QuiPS: How a Discrete Velocity Technique Morphed into Monte Carlo Simulation

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I will describe the evolution of the quasi-particle scheme (QuiPS) for solving the Boltzmann equation from a discrete velocity method [1-3] to something that looks a lot like DSMC [4]. QuiPS can be viewed as Monte Carlo simulation using fixed velocity particles with variable statistical weight and is complementary to conventional DSMC that uses variable velocity particles with fixed statistical weight [5]. In general, QuiPS permits resolution of the tails of the velocity and internal state distributions at lower computational cost than conventional DSMC, which is critical to accurate calculation of chemical reaction and ionization rates in some applications [6]. QuiPS can also model transient flows more than DSMC efficiently and provides the opportunity to implement some novel adaptive schemes [7-9]. I will provide illustrative results of QuiPS calculations and discuss possible extension and developments.

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