Multi-type exclusion processes and queues in tandem

Abstract. We consider totally asymmetric simple exclusion processes with \( n \) types of particle and holes (\( n \)-TASEPs).

Omer Angel recently gave an elegant construction of the stationary measures for the 2-TASEP, based on a pair of independent product measures. We show that Angel’s construction can be interpreted in terms of the operation of a discrete-time M/M/1 queueing server; the two product measures correspond to the arrival and service processes of the queue. We extend this construction to represent the stationary measures of an \( n \)-TASEP in terms of a system of priority queues in tandem. The proof of stationarity involves a system of \( n \) 1-TASEPs, whose evolutions are coupled but whose distributions at any fixed time are independent.

One corollary is the form of an arrival process which is a ”fixed point” for an \( n \)-type priority queue (i.e. such that the departure process has the same law as the arrival process).

Joint work with Pablo Ferrari.