

A new marching ridges algorithm for crack path tracking in regularized ductile media

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Résumé :

Tracking algorithms are used to predict crack paths in structures modeled with the finite element method, in such a way that the paths do not depend on the selected mesh. For ductile media, the simplest methods rely on scalar variables, somehow related to material degradation. Despite their simplicity, they suffer from a major limitation: they allow the crack to initiate and propagate in only one direction. Consequently, such approaches usually fail in case of crack branching or crack initiation inside the structure. To overcome this difficulty, a new crack path tracking algorithm has been recently developed. It is designed to simultaneously detect several local maxima of a degradation-related variable by following the associated ridge lines. That is why this algorithm could be referred to as a marching ridges algorithm. The performance of the proposed approach will be illustrated by numerical examples, obtained with a quasi-static implicit resolution procedure, within the small and the finite strain framework, in 2D and 3D.