

Antti Hannukainen, Sergey Korotov, Marcus Rüter: *A posteriori error estimates for some problems in linear elasticity*; Helsinki University of Technology, Institute of Mathematics, Research Reports A522 (2007).

Abstract: *This paper is devoted to the construction of a posteriori error estimators for problems in linear elasticity. The error control is performed in terms of linear (continuous) functionals, which are designed to verify the error between the exact solution and its finite element approximation in local subdomains of special interest with respect to certain quantities of interest (e.g., the J-integral in fracture mechanics). The approach employed has been analysed earlier in the author's works [12, 13] for a class of linear elliptic problems. It is based on the usage of an auxiliary (so-called adjoint) problem. In the framework of this approach, the original (primal) and adjoint problems are solved on noncoinciding meshes and averaging of gradients is used to evaluate the term in the estimator that cannot be computed directly. In the present paper, we consider a more difficult case of an elliptic system of partial differential equations arising in the theory of linear elasticity. Averaging procedures are applied to the field of strains (or stresses). Series of numerical tests show the asymptotic convergence of the proposed estimator if the number of nodes in the adjoint mesh grows and also demonstrate that, in many cases, a sufficiently accurate evaluation of the error in terms of a selected linear functional can be obtained even if the number of nodes in the adjoint mesh is essentially less than in the primal one.*

AMS subject classifications: 65N15, 65N30, 65N50

Keywords: a posteriori error estimation, local errors, superconvergence, finite element method, linear elasticity, fracture mechanics.

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ISBN - 978-951-22-8712-3

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