

MONOLITHIC SOLVER FOR FLUID-STRUCTURE INTERACTION PROBLEMS

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Abstract

We present a monolithic approach for solving the fluid-structure interaction problem with general constitutive laws for the fluid and solid parts. It is based on the ALE formulation of the balance equations for the fluid and solid in the time dependent domain. The discretization is done by the finite element method. The discretized system of nonlinear algebraic equations is solved using approximate Newton method with line-search strategy as the basic iteration and geometric multigrid as linear solver. Since we know the sparsity pattern of the Jacobian matrix in advance, its approximate computation can be done by using finite differences in an efficient way so that the linear solver remains the dominant part in terms of the CPU time.