Isogeometric Phase-field Modeling of Brittle and Ductile Fracture

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ABSTRACT

The phase-field approach to predicting crack initiation and propagation relies on a damage accumulation function to describe the phase, or state, of fracturing material. The material is in some phase between either completely undamaged or completely cracked. A continuous transition between the two extremes of undamaged and completely fractured material allows cracks to be modeled without explicit tracking of discontinuities in the geometry or displacement fields. A significant feature of these models is that the behavior of the crack is completely determined by a coupled system of partial differential equations. There are no additional calculations needed to determine crack nucleation, bifurcation, and merging.

In this presentation, we will review our current work on applying second-order and fourth-order phase-field models to quasi-static and dynamic fracture of brittle and ductile materials, within the framework of isogeometric analysis. We will present results for several two- and three-dimensional problems to demonstrate the ability of the phase-field models to capture complex crack propagation patterns.

For background describing our work on brittle fracture, the reader is urged to consult references [1] and [2].

REFERENCES
