Fluid–Structure Interaction

Fluid-structure interaction (FSI) is the interaction between a surrounding or internal fluid flow and a solid structure that is movable or deformable. In general FSI problems are too complex to be solved analytically and have to be analyzed by numerical methods. As multiple physical fields are relevant in FSI simulations they are located in the wide field of multiphysics simulations. In general the computation of multiphysics-problems can be done in either a monolytical approach, where the flow and structure-displacement governing equations are solved simultaneously in a single solver or in a partitioned approach, where the equations are solved separately by different solvers with an interface to exchange results on discrete time steps.

The aim of this project is to create a software module/interface for an existing coupled-analysis-system in order to handle FSI-calculations with the computational fluid dynamics (CFD) program *Open Foam* and either the open source finite elements (FEM) solver *Calculix* or the proprietary FEM-solver *ABAQUS*.

Tasks:

1. Becoming acquantained with the fluid and structure simulations with the predetermined programs and the already at P&Z existing coupled-analysis-system *Acoupella*
2. Build-up a suitable model for the coupled FSI-calculation (structural + fluid dynamics model)
3. Build-up suitable interfaces (Perl and Octave) from Open Foam to the coupled-analysis-system *Acoupella*
4. Run verification simulations for one-way coupling fluid to structure
5. Extend method for two-way coupling dependent on first results (FSI)

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