Dmitri Kuzmin, Antti Hannukainen, Sergey Korotov: *A new a posteriori error estimate for convection-reaction-diffusion problems*; Helsinki University of Technology, Institute of Mathematics, Research Reports A524 (2007).

Abstract: *A new a posteriori error estimate is derived for the stationary convection-reaction-diffusion equation. In order to estimate the approximation error in the usual energy norm, the underlying bilinear form is decomposed into a computable integral and two other terms which can be estimated from above using elementary tools of functional analysis. Two auxiliary parameter-functions are introduced to construct such a splitting and tune the resulting bound. If these functions are chosen in an optimal way, the exact energy norm of the error is recovered, which proves that the estimate is sharp. The presented methodology is completely independent of the numerical technique used to compute the approximate solution. In particular, it is applicable to approximations which fail to satisfy the Galerkin orthogonality, e.g. due to an inconsistent stabilization, flux limiting, low-order quadrature rules, round-off and iteration errors etc. Moreover, the only constant that appears in the proposed error estimate is global and stems from the Friedrichs-Poincaré inequality. Numerical experiments illustrate the potential of the proposed error estimation technique.*

AMS subject classifications: 65N15, 65N50, 76M30

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