A. Hannukainen, S. Korotov: *Computational Technologies for Reliable Control of Global and Local Errors for Linear Elliptic Type Boundary Value Problems*; Helsinki University of Technology, Institute of Mathematics, Research Reports A494 (2006).

Abstract: *The paper is devoted to the problem of reliable control of accuracy of approximate solutions obtained in computer simulations. This task is strongly related to the so-called a posteriori error estimates, giving computable bounds for computational errors and detecting zones in the solution domain, where such errors are too large and certain mesh refinements should be performed. Mathematical model described by a linear elliptic equation with mixed boundary conditions is considered. We derive in a simple way two-sided (upper and lower) easily computable estimates for global (in terms of the energy norm) and local (in terms of linear functionals with local supports) control of the computational error understood as the deviation between the exact solution of the model and the approximation. Such two-sided estimates are completely independent of the numerical technique used to obtain approximations and can be made as close to the true errors as resources of a concrete computer used for computations allow. Main issues of practical realization of the estimation procedures proposed are discussed and several numerical tests are presented.*

AMS subject classifications: 65N15, 65N30

Keywords: a posteriori error estimation, error control in energy norm, error control in terms of linear functionals, differential equation of elliptic type, mixed boundary conditions, gradient averaging.

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