数学与系统科学研究院

计算数学所学术报告

报告人：**Assistant Prof. Jie LIU**

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报告题目：

A second-order stable explicit interface advancing scheme for FSI with both rigid and elastic structures and its application to fish swimming simulations

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上午 **11:00~12:00**

报告地点：　科技综合楼三层

311 报告厅

Abstract:

In this paper, we present a temporally second-order numerical scheme for fluid–structure interaction (FSI) problems in which the structure may be rigid or elastic. The explicit treatment of the interface motion and the semi-implicit treatment of all the other terms make the scheme very efficient. We prove an energy inequality of the scheme which shows that the explicit treatment of the interface motion does not damage the stability. An exact solution for FSI is derived. We use it to numerically check that our scheme converges at rate $O(\Delta t^2 + h^{m+1})$ when we use $P_m/P_{m-1}/P_m$ finite elements for fluid velocity, fluid pressure and structure velocity. We also test its performance on the benchmark problem of a laminar incompressible channel flow around a compressible elastic structure. As our fluid–structure system can model both active motion and passive deformation of structures, we apply our scheme to study the locomotion of articulated structures in viscous fluids. We propose an elastic-rigid fish model which obeys all the local balance laws at the deforming interfaces. It can faithfully capture the vorticity generation and drag/thrust generation at these deforming interfaces. Our computation shows that a planar three-link fish can propel itself in a viscous fluid by periodically change its shape variables. Mesh refinement study is also performed.

欢迎大家参加！