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Derivation of the hydrodynamical equation for the zero-range interaction process. (English)

Zbl 0536.60097
Ann. Probab. 12, 325-334 (1984).

In continuation of the reviewer's paper in Z. Wahrscheinlichkeitstheor. Verw. Geb. 58, 41-53 (1981; Zbl 0451.60097) the property of local equilibrium for the asymmetric zero range process with particular initial states is established and the evolution of the parameter characterizing the local equilibria is derived.

The model is given by the Markov process on N^Z whose generator is $Lf(\eta) = \sum_i 1_{\{\eta_i>0\}}.(f(\eta^i) - f(\eta))$, where η^i is obtained from η by moving a particle from i to $i+1$. The equilibria are the product measures ν_ρ, $0 < \rho < \infty$, with $\nu_\rho(\eta_i = k) = (\rho/1+\rho)^k \cdot (1+\rho)^{-1}$, $k \geq 0$.

The result may roughly be stated as follows: Rescale space and time by the same factor ϵ ; then, as ϵ tends to zero, the macroscopic density profile ρ (x,t) evolves according to the equation

$$\frac{\partial \rho}{\partial t} + \frac{\partial \rho}{\partial x} \cdot (1+\rho)^{-2} = 0,$$

if the initial density ρ (0,.) satisfies one of the following two conditions: (a) it is an increasing step function taking on only two values (Th.2.4); (b) it is decreasing and differentiable (Th.3.3).

Reviewer: H.Rost

MSC:

60K35 Interacting random processes; statistical mechanics type models; percolation theory

60J70 Applications of Brownian motions and diffusion theory (population genetics, absorption problems, etc.)

Cited in **18** Documents

Keywords:

hydrodynamic equation; local equilibrium; zero range process

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