An iterative method for homogenizing particles

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ABSTRACT

Smoothed particle hydrodynamics (SPH) is a “truly” meshfree method [1], which has been applied to different areas in engineering and sciences. Despite its great success and wide applications, the conventional SPH method is not able to accurately simulate flows around rigid bodies, especially aerofoils, as the conventional SPH method is difficult to get the convergent results. In this work, based on the kernel gradient free (KGF) SPH method [2], a new discrete scheme of Laplace operator and an iterative method of homogenizing particle are proposed. These methods improve computational accuracy and numerical instability of the conventional SPH method due to the particle clustering. In order to further improve the stability of numerical calculation, the Shepard function is used to correct density field. A projecting point method is used to deal with wall boundary and a modified non-reflection boundary treatment is adopted to reduce acoustic wave reflections of the far field boundary [3]. A number of numerical examples including a 2D incompressible fluid flow of shear cavity, a flow around the cylinder, and a flow around the aerofoil are simulated. It demonstrated the present method is accurate and robust for simulating the flow around bodies for small and moderate Reynolds number.

REFERENCES

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