On the coupling of regularization techniques and h-(hp-adaptive) BEM for hemivariational inequalities

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We couple the regularization techniques of nondifferentiable optimization with the h resp. hp-adaptive versions of the boundary element method (BEM) in view of their application to linear elastic problems with nonmonotone contact boundary conditions. As a model example we consider a delamination problem in case of contamination. The variational formulation of this problem leads to hemivariational inequality with a nonsmooth functional defined on the contact boundary. This problem is first regularized and then, discretized by a h- resp. hp-BEM. We give conditions for the uniqueness of the solution, prove convergence of the BEM Galerkin solution of the regularized problem in the energy norm, and obtain an a-priori error estimate for the regularized problem based on a novel Céa-Falk approximation lemma. Furthermore, we derive an a posteriori error estimate based on an equivalent regularized mixed formulation thus enabling hp-adaptivity. Numerical experiments demonstrate the behavior, strengths and weaknesses of the proposed approximation scheme.