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ARBITRARY ORDER VIRTUAL ELEMENT METHODS FOR HIGH-ORDER PHASE-FIELD MODELING OF DYNAMIC FRACTURE

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ABSTRACT

Accurate modeling of fracture nucleation and propagation in brittle and ductile materials subjected to dynamic load is important in predicting material damage and failure under extreme conditions. The exact solution of the high-order phase-field fracture model has higher regularity. Thus numerical solutions of the model can embrace improved convergence and better accuracy. Virtual element methods are generalization of classical finite element methods and allow polytopal meshes. In this work, we develop a virtual element framework for the high-order phase-field model of dynamic fracture. We use H^1-conforming virtual elements and generalized-α method for the elastodynamic equation, and adopt H^2-conforming virtual elements for the high-order phase-field equation. We verify our virtual element framework using classical quasi-static benchmark problems and show numerical examples for dynamic fracture propagation.