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：

Modeling and Numerical Studies For Fluid-Structure Interactions

邀请人： 张硕 博士

报告时间：2014 年 12 月 23 日（周二）下午 15:30-16:30

报告地点： 数学院南楼五层 514 会议室

Abstract:

In this talk, I will present our recent study on a dynamic fluid-structure interaction (FSI) problem involving with a rotational and elastic structure by using the arbitrary Lagrangian-Eulerian (ALE) method for fluid model in Eulerian description and the St.Venant-Kirchhoff structural model in Lagrangian description, and design its monolithic mixed finite element approximation. In addition, our studies on fictitious domain method and full Eulerian phase field method for FSI problems will be also introduced. In particular, in terms of ALE method, we developed a nonlinear rotational and deformable structural model for FSI for the first time. The technique of master-slave relations is employed to realize the interfacial kinematic condition on the interface of fluid and structure. Velocity is adopted as the principle unknown to reformulate the structural model. Our algorithm can also handle a large and irregular fluid flow channel in which the rotational structure is immersed with ALE method. We use Newton's method to linearize, and Galerkin/least-square (GLS) and streamline-upwind/Petrov-Galerkin (SUPG) schemes to stabilize the mixed finite element discretization of fluid equations with ALE approach. Numerical experiments are successfully carried out for a simplified turbine in 2D and a realistic turbine in 3D which is deforming as well as spinning around its rotation of axis cases due to the fluid impact.

欢迎大家参加！