SimTech Cluster of Excellence
Institute of Applied Mechanics (CE)
Chair of Continuum Mechanics
University of Stuttgart Germany

BSc. research project

[computational mechanics; material modeling]

EMMA
Efficient Methods for Mechanical Analysis
www.mechbau.uni-stuttgart.de/EMMA

Potential-based modeling of viscoelastic interface behavior

The constitutive behavior of singular surfaces, e.g. at cracks or phase boundaries, is commonly described by cohesive zone models (CZMs). A class of CZMs defined by two potentials, namely an energy storage function and a dissipation potential related to irreversible processes, has been introduced recently and is referred to as standard dissipative cohesive zones (SDCZs). The potential structure of the SDCZs resembles the one of the well-established and widely accepted generalized standard material (GSM) framework. It clearly imposes restrictions on the modeling of constitutive relations, but is required and exploited, e.g., in multiscale applications.

The aim of this project is to find a SDCZ model for viscoelastic interfaces under the assumption of small displacement jumps. In a first step, a unidirectional viscoelastic damage mechanism is to be developed based on a generalized Maxwell model. Several of these unidirectional mechanisms will then be combined to obtain a model which is suitable for the description of interfaces that can, e.g., be found in particle or fiber reinforced polymers.

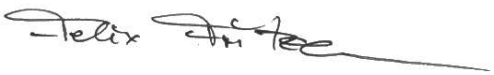
Tasks

- Bibliographic study on cohesive zone models
- Development of a unidirectional viscoelastic damage mechanism
- Elaboration of a viscoelastic SDCZ by superposition of multiple mechanisms
- Implementation of the gradients of the potential functions
- Implementation of a time integration algorithm

Required qualifications

- Basic knowledge of linear and nonlinear material modeling
- Elementary knowledge of numerical methods
- Fundamental programming skills (C/C++ or MATLAB)

Stuttgart, July, 2015



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