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Direct quadrature method of moments for Boltzmann equation with dissipative dynamics PRAKASH VEDULA, University of Oklahoma, RODNEY FOX, Iowa State University — Computational modeling of transport phenomena, such as those in rarefied gases, granular flows and plasmas, is particularly challenging due to the presence of a collision operator in the governing Boltzmann equation that is non-linear and integro-differential in nature. Earlier numerical approaches in the literature have been found to be computationally expensive and/or lacking in sufficient accuracy. In order to address these issues, we propose a new approach for the Boltzmann equation using direct quadrature method of moments. In this approach, the velocity distribution function is represented as a set of Dirac-delta functions, with associated weights and locations. The evolution of these weights and their locations is derived from the Boltzmann equation using constraints on generalized moments of velocity. The collision integral can be simplified into a more manageable form using appropriate coordinate transformations and multinomial expansions. The approach is designed to preserve mass, momenta and correct rates of dissipation of energy and selected generalized moments of velocity. The criteria for selection of moment constraints and the performance of this approach will be evaluated.

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