Satoshi Ii

Department of Mechanical Engineering
The University of Tokyo
7-3-1 Hongo Bunkyo-ku, Tokyo 113-8656, Japan
TEL: +81-3-5841-6288,
Email: sii@fel.t.u-tokyo.ac.jp

Session Number 2

Bio

I am working on the computational fluid dynamics as a postdoctoral fellow at the University of Tokyo. My research interests are fluid-structure interaction problem and development of numerical model. I received the PhD in science from Tokyo Institute of Technology. Meanwhile, I was studying at RIKEN as a junior research associate (JRA).

Abstract

Toward development of the next generation super-computer in Japanese national project, the human body simulation is assigned as one of the grand challenge applications. The human body consists of complex systems from the molecule and cell level to organ scale. Therefore a very high performance computer is required in order to take account of whole systems.

Our research group focuses on the organ and body scale such as blood circulation system, heart system and pulmonary system. Then the fluid-structure interaction problem is deeply related to the above-mentioned phenomena. Usually, measurement data is obtained from CT, MRI and ultrasound imaging equipment. Thus we developed the numerical model based on Eulerian framework in order to use such voxel (volume) data. In our numerical model, the incompressible Newtonian fluid, and incompressible St. Venant-Kirchhoffstor material or Hyperelastic material are employed. Here we use VOF (volume of fluid/fraction) function defined in each voxel cell in order to estimate the cell-wise deviatoric stress. Moreover the left-hand Cauchy-Green deformation quantity is updated to obtain the deviatoric stress in terms of structure. Our simple numerical mode l is quite competitive to other numerical models developed in Lagrangian framework.

However our current model supposes that the gradient of velocity is continuous across the interfaces, for simplicity. Thus my ongoing work is to improve our numerical model by satisfying physical conditions at the interface. By using this idea, numerical model can increase the accuracy, in addition it will be able to treat pressure jump explicitly at the interface.