Modelling fracture with eigenerosion versus phase-field

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Eigenerosion (EE) is a discretization approach to fracture alternative to the popular phase-field (PF) method. Phase-field is a very general method that can be used to model material discontinuities and interfaces. Contrariwise, eigenerosion has been developed to model fracture. Phase-field and element erosion methods have a common variational structure: an elastic energy-release mechanism, namely, progressive damage in the case of PF and abrupt damage in the case of EE; and an energy cost of damage, derived from the phase-field and its gradients in the case of PF and from an estimate of the fracture area in the case of ER. In both cases, the static equilibrium configurations of the solid follow from global energy minimization. In addition, crack propagation is modeled in both cases by means of a rate-independent gradient flow that balances elastic energy-release rate and dissipation. This presentation wants to compare eigenerosion and phase-field in a very general form, pointing out similarities and differences, and focusing on the accuracy and convergence properties to reveal the advantages and the drawbacks of both approaches. This research has been developed in collaboration with Michael Ortiz and Kerstin Weinberg.

References

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