Einladung zum Gastvortrag
Aachener Mechanik & Statik Kolloquium

25. April 2018 | 14:50 Uhr

Fakultät für Bauingenieurwesen | Gebäude 2130 | 2. OG; BS 218
Mies-van-der-Rohe-Straße 1 | 52074 Aachen

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„New advances for evolving meshes/discretization in 3D large deformation problems. Application to metal forming, wear, crack propagation and fluid-structure interactions using FEM, DEM and PFEM"

In many nonlinear situations in general and in metal forming processes in particular, the deformations can be so large that the initial finite element mesh gets completely distorted if one uses the classical Lagrangian formulation. This leads to inaccuracies in the computational process. In order to overcome that problem, there exist two main remedies. The first one is to use the ALE or Arbitrary Lagrangian Eulerian formulation, which allows uncoupling material movement from mesh displacement while keeping the same mesh topology. In such a formulation, the mesh distortions can be, at least to a certain extent, minimized and reliable computations can be carried out, either for stationary or non-stationary processes. However, sometimes, even ALE cannot prevent mesh distortions and a complete remeshing operation, with a new completely independent mesh, has to be carried out.

We present here new possibilities offered by the combination of ALE formulation and remeshing methodologies through a variety of applications including rolling, roll-forming, forging, thixoforming and friction stir welding applications.

Numerical algorithms allowing to robustly simulate the generation and propagation of 3D cracks, through both metallic and composite structures are also presented, as well as algorithms allowing to simulate wear. Aerospace applications dealing with the impact of an aeroengine blade on its casing will be presented, as well as the interaction of a booster blade that comes repeatedly into contact with an abradable material sprayed on the casing.

Alternative to FEM (Finite Element Method), new discretization techniques such as DEM (Discrete Element Method) and PFEM (Particle Finite Element Method) will be introduced. Application of these techniques to ball mill simulation and to fluid-structure interactions will also be presented.

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