数学与系统科学研究院

计算数学所学术报告

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报告题目：

The Immersed Boundary method: mathematical formulation and numerical approximation

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计算数学所报告厅

Abstract:

The Immersed Boundary Method (IBM) has been designed by Peskin for the modeling and the numerical approximation of fluid-structure interaction problems and it has been successfully applied to several systems, including the simulation of the blood dynamics in the heartIn the IBM the Navier-Stokes equations are considered everywhere and the presence of the structure is taken into account by means of a source term which depends on the unknown position of the structure. These equations are coupled with the condition that the structure moves at the same velocity of the underlying fluid. Recently, a finite element version of the IBM has been developed, which offers interesting features for both the analysis of the problem under consideration and the robustness and flexibility of the numerical scheme. The numerical procedure is based on a semi-implicit scheme for which we performed a stability analysis showing that the time-step and the discretization parameters are linked by a CFL condition, independently of the ratio between the fluid and solid densities. The mass conservation of the IBM is strictly related to the discrete incompressibility of the scheme used for the approximation of the fluid. We review several schemes and compare them with respect to their use within the framework of the IBM.

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