constant is explicitly known up to some additional terms that guarantees reliability. The lower bound is also established, one being robust when the convection term (or the reaction term) becomes dominant. Moreover, the estimator is asymptotically exact when the recovered gradient is superconvergent. The reliability and efficiency of the proposed estimators are confirmed by some numerical tests.

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