



INTERDISCIPLINARY CENTRE FOR
ADVANCED MATERIALS SIMULATION

ICAMS Seminar

Prof. Dr. Thomas-Peter Fries

RWTH Aachen, Germany

Monday, October 24, 4:30 p.m. ICAMS Seminar room UHW 11/1102

2d and 3d Crack Simulations with the eXtended Finite Element Method (XFEM)

The eXtended Finite Element Method (XFEM) has developed to be the method of choice for the simulation of crack problems. The method allows for the mesh-independent approximation of discontinuities and singularities within elements. This is achieved by an enrichment of the classical FEM approximation space. As a consequence, propagating cracks in two and three dimensions may be simulated on fixed meshes. In contrast, the classical FEM relies on the quality of the mesh which needs to be frequently updated during the crack simulation.

The first part of the talk is devoted to an introduction and brief overview on the XFEM. Basic concepts are outlined and general application fields are shown. The second part focusses on crack simulations with the XFEM. A mixed explicit-implicit description of the crack geometry is introduced. For the XFEM-solver, the crack surface is defined implicitly in terms of level-set functions. However, the crack propagation is based on the manipulation of an explicit surface mesh rather than on the solution of transport equations for the level-set functions. A frequent change between the explicit and implicit description of the crack surface is required. An important advantage of the proposed technique is that two and three dimensional crack problems are treated in a consistent manner. Numerical results are shown and prove the success of the proposed formulation.

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