

عنوان مقاله:

Numerical simulation of viscous flows by smoothed particle hydrodynamics

محل انتشار:

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خلاصه مقاله:

Smoothed Particle Hydrodynamics (SPH) is one of the best methods for the simulation of free-surface flow problems. Among two forms of SPH methods, weak compressible SPH (WCSPH) and incompressible SPH (ISPH), the ISPH method performs better than WCSPH in many cases, because this method is based on Rankine source solution and also uses larger stepping length by avoiding the second-order derivative in pressure Poisson equation. The best way of solving the Poisson equation with large particle numbers are iterative methods. In this paper, the numerical Generalized Minimal Residual (GMRES) method is used to study the dam breaking. The classical dam-break problem is studied by the present two-phase approach and the advantages and disadvantages of different SPH methods are described and analyzed. Using this linear equation solver, ISPH based on Rankine source solution can give smoothed and reliable pressure distribution. The computation in the ISPH method is composed of two basic steps. The first step is a prediction, in which the velocity field is computed without imposing incompressibility. The second step is a correction in which incompressibility is enforced. The results of this method are compared with experimental results which were matched well. The results also demonstrate that the pressure distribution obtained from the coupled dynamic solid boundary treatment algorithm leads to accurate ordered particle distribution and much smoother pressure field with clear pressure layers, besides that the energy dissipation due to the artificial viscosity is considerably reduced when used in combination with the density re-initialization.

کلمات کلیدی:

(Viscous Flow, Fluid-Structure Interaction (FSI), Smoothed Particle Hydrodynamics (SPH

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