STATIK DYNAMIK

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NUMERISCHE METHODEN IN DER STRUKTURMECHANIK

Computational Failure Analysis: From Continuous to Localized Damage

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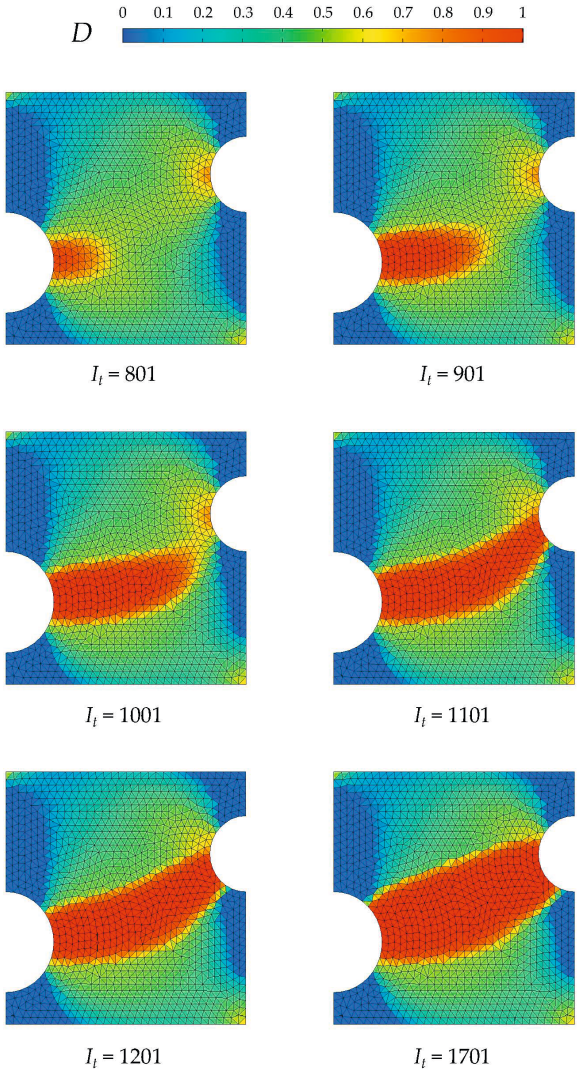

Abstract:
Two families of models are commonly used to study the rupture of materials:

- a first family of models describes the collapsing area of a material in a continuous way (e.g. damage models);
- another family of models introduces a discontinuity in the structure when a crack initiates (e.g. cohesive zone models).

Continuous models are more suitable to describe the initiation of rupture, whereas discontinuous models give a better description of the end of the rupture process. The aim of this work was to determine when and how the transition from a continuous to a discontinuous description of rupture should be done.
First, a damage model with two damage variables was developped to separate the diffuse damage from the localized one in fully continuous description of the material (see picture). The localized damage of this model could also be modelized in a discontinuous way.
Then, some problems related to the simulation of crack propagation with cohesive zone models have been studied. Two formulations have been proposed for the implementation of cohesive zone models which have an initialy infinite stiffness.
Last, a numerical method inspired from the equivalent crack concept of Mazars and Pijaudier-Cabot was used to obtain numerically the shape of an equivalent cohesive law which reproduces the behaviour of the localized damage of a reference continuous model. The equivalent model that is obtained combines a continuous and a discontinuous description of rupture.