A Homogenization-Based Phase Field Approach to Fracture with Explicit Dependence on Local Crack Orientation

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ABSTRACT

The regularized variational theory of fracture [1], or so-called phase field approach to fracture, has gained popularity due to its ability to predict crack nucleation, propagation, and branching without extra criteria. This approach works by minimizing a total energy functional with the displacement field and phase field (0=intact material, 1=crack) as arguments, and eliminates the cumbersome geometric tracking compared with traditional discrete crack methods such as the extended finite element method. However, each of the prevailing models [2, 3] predicts a different crack path even under certain simple loadings. In order to get a model with proper tension-compression decomposition, we apply the homogenization theory to construct a phase field model, which predicts reasonable crack paths for the three-point bending test and through-crack shear test, among others. We will compare the prediction of our model with similar ones proposed by [4] and [5].

REFERENCES


