6th European Conference on Computational Mechanics (ECCM 6)
7th European Conference on Computational Fluid Dynamics (ECFD 7)
11-15 June 2018, Glasgow, UK

A CONTINUOUS-DISCONTINUOUS PHASE-FIELD APPROACH FOR CRACK PROPAGATION

Rudy J.M. Geelen[1], Yingjie Liu[1], John E. Dolbow[1] and Antonio Rodríguez-Ferran[⋆2]

[1] Duke University, Durham NC 27708, USA,
{rudy.geelen, yingjie.liu, jdolbow}@duke.edu
[2] Universitat Politècnica de Catalunya-BarcelonaTech, 08034 Barcelona, Spain,
antonio.rodriguez-ferran@upc.edu

Keywords: *X-FEM; crack propagation; optimization; finite elements; phase-field*

We present a new continuous-discontinuous strategy based on the phase-field approach for the computational modeling of fracture. The three main ingredients are 1) a crack length functional that triggers the continuous-to-discontinuous transition, 2) an optimization-based crack tracking strategy that consists in fitting the actual damage field provided by the phase-field model and an auxiliary geometrical damage field and 3) the eXtended Finite Element Method (X-FEM) enrichment of displacements to insert a strong discontinuity in the wake of the diffuse crack tip. We illustrate the capabilities of the proposed approach to model crack propagation, branching and coalescence by means of several benchmark problems.

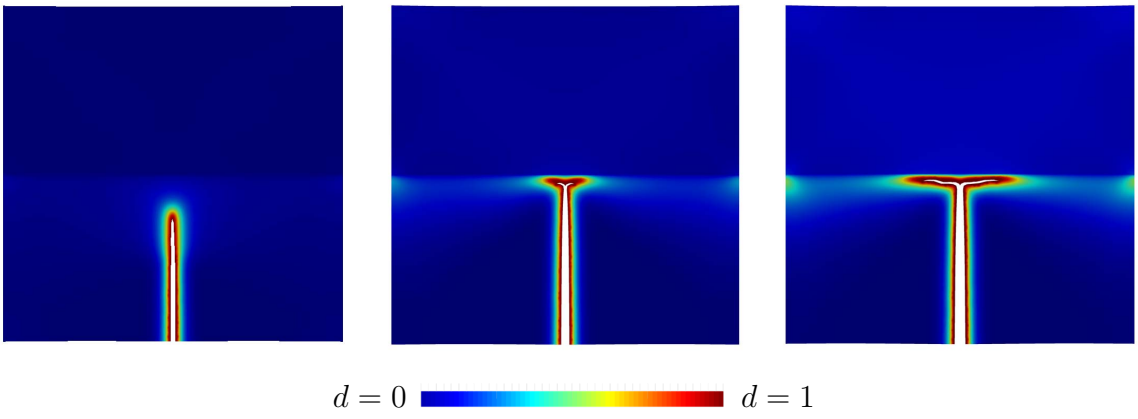

Figure 1: Crack propagation and branching in a notched bimaterial specimen under tension