

PARTICLE METHOD FOR FLUID DYNAMICS WITH COMPLEX FREE SURFACE MOTION

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Abstract

Moving Particle Semi-implicit (MPS) method [1] has been developed as a particle method for fluid dynamics with complex free surface motion. A semi-implicit algorithm for incompressible flow, an arbitrary Lagrangian-Eulerian (ALE) algorithm, a symplectic scheme, a compressible-incompressible unified algorithm, and high-order schemes using the method of least squares are explained. Numerical techniques for multi-phase flow analysis are summarized. Surface tension models are provided and a calculation example is shown. A recent study of an overlapping particle technique to control the spatial resolution is presented. The wall boundary condition represented by polygons improves the calculation performance in three-dimensional complex domains. The MPS method has been applied to industrial problems: oil behavior in a gear box, drive on a flooded road, flow in a mixing tank, large-scale tsunami run-up on a coastal city, swallowing, movies and games.

References

- [1] S. Koshizuka and Y. Oka, "Moving-Particle Semi-implicit Method for Fragmentation of Incompressible Fluid" Nucl. Sci. Eng., 123, 421-434 (1996)..