Reflective Boundary Conditions Applied to Smoothed Particle Hydrodynamics (SPH) Method for Solving Fluid Dynamics Problems in 3-D Domains

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ABSTRACT

This paper aims to present the reflective boundary conditions (RBC) in 3-D domains and applications in Fluid Dynamics problems. Currently, RBC have been used in meshfree particle methods as an attempt to respect the continuum physical laws at the macroscopic domain, without the application of fictitious/ ghost particles - that improperly mix molecular and continuum mechanics concepts [1]. RBC methodology, validation in 2-D domains and applications in hydrostatics and hydrodynamics cases were presented in [2]. Hydrostatics and hydrodynamics cases with the RBC implementation in 3-D domains are presented in this work. A Newtonian, incompressible, uniform and isothermal fluid inside an immobile reservoir open to the atmosphere and dam break flow have been studied. In the first case, a modified SPH formulation using a modified pressure concept [3] has been used. Dam breaking simulations used the standard SPH formulation. In both cases, the numerical results showed good agreement with the analytical results or literature data.

Key words: Smoothed Particle Hydrodynamics, reflective boundary conditions, continuum mechanics, modified pressure

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