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A UNIFIED POTENTIAL-BASED APPROACH FOR MIXED MODE COHESIVE FRACTURE

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ABSTRACT

The characterization of non-linear constitutive relationships along fractured surfaces is a fundamental issue in mixed-mode cohesive fracture simulations. Constitutive relationships are classified by either a non-potential-based model or a potential-based model. The non-potential-based models result in non-symmetric system of equations (increasing computational cost) and maybe problematic in mixed-mode situations, while previous potential-based models are unable to consider different fracture energies in different modes (e.g. mode I and mode II fracture energy). In this study, a novel potential-based approach for mixed-mode cohesive fracture is proposed in conjunction with macroscopic fracture parameters such as fracture energies, cohesive strengths and shape of cohesive interactions. Since these fracture parameters are based on the different fracture modes (e.g. mode I and mode II), the proposed potential-based model characterizes the different fracture energies and cohesive strengths in each mode of fracture. Due to the explicit use of shape parameters, the proposed approach is also applicable to various materials, i.e. ductile, brittle and quasi-brittle materials. Furthermore, the proposed method demonstrates the path-dependence of work-of separation. The model is verified and validated by simulating the mixed-mode bending test and the four-point shear beam test.

REFERENCES

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