An Immersed Interface Method for Solving Viscous Incompressible Two-fluid Flows

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Date: 3 December 2008 (Wednesday)
Time: 4.30 pm – 5.30 pm
Venue: SPMS-Executive Classroom 1, MAS-03-06
School of Physical and Mathematical Sciences

In this talk, we present an immersed interface method for solving viscous incompressible two-fluid flows. The method combines the augmented immersed interface method with front tracking representation of the interface on a uniform Cartesian grid. The immersed interface is represented by a number of Lagrangian control points, and the augmented strategy is to decouple the jump conditions of the fluid variables through two augmented variables. In the proposed method, the augmented interface variables are determined by solving a small system of equations by the LU method or GMRES iterative method. The forces, the augmented variables and their derivatives along the interface, which are related to the jumps in pressure and the jumps in the derivatives of both pressure and velocity, are interpolated using cubic splines. The fluid equations are discretized on a staggered Cartesian grid by a second order finite difference method. The numerical results show that the overall scheme is second order accurate.

Speaker Biography

Dr. Zhijun Tan is currently a Research Fellow in the Department of Mechanical Engineering at the National University of Singapore (NUS). He obtained his master degree from Xiangtan University, China, in 2002, and his Ph.D degree from Hongkong Baptist University, in 2005. His current research interests focus on numerical methods for PDEs, computational fluid dynamics, adaptive mesh methods, phase field method, immersed boundary/interface method for interface problems arising in physics and biology.

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