Title	CLP
Author(s)	,
Citation	
Issue Date	2003-03
Type	Thesis or Dissertation
Text version	author
URL	http://hdl.handle.net/10119/1696
Rights	
Description	Supervisor: , ,

Analysis of 3D pipe flow with fluid and elastic wall in using CIP method

Konishi Tohru (110045)

School of Information Science,
Japan Advanced Institute of Science and Technology

February 14, 2003

Keywords: CIP, boundary, 3D.

The model with boundary between solid and liquid is difficult to deal with the boundary. This model is movement boundary ploblem. Today numerical fluid analysis is being done to this movement boundary ploblem by various technique.

Eulerrian method and Lagrangian method are used as a solver of the motion equation of fluid. The grid system is fixed to grid point in the sapce as for Eulerrian method, the other hand side, the grid system moves in Lagrangian method according to the moving grid points. In general, Lagrangian method is used for moving boundary problem. Because Lagrangian method can set the girid which fits the boundary of fluid and solid, the definition of a free surface is easy. However, re-griding of each time step is needed when the grid system is defined by Lagrangian method, and there are ploblem of the extream transformation of the mesh etc. Eulerrian method have the advantage to treating easy because of the fix mesh to grid point. But it is defficult to express the boundary of fluid and solid accuracy good, and the device is necessary to express the boundary. The advection term is calculated in equation of motion When the boundary of fluid and solid is pursued, the decrease in accuracy because of numerical diffusion is caused.

The CIP method proposed by Yabe is technique. The CIP technique is a method of sloving the advection equation by using a fixed grid in accuracy

1

good. Furuta analyzed the flow of pipe with moving wall using the CIP. Araki developed parallel implementation base domain decomposition for pipe flow with movig wall using the CIP method on the parallel computer.

Matsuzawa analyzed the interaction between fluid and elastic wall by using CIP. The calculation modele assumed the axis symmetry model. The calculation is transformed from two dimension cartesian coordinates into a cylinder axis coordinates, and has been enhanced from 2 dimension to semi-2 dimension.

This reserch aims to analyze the 3D model using CIP method. First,I analized Cavity problem using MAC method. and second, using CIP method to the culculation of velocity.

Compare with the Ku's reserch, it's proved the CIP method has accuracy in the case Reynolds number is 100 though grid is scanty. But the data near the boundary is not accurcy. So it's necessary to investigate more. It's expected to use CIP method for 3D pipe flow with poiseuille flow.