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Numerical Simulation of Unsteady Cases of Fluid Flow Using Modified Dynamic Boundary Condition (mDBC) in Smoothed Particle Hydrodynamics Models

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Abstract : This paper presents numerical simulations using an open boundary algorithm with modified dynamic boundary condition (mDBC) for weakly compressible smoothed particle hydrodynamics models from particle-based code Dualsphysics. The problems of piping erosion in dams and dikes are aimed for studying the algorithm. The case 2D model of unsteady fluid flow past around a fixed cylinder is simulated, where various values of Reynold's numbers (Re40, Re60, Re80, and Re100) and different model's resolution are considered. A constant velocity with different values of viscosity for generating various Reynold's numbers and different numbers of particles over a cylinder for the resolution are modeled. The interaction between solid particles of the cylinder and fluid particles is concerned. The cylinder is affected by the hydrodynamics force caused by the flow of fluid particles. The solid particles of the cylinder are the observation points to obtain force and pressure due to the hydrodynamics forces. As results of the simulation, which is to show the capability to model 2D unsteady with various Reynold's numbers, the pressure coefficient, drag coefficient, lift coefficient, and Strouhal number are compared to the previous work from literature.

Keywords : hydrodynamics, internal erosion, dualsphysics, viscous fluid flow
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