Phase-field modeling of ductile fracture at finite strains

Marreddy Ambati*, Tymofiy Gerasimov* and Laura De Lorenzis*

* Institut für Angewandte Mechanik
Technische Universität Braunschweig
Bienroder Weg, Campus Nord, 38108 Braunschweig, Germany
e-mail: {m.ambati, t.gerasimov, l.delorenzis}@tu-braunschweig.de
web page: https://www.tu-braunschweig.de/iam

ABSTRACT

Phase-field modeling of fracture in elastic and elasto-plastic solids is a modern promising framework that enables a unified description of complicated failure processes (including crack initiation, propagation, branching, merging), as well as its efficient numerical treatment, see [1] and references therein for elastic and [2-4] for elasto-plastic solids.

The goal of this contribution is two-fold. First, we present a novel phase field formulation of ductile fracture for elasto-plastic solids. In contrast to the formulations in [2, 3], our model intrinsically couples the crack phase-field with the accumulation of the plastic strains, thus enabling the plastic strain localization to be the main driving quantity of the phase-field evolution. Secondly, we extend the proposed model to finite strains. We compare the numerical predictions to available experimental data, demonstrating the ability of the model to reproduce important phenomenological and quantitative features of ductile fracture.

REFERENCES

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