

Level Set and Volume of Fluid Coupled Method for Violent Two-phase Flows

Songtao Chen, Weiwen Zhao and Decheng Wan*

Computational Marine Hydrodynamics Lab (CMHL), School of Naval Architecture, Ocean and Civil Engineering, Shanghai Jiao Tong University, Shanghai 200240, China

* Corresponding Author Email: dcwan@sjtu.edu.cn

ABSTRACT

In this paper, a fully coupled level set and volume of fluid (CLSVOF) method for unstructured meshes is implemented in OpenFOAM. The interface is reconstructed by the piecewise-linear interface calculation (PLIC) method, where the interface normal is given by the level set method. A reinitialization algorithm suitable for unstructured meshes is employed to maintain the signed distance property of the level set function. Besides, the surface tension is instead calculated by the continuous level set function. The CLSVOF method is validated on two-dimensional and three-dimensional dam break benchmark cases and achieves good agreements with experiments. Furthermore, the comparison with the algebraic VOF method demonstrates that the CLSVOF method can obtain a sharper interface and significantly reduce spurious velocities, both of which are helpful for simulating violent two-phase flows.

Keywords: CLSVOF; PLIC; level set; unstructured meshes; two-phase flows; OpenFOAM

REFERENCES

- Dianat, M., Skarysz, M., and Garmory, A. (2017). A coupled level set and volume of fluid method for automotive exterior water management applications. *International Journal of Multiphase Flow*, 91, 19-38.
- Skarysz, M., Garmory, A., and Dianat, M. (2018). An iterative interface reconstruction method for PLIC in general convex grids as part of a Coupled Level Set Volume of Fluid solver. *Journal of Computational Physics*, 368, 254-276.