Streaming Formulation in Volumetric Lattice Boltzmann Method and Its Improvement[1] HUIDAN (WHITNEY) YU, XIAOYU ZHANG, Indiana University-Purdue University Indianapolis — Volumetric lattice Boltzmann method (LVBM) has been specifically developed to deal with complex flow domains with or without willfully moving boundaries (Yu, *et al*, PRE, 2014). In the VLBM, fluid particles are uniformly distributed in lattice cells, instead of the traditional lattice nodes. A unique parameter, which represents the ratio of solid volume over the cell volume, is introduced to distinguish three types of lattice cells: solid cell (pure solid occupation), fluid cell (pure fluid occupation), and boundary cell (partial solid and partial fluid). Through this parameter, a volumetric bounce-back mechanism is uniquely included in the formulation of streaming process. As a result, extra interpolation/extrapolation to deal with arbitrarily oriented boundaries are avoided. Such a formulation significantly eases the handling of complicated geometries and promotes the computational efficiency without compromise of accuracy. In this work, we present the original formulation of the streaming process in VLBM and its modification. Quantitative validations in 3-D pulsatile duct flows with circular and rectangle cross sections respectively demonstrate the reliability of VLBM for solving unsteady flows..

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