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Solution of the Boltzmann Equation With Arbitrary Post-Collision Velocities A.B. MORRIS, P.L. VARGHESE, D.B. GOLDSTEIN, University of Texas at Austin — We present a discrete velocity scheme which solves the Boltzmann equation and show numerical results for homogeneous relaxation problems. Although direct simulation of the Boltzmann equation can be efficient for transient problems, computational costs have limited its use. Traditional discrete velocity schemes require post-collision velocity pairs to lie precisely on the grid and additional constraints on mass, momentum, and energy further restrict the velocity grid to be uniform. A velocity interpolation algorithm enables us to select post-collision velocity pairs not restricted to those that lie on the grid. This algorithm allows arbitrary post-collision velocities as well as non-uniform grids to be used. On uniform grids many points contain negligible mass and it becomes computationally expensive to resolve the distribution function. By concentrating grid points near the center of mass velocity accurate solutions can be obtained efficiently. Comparisons between computed and reference solutions are shown for various grids, demonstrating correct relaxation rates and behavior of the macroscopic properties.

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