

Abstract

Analysis of the hydrodynamic flux in the 2-exclusion process

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In this thesis we have studied the K -exclusion process with periodic boundary condition, in particular the $K = 2$ case. In this process of interacting particle systems the particles may hop to the right with a unit rate if no exclusion happens, taking into mind that the maximal particle number on a site is K .

Our aim was to describe the hydrodynamic flux as the process is in the steady state. As there isn't a factorised steady state for this case of models we had to look for the more general concept of matrix product form steady states. The main idea behind the concept is to associate a matrix with every possible number of particles on a site, then take the product of the matrices corresponding to every site, and make a real value function of it by taking the trace in the end.

We have shown a necessary condition for such form of steady states to exist. This lead to a quadratic algebra containing 9 equations. We have discussed the main properties of this algebra, also including the relation to the symmetries of the system.

We have found that the algebra is very usable as we gave the method to determine the stationary distribution with the help of it. We have also proved that this way we get the same results as by calculating with the help of the infinitesimal generator. However, our method turned to be highly automatic making it much faster then the classic way.

Finally with the help of the calculated stationary distributions we have plotted a few hydrodynamic flux - density functions, and saw some properties which had fit with all the given graphs.