Single-lane TASEP with generalized update

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Numerical simulation results are presented here for the single-lane totally asymmetric simple exclusion process (TASEP) with generalized update (GU). First, we note, that the application of TASEP to bio-molecular process goes as far as [1], see also e.g. [2], where Y.-M. Yuan et al. used the model to describe directed motion of molecular motors along twisted filaments. Second, we would like to point out that the TASEP has achieved the status of a paradigmatic model in the study of non-equilibrium statistical mechanics similar to the role of Ising model in the equilibrium statistical mechanics. The generalization of the update procedure for TASEP was suggested first in [3] through the inclusion of an additional interaction factor between the particles. TASEP with GU was first studied by A.E. Derbyshev et al. [4] on a ring. The use of open boundary conditions, employed here, leads to a very rich phase behaviour, which could not be observed on a ring. Representative points of the phase diagram were explored. The total current, flowing in the system, the density distribution of the particles, as well as the nearest-neighbor (NN) correlations in the system were studied. The numerical simulations reveal a very broad type of behavior of the system, depending on the additional interaction factor, resulting in higher values of the current and quite unexpected change of the NN-correlations, while the other parameters of the system are kept fixed (i.e., the input and exit rates).

References

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