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MODELING OF LARGE DEFORMATION OF INCOMPRESSIBLE SOLIDS AND IMPLEMENTATION TO TRANSPORT OF CELLS AND PARTICLES IN SMALL BLOOD VESSELS

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Computational modeling of large deformation of incompressible solids has been a subject of numerous investigations. We have formulated a concept of FE modeling of solid large deformation which is analogous to modeling of incompressible fluids. A mixed formulation is employed as for linear fluid finite elements. Using this approach we were able to incorporate the governing equations of solids into a strong coupling method of the solid-fluid interaction, in a consistent manner. We also found that the most reliable, robust and accurate concept of modeling motion of incompressible solids within incompressible fluid is the strong coupling with a remeshing procedure [1]-[2]. The models also include interactions among moving bodies together with rigid and deformable walls. The interactions can be repulsive, attractive, deterministic and stochastic. Both 2D and 3D deformations and fluid flow are cosidered. These conditions of convective transport are particularly important for biological systems.

Applications are related to modeling motion of cells, micro and nanoparticles within small domains as in case of channels, chips for cancer cell separation and capillaries with narrowing.

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