quadratic electric potentials provides the convenient opportunity to evaluate stochastic algorithms for the solution of the former equation with the analytic solutions of the latter equation - Liouville trajectories corresponding to acceleration due to a constant electric field. The direct application of this idea is impeded by the fact that the analytic transformation of the first equation into the second involves generalized functions. In particular, the Wigner potential acts as a derivative of the delta which gives rise to a Newtonian accelerating force. The second problem is related to the discrete nature of the Wigner momentum space. These peculiarities incorporate unphysical effects in the approximate Wigner solution, which tends to the Boltzmann counterpart in a limiting case only, and resemble the application of the methods of Monte Carlo cellular automata. Numerically the situation is very challenging due to an exponential growth in the number of particles as evolving particles generate pairs of new particles of opposing signs. Parallelization is an important measure in order to reduce the run time of the calculation. Since the number of particles increases during the evaluation of the algorithm, adaptive parallelization methods need to be explored to increase the throughput of the calculations and hence reduce the total run time.

The Role of Annihilation in a Wigner Monte Carlo Approach

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The Wigner equation provides an interesting mathematical limit, which recovers the constant field, ballistic Boltzmann equation. The peculiarities of a recently proposed Monte Carlo approach for solving the transient Wigner problem, based on generation and annihilation of particles are summarized. The annihilation process can be implemented at consecutive time steps to improve the Monte Carlo resolution. We analyze theoretically and numerically this process in the case of the benchmark example provided by the above limit. Then we show that the approach can be used for simulation of realistic quantum phenomena, such as tunneling of a wave packets through potential barriers.

GPU Calculations of Unsteady, Viscous, Compressible and Heat Conductive Gas Flow at Supersonic Speed

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The recent trend of using Graphics Processing Units (GPUs) for high performance computations is driven by the high ratio of price performance for these units, complemented by their cost effectiveness. Such kinds of units are increasingly being deployed not only as accelerators for supercomputer installations, but also in GPU-enabled