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Titel des Beitrags: 3D fluid-structure-contact interaction based on a combined XFEM FSI and dual mortar contact approach
Abstract: Finite deformation contact of flexible solids embedded in fluid flows occurs in a wide range of engineering scenarios. We offer a novel three-dimensional finite element approach in order to tackle this problem class. The proposed method consists of a dual mortar contact formulation, which is algorithmically integrated into an eXtended finite element method (XFEM) fluidstructure interaction approach. The combined XFEM fluid-structure-contact interaction method (FSCI) allows to compute contact of arbitrarily moving and deforming structures embedded in an arbitrary flow field. In this paper, the fluid is described by instationary incompressible Navier-Stokes equations. An exact fluidstructure interface representation permits to capture flow patterns around contacting structures very accurately as well as to simulate dry contact between structures. No restrictions arise for the structural and the contact formulation. We derive a linearized monolithic system of equations, which contains the fluid formulation, the structural formulation, the contact formulation as well as the coupling conditions at the fluidstructure interface. The linearized system may be
solved either by partitioned or by monolithic fluid-structure coupling algorithms. Two numerical examples are presented to illustrate the capability of the proposed fluidstructure-contact interaction approach.

Stichworte:
finite deformation contact; contact of solids in fluid; eXtended finite element method; fluid-structure interaction; dual mortar contact approach; partitioned and monolithic fluid-structure coupling

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