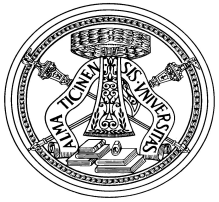

Università degli Studi di Pavia

Computational Mechanics & Advanced Materials Group - DICAr

SEMINAR

Handling Deforming Fluid Domains with Spline-Based Finite Element Methods

Many fluid flow problems we encounter in our daily life are subject to a deforming computational domain. In some cases, the domain deformation is imposed externally; e.g., for fluid-structure-interaction problems. In other cases, the boundary deformation is unknown; leading to a free-boundary problem. An example are free-surface flows. Within these types of problems, the governing equations of fluid flow are coupled with a domain deformation approach. These domain deformation approaches can either fall into the category of interface capturing, such as level-set or volume-of-fluid methods, or interface tracking, where, at least in portions of the mesh, a Lagrangian view point is adopted and the mesh nodes are displaced with the fluid flow. Our solution approach is based on the Deforming-Spatial Domain/Stabilized Space-
Time (DSD/SST) finite element method in combination with a boundary conforming interface tracking scheme. In order to enhance the aspect of boundary conformation, the scheme employs Non-Uniform Rational B-Splines (NURBS) as a support of the standard finite element representation of (1) the geometry, (2) the flow solution, and, in the context of fluid-structureinteraction, (3) the structural solution. Our methods cover both full isogeometric approaches and the NURBS-enhanced finite element method. The advantages of the discussed approaches are demonstrated on two numerical examples of fluid flow, namely two-phase flow with drops and sloshing tanks.

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