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Variational Methods

A first-order formulation for dynamic phase-field fracture in viscoelastic materials

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Abstract

We analyze a model describing dynamic fracture in viscoelastic materials. In the first funding period, we have introduced a first-order formulation for the elastic equation of motion to apply a discontinuous Galerkin method for the space discretization. This approach was compared analytically to a previous second-order system, and equivalence of both procedures has been discussed. Technical challenges arise here from the non-conforming FEM setting.

In both models, the sharp crack surface is regularized with a phase-field method and nonlinearly coupled with the elastic system. Given this, a rigorous convergence analysis starting from a system fully discretized was provided.

The concentration on the hyperbolic nature of the problem and the first-order approach lead in general to weaker forms of solutions, which is a point that will be addressed in the second period. Additional goals and an outlook will be presented.