Un résultat pour le processus d’exclusion à longue portée. (French. English, French summaries) [A result for the long-range exclusion process]


In this paper, Guiol studies the long-range exclusion process. For this Markov process $(\eta_t)_{t \geq 0}$ on $\{0, 1\}^S$ ($S$ is a denumerable set), particles evolve in the following way: Each site is endowed with an exponential clock of parameter 1, and the clocks are mutually independent. Let $(X_n)_{n \in \mathbb{N}}$ be a Markov chain on $S$ with transition probability $p(\cdot, \cdot)$. When the clock rings at site $x \in S$, the particle of configuration $\eta$ present at $x$ (if there is one) follows the Markov chain $(X_n)$ of initial position $X_0 = x$, until either it returns to $x$, or it finds an empty site of $\eta$ (i.e., $\eta(X_n) = 0$); in both cases, it stays there, otherwise it disappears.

This process, introduced by F. Spitzer [Advances in Math. 5 (1970), 246–290 (1970); MR0268959 (42 #3856)], was first investigated by T. M. Liggett [Ann. Probab. 8 (1980), no. 5, 861–889; MR0586773 (81j:60113)]: He constructed the process, which is not Feller, using Feller approximations, called $k$-step exclusion with disappearance (they converge to the long-range process when $k$ goes to infinity). For such a process, if the particle starting from $x$ and following $(X_n)$ does not come back to $x$ or find an empty site for $n \leq k$, it disappears. Among various results on the invariant measures of the long-range process, depending on $S$ and $p(\cdot, \cdot)$, Liggett proved that, when $S = \mathbb{Z}^d$ and $p(\cdot, \cdot)$ is translation invariant, the Bernoulli product measures $\nu_\rho$ with parameter $\rho \in [0, 1]$ are invariant.

In this setting, Guiol proves here that if moreover $p(\cdot, \cdot)$ is irreducible, then the set of extremal invariant and translation-invariant measures is reduced to the Bernoulli measures. The technique of proof is similar to the one described by Liggett in Section VIII.3 of his book [Interacting particle systems, Springer, New York, 1985; MR0776231 (86e:60089)] for the simple exclusion process: First show that, under an invariant and translation-invariant measure for a coupled long-range exclusion process (with basic coupling), the configurations are ordered coordinatewise; then obtain an invariant measure for the coupled process, and finally conclude by coupling any translation-invariant and invariant measure with a Bernoulli measure. Each step (except the last one) requires one to use the $k$-step approximating processes.

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