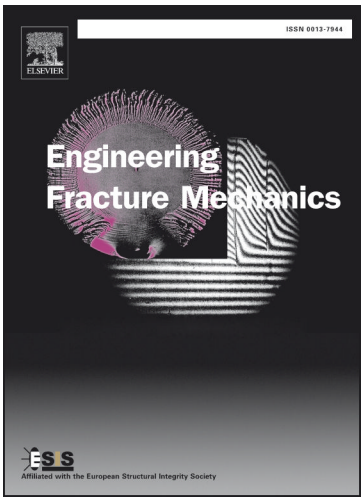

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A boundary element method formulation for quasi-brittle material fracture analysis using the continuum strong discontinuity approach

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Abstract

The implicit formulation of the boundary element method is applied to bi-dimensional problems of material failure involving, sequentially, inelastic dissipation with softening in continuous media, bifurcation and transition between weak and strong discontinuities. The bifurcation condition is defined by the singularity of the localization tensor. Weak discontinuities are related to strain localization bands of finite width, which become increasingly narrow until to collapse in a surface with discontinuous displacement field, called strong discontinuity surface. To associate such steps to the fracture process in quasi-brittle materials, an isotropic damage constitutive model is used to represent the behaviour in all of them, considering the adaptations that come from the strong discontinuity analysis for the post-bifurcation steps. The crack propagation across the domain is done by an automatic cells generation algorithm and, in this context, the fracture process zone in the crack tip became totally represented.

Keywords: Material failure analysis, damage constitutive models, boundary element method, continuum strong discontinuity approach

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