

國立中山大學應用數學系

學術演講

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講題：An Embedded Boundary and Immersed
Boundary Finite-Element Methods for
Complex Flow Simulations

時間：2014/06/04 (星期三) 16:10 ~ 17:00

地點：理學院四樓理 SC 4011 室

茶會：15:30 於理 SC 4010 室 (系辦公室)

摘要

The purpose of present study aims at the combination of embedded boundary finiteelement method (EBFEM) and immersed boundary finite-element method (IBFEM) for complex flow simulations. The model based on the Navier-Stokes equations is devised for the solution of the viscous flows with immersed boundaries using EBFEM and IBFEM. The governing equation is discretized by finite element method on a non-uniform Cartesian mesh using the primitive variables formulation. Numerical solutions for the scenarios with three variables, two velocities and one pressure are obtained by adopting decoupled numerical solution procedure. Geometries featuring the flexible solid obstacles in the flow are embedded in the Cartesian grid with special discretizations near the embedded cell to ensure the accuracy of the solution in the cut cells. A volume of solid/fluid in the cut cell is estimated to enforce the volume conservation enclosed by an immersed boundary that allows us to compute the virtual forces inside the embedding bodies. The present study naturally gives more reasonable results on problems including the flow past a circular cylinder, flow past two circular cylinders of different diameters (side by side, tandem and staggered arrangements). The time history of drag and lift coefficients and vortex shedding are implemented. Moreover, the time-based variation of the flow phenomena, such as pressure and velocity and vorticity fields are sketched in this study. Thus, it is convinced that the EBFEM and IBFEM are robustness and accuracy of solving viscous fluid flow.

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