A PARTITIONED IMPLICIT APPROACH TO TREAT FREE SURFACES IN STRONGLY COUPLED FLUID STRUCTURE INTERACTION SIMULATIONS

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Fluid structure interaction (FSI) problems are of great relevance to many fields in engineering amd applied sciences. One wide spread and complex FSI–subclass is the category that studies the instationary behaviour of incompressible viscous flows and thin–walled structures exhibiting large deformations. Free surfaces often present an essential additional challenge for this class of problems. Prominent application areas are fluid sloshing in tanks and numerable problems in offshore engineering and naval architecture.

This talk discusses the construction of a computational approach for the simulation of nonlinear instationary fluid structure interaction problems including free surfaces. Main focus of the presentation will be on the computational treatment of the free surface and on its embedding into the partitioned coupled solver. For this purpose a partitioned implicit approach for free surface flows is developed and discussed. This strategy supports robustness of the overall coupled approach. It will be demonstrated how this scheme is embedded both in a recently developed iterative staggered approach based on an iterative Dirichlet–Neumann substructering scheme. Selected numerical examples will be presented to show the performance of the overall computational approach.