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An added-mass free semi-implicit coupling scheme for fluid-structure interaction *

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Abstract

We propose a semi-implicit coupling scheme for the numerical simulation of fluid-structure interaction systems involving a viscous incompressible fluid. The scheme is stable irrespectively of the so-called added-mass effect (fluid and solid densities which are close and/or domain which is slender) [5]. Moreover, it allows for conservative time-stepping within the structure. The efficiency of the scheme is based on the explicit splitting of the viscous effects and geometrical/convective non-linearities, through the use of the Chorin-Temam projection scheme within the fluid [6]. Stability relies on the implicit treatment of the pressure stresses and on the Nitsche's treatment of the viscous coupling [2,3,4]. The numerical stability of the scheme is proved theoretically through *a priori* energy estimation [1]. Numerical results in two and three dimensions illustrate the stability and efficiency of the scheme as well as its potentiality in the context of blood flow simulations [7].

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