Takahiro Tannai, J Laser Opt Photonics 2018, Volume:5
DOI: 10.4172/2469-410X-C2-026

Theoretical approaches to saturation and relaxation of congestion in TASEP (Totally Asymmetric Simple Exclusion Process) network with junctions with density-dependent rules

Takahiro Tannai
The University of Tokyo, Japan

We consider transport phenomena in chemistry and biology in the aspect of physics. Transport phenomena are results of collective motions of self-driven particles, i.e., particles which can move. Similar phenomena such as traffic flow and transportation network in our society can be seen in many scenes. Although Each topic has been individually treated in different research fields, with focus on the collective behaviors of particles, we can use an interdisciplinary approach to these many topics from physics, especially statistical mechanics with use of mathematics.

As one of the most simple model, we consider a TASEP (Totally Asymmetric Simple Exclusion Process) network with junctions. It is assumed that junction has density-dependent and (indirectly) time-dependent rule. From extension of mean-field approximation, we can theoretically derive the fact that interactions between branching in upper-stream and aggregation in down-stream often makes saturated congestion from parameters of junctions. In the case of networks with paralleled multi-chain segments, the multi-chain segments enable the network less congested than the single TASEP segment, which is congestion relaxation. In order to confirm the validity of theoretical analysis, we use results of numerical simulations.

Biography

Takahiro Tannai has completed his Ph.D. from The University of Tokyo and now is a researcher there. His research backgrounds are physics and mathematics from broad area and current interests are interdisciplinary approaches to networks of transport phenomena in chemistry and biology and similar phenomena in our society.

ttannai.23@gmail.com

Notes: