

GRADIENT OF DAMAGE ENHANCEMENT FOR A COHESIVE MODEL

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Gradient enhancements have become increasingly popular in the last decades for dealing with problems in mechanics suffering from spurious mesh sensitivity induced by strain softening. Many proposals exist in this sense and various techniques and formulations have been successfully applied to study localization and fracture.

In usual local models stresses, strains and internal variables are defined only point-wise and can be regarded as fields that are in general discontinuous inside elements and across elements boundaries. On the contrary, once spatial gradients are introduced in constitutive equations these last ones are no more defined at the Gauss point level as customary, but at a larger scale, i.e. that of the structural model. In gradient-dependent models the presence of spatial gradients forces a greater regularity whereby one obtains a more physical damage distribution that will be smeared across elements and prevent ill-posedness of boundary value problems.

In this work reference is made to a cohesive damage model originally proposed in [1]. The gradient enhancement can be introduced using different arguments, see e.g. [2, 3] among others, and the evaluation of the damage state amounts to the solution of a boundary value problem since the damage function now contains spatial derivatives. Analogous to the case of 2D continuum damage [4], the gradient enhanced cohesive allows to obtain meaningful answers quite independently from the mesh size.

Numerical results will be presented to demonstrate the superior performances of the present model with reference to typical fracture propagation tests.

References

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