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Markov processes of infinitely many nonintersecting random walks

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Consider an N-dimensional Markov chain obtained from N one-dimensional random walks by Doob h-transform with the q-Vandermonde determinant. We prove that as N becomes large, these Markov chains converge to an infinite-dimensional Feller Markov process. The dynamical correlation functions of the limit process are determinantal with an explicit correlation kernel. The key idea is to identify random point processes on Z with q-Gibbs measures on Gelfand-Tsetlin schemes and construct Markov processes on the latter space. Independently, we analyze the large time behavior of PushASEP with finitely many particles and particle-dependent jump rates (it arises as a marginal of our dynamics on Gelfand-Tsetlin schemes). The asymptotics is given by a product of a marginal of the GUE-minor process and geometric distributions.

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