Abstract Submitted
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Numerical solution of Boltzmann equation using discrete velocity grids PRAKASH VEDULA, University of Oklahoma, Norman — An importance sampling based approach for numerical solution of the (single species) Boltzmann equation using discrete velocity grids is proposed. This approach involves a stochastic method for evaluation of the collision integral based on sampling of depleting/replenishing collisions and is designed to preserve important symmetries of the collision operator, including collision invariants. The underlying particle distribution function is represented as a collection of delta functions with associated weights that are non-negative. A key feature in the construction of the proposed method is that it ensures that the weights associated with the distribution function remain non-negative during collisional relaxation, thereby satisfying an important realizability condition. Performance of the proposed approach will be studied using test problems involving spatially homogeneous collisional relaxation flow and microchannel flows. Results obtained from the proposed method will be compared with those obtained from the (deterministic) collisional Lattice Boltzmann Method (cLBM) and the traditional direct simulation Monte Carlo (DSMC) method for solution of Boltzmann equation. Extension of the proposed method using discrete velocity grids for multicomponent mixtures will also be discussed.

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