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EXISTENCE AND APPROXIMATION FOR A STEADY FLUID-STRUCTURE INTERACTION PROBLEM USING FICTITIOUS DOMAIN APPROACH WITH PENALIZATION*

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Abstract

In the present paper, we use a penalization of the Stokes equation in order to obtain approximate solutions in a larger domain including the domain occupied by the structure. The coefficients of the fluid problem, excepting the penalizing term, are constant and independent of the deformation of the structure, which represents an advantage of this approach. Subtracting the structure equations from the fictitious fluid equations in the structure domain and using the Green's formula, we obtain a weak formulation where the continuity of the stress at the interface does not appear explicitly. This is a second advantage of this model, because the computation of the stress at the fluid-structure interface is not easy from the theoretical point of view as well as for the numerical approximation. This problem is a free boundary problem and a fundamental difficulty is to find the free interface between the

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