

Title: Numerical solution of flows in time dependent domains with elastic walls
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Abstract: This work is devoted to the numerical solution of flow in time dependent domains with elastic walls. This problem has several applications in engineering and medicine. The flow is described by the system of Navier-Stokes equations supplemented with suitable initial and boundary conditions. A part of the boundary of the region occupied by the fluid is represented by an elastic wall, whose deformation is described by a hyperbolic partial differential equation with initial and boundary conditions. Its right-hand side represents the force by which the fluid flow acts on the elastic wall. The goal of this work is to elaborate a numerical method for solving this coupled problem based on the finite element method and the ALE formulation of the equations describing flow. A formulation and analysis of the problem together with discretization, algorithmisation and programming of modules, which were added to an existing software package, is presented. The method that was worked out is applied to solve test problems.

Keywords: interaction of flow and an elastic wall, Navier-Stokes equations, ALE method, finite element method, string equation