APS physics

Bulletin of the American Physical Society

Session GR: CFD: Applications
8:00 AM–10:10 AM, Monday, November 24, 2008
Room: 203A

Chair: Siva Thangam, Stevens Institute of Technology

Abstract ID: BAPS.2008.DFD.GR.7

Abstract: GR.00007 : Measurement-Integrated Simulation of Three-Dimensional Flow Behind a Square Cylinder Using Pressure Measurement on the Cylinder
9:18 AM–9:31 AM

Preview Abstract   *MathJax On | Off* ← *Abstract* →

Authors:
 Takayuki Yamagata
  (Graduate School of Engineering, Tohoku University)

 Toshiyuki Hayase
  (Institute of Fluid Science, Tohoku University)

It is difficult problem to reproduce real flow with a numerical simulation because of inevitable error in boundary and initial conditions as well as unexpected disturbance. The Measurement-Integrated (MI) simulation, which is a kind of the observer in control theory, converges to the real flow with the aid of feedback signal which compensates the difference between the simulation and the real flow. In this study, we investigate the reproducibility of the velocity field for a flow behind a square cylinder analyzed with the three-dimensional MI simulation with pressure measurement in comparison with ordinary numerical simulation. The MI and the ordinary simulations are performed with three grid systems of different resolutions to investigate the effect of the grid resolution. Both the MI and the ordinary simulation with a finest grid system properly reproduced the velocity field obtained by the experiment. The MI simulation with a coarse grid system correctly reproduces the frequency and the phase of vortex shedding corresponding to the experiment and reproduces the primary structure of the velocity fluctuation of the solution with the fine grid system. The ordinary simulation with the same coarse grid system, however, fails to reproduce the flow with the vortex shedding.

To cite this abstract, use the following reference: http://meetings.aps.org/link/BAPS.2008.DFD.GR.7

APS Home | APS Meetings | Join APS | Help | Contact APS Meetings