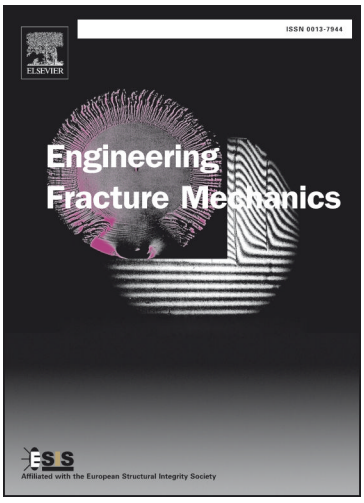


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# *Effective 2D and 3D crack propagation with local mesh refinement and the screened Poisson equation*

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**Abstract**

In this paper, we propose a simple 2D and 3D crack evolution algorithm which avoids the variable/DOF mapping within mesh adaptation algorithms. To this end, a new area/volume minimization algorithm for damaged elements is introduced with the goal of improving the crack path representation. In addition, the new algorithm consists of: (*i*) mesh-creation stage where a damage model is employed to drive the remeshing procedure (*ii*) a subsequent analysis stage with a localization limiter in the form of a modified screened Poisson equation. This is exempt of crack path calculations. In the second stage, the crack naturally occurs within the refined region. A staggered algorithm for equilibrium and screened Poisson equations is used in this second stage. Element subdivision is based on edge split operations in 2D and 3D using the damage variable. Both 2D and 3D operations are described in detail. With the objective of assessing the robustness and accuracy of the algorithm, we test its capabilities by means of four quasi-brittle benchmark applications.