Goal oriented error adaptivity for dynamic stress concentration

With a Symmetric Boundary Element Galerkin Method

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ABSTRACT

The boundary element method (BEM) is known to be efficient for elastic wave propagation when unbounded domains are involved, like in the diffraction of waves on elastic inclusions. At the interface between the inclusion and the outer domain, stress concentration occurs, which can lead to material damage in the case of the forward. The stress concentration factor is not a direct output of the BEM but is obtained with a special output treatment of the tangential surface derivatives of the displacements so that the error estimation on this quantity is not straightforward.

To provide a stable computation of this quantity, we propose a symmetric, regularized variational formulation of the integral boundary equations. Then, an adjoint BEM formulation is used for the goal-oriented error estimation. It is strongly connected with the equivalent of a seismic moment of the residual error at the interface.

Several numerical examples will be provided for the diffraction of plane waves against a cavity and an elastic inclusion to show the efficiency of the proposed approach.