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2D Unstructured Finite Volume Lattice Boltzmann Model for Flow with Complex Geometric Boundaries LEITAO CHEN, LAURA SCHAEFER, University of Pittsburgh — Many of the numerical issues of LBM (lattice Boltzmann method) are not yet fully solved. One of the issues is its inability of handling complex geometric boundaries. Some published work, which is based on collision-streaming discretization of the LBE and corresponding lattice-like mesh, introduced successful treatments for curved boundaries. However, those schemes are not applicable to the boundaries with large curvature like porous media since the lattice-like mesh is not able to recognize it. In order to solve this issue, a 2D FVM (finite volume method)-based numerical framework is proposed, which completely uncouples the lattice structure and the spatial discretization and therefore brings the freedom of using any type of lattice structure while keeping the basic framework unchanged. The model is solved on an unstructured triangular mesh and triangular control volume. Boundary schemes of isothermal and thermal flow for the new numerical framework are also studied. Finally, a variety of isothermal and thermal flow problems are simulated and compared with other work. The proposed model can simulate the flow with a complex geometry to the desired accuracy in addition to complementing the simple geometry of the existing LB model.

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