

OR3-6

非構造格子における THINC/SW 法と S-CLSVOF 法
による気液 2 相流の数値計算方法の改良

Improvement of Two-Phase Flow Solver based on
THINC/SW and S-CLSVOF on Unstructured Meshes

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This study provides a practical implementation of a twophase flow solver for Newtonian fluids with an immiscible interface. The solution procedure is composed of the tangent of hyperbola for interface capturing (THINC), the simple coupled level-set and volumeof- fluid (S-CLSVOF) algorithm, and the density-scaled balanced continuum surface force (DSB-CSF) model. The newly introduced methods in the present study are 1) THINC with slope weighting (THINC/SW) extended to unstructured meshes and an 2) efficient initialization of the level-set function, which enables fewer iterations of the re-initialization. The validity and effectiveness of the present method are confirmed through three benchmark problems with comparison to other solvers. Regarding the accuracy of the interface advection, the present solver showed a sufficiently small error, which is comparable to the other established solvers. Regarding the re-initialization procedure of the level-set function, the number of iterations required by the proposed method is approximately half that required by a conventional method. For the benchmark problem on the thermocapillary flow in a rectangular cavity, it is confirmed that the present solver provides a solution sufficiently close to the asymptotic solution to this problem.

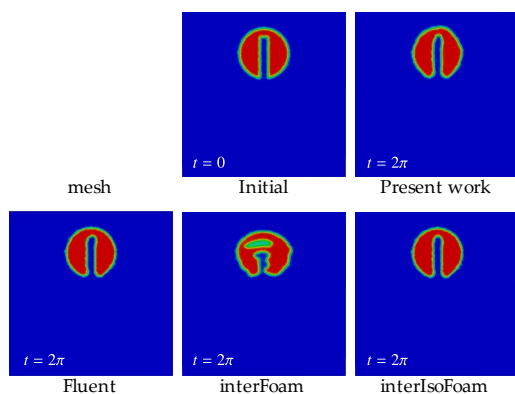


Fig. 1 Numerical results of Zalesak's slotted-cylinder benchmark problem on 12785 randomly generated unstructured meshes. Color contours indicate the VOF function after one revolution, which is interpolated on the vertices for visualization.

References

- 1) S. Shiratori, T. Usui, S. Koyama, S. Ozawa, H. Nagano and K. Shimano: Int. J. Microgravity Sci. Appl., 38(3) (2021) 383001.

