Marcus Rüter, Sergey Korotov, Christian Steenbock: *Goal-oriented Error Estimates based on Different FE-Spaces for the Primal and the Dual Problem with Applications to Fracture Mechanics*; Helsinki University of Technology, Institute of Mathematics, Research Reports A498 (2006).

Abstract: *The objective of this paper is to derive goal-oriented a posteriori error estimators for the error obtained while approximately evaluating the nonlinear J-integral as a fracture criterion in linear elastic fracture mechanics (LEFM) using the finite element method. Such error estimators are based on the well-established technique of solving an auxiliary dual problem. In a straightforward fashion, the solution to the discretized dual problem is sought in the same FE-space as the solution to the original (primal) problem, i.e. on the same mesh, although it merely acts as a weight of the discretization error only. In this paper, we follow the strategy recently proposed by Korotov et al. [13, 12] and derive goal-oriented error estimators of the averaging type, where the discrete dual solution is computed on a different mesh than the primal solution. On doing so, the FE-solutions to the primal and the dual problems need to be transferred from one mesh to the other. The necessary algorithms are briefly explained and finally some illustrative numerical examples are presented.*

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