Title : An open-source Abaqus implementation of the phase-field approach to study ductile dynamic fracture.

By

Gergely Molnár (gergely.molnar@insa-lyon.fr)

The study deals with the implementation of the phase-field method in the finite element code ABAQUS to model dynamic fracture in both brittle and ductile cases. Our aim is twofold: following the recognition of our previous open source implementation of the static model, we propose an updated version of the user de defined element (UEL), this way not only static-brittle cases, but also ductile and dynamic models can be developed. Secondly, the phase field model proposes an energetically consistent approach to study physically complex phenomena (such as crack branching or the velocity-toughening mechanism). We show that the relationship between crack tip velocity and stress intensity factor can be partially explained by the diffuse nature of the accelerating crack. However, we do agree that additional viscous (time dependent) material properties can play a significant role for certain materials too. The implementation was verified with several computational and experimental benchmark tests.