

On the Single-Lane TASEP with Generalized Update and Open Boundary Conditions

N. Pesheva¹, N. Bunzarova^{1,2}, J. Brankov², V. Priezhev²

¹ Institute of Mechanics, BAS, Sofia, Bulgaria
nina@imbm.bas.bg, nadezhda@imbm.bas.bg

² Bogoliubov Laboratory of Theoretical Physics, JINR, Dubna, Russia
brankov@theor.jinr.ru, priezzvb@theor.jinr.ru

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We report on numerical simulation results for the stationary properties of the totally asymmetric simple exclusion process (TASEP) with generalized update (GU) on a simple chain with open boundary conditions (OBC). We note that the application of TASEP to biomolecular processes can be traced back to [1], see also [2,3], where the model was used to describe directed motion of molecular motors along twisted filaments. The model with generalized update, suggested and studied on a ring in [4,5], includes interaction between nearest-neighbor particles. The implementation of OBC leads to a variety of stationary properties of the TASEP with GU, which cannot be observed on a ring. We introduce here a modified left boundary condition which controls the input of particles in the chain, which allows for a smooth transition from the standard updates to the extreme case of particles gluing in stable clusters. The density distribution of particles along the chain, nearest-neighbor particle-particle correlations, and the fundamental relationship between particle current and density were studied at different values of the parameters. Our numerical simulations reveal broad and quite unexpected modes of behavior of the system. Simple analytical models for the description of some of the unusual types of behavior are suggested. Finally, the possibilities for different applications are mentioned.

References

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