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# Application of entropy analysis to discrete-time interacting particle systems on the one-dimensional lattice

Hirotake YAGUCHI

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ABSTRACT. Stationary measures for discrete-time interacting particle systems on the one-dimensional lattice are considered. In our systems infinitely many particles can change their states simultaneously, and the change of each particle state is affected by particles on the surrounding sites. We extensively improve the relative entropy method and make it applicable to such discrete-time particle systems generally. We prove that the stationary measures for Ising models are given by a unique Gibbs state and those for exclusion processes are given by canonical Gibbs states.

## 1. Introduction

In this paper we aim to establish a general way of analyzing stationary measures for discrete-time interacting particle systems on the one-dimensional lattice. In our systems the particles on sites of $\mathbf{Z}$ change their states at each time according to a given probabilistic rule which satisfies the local equilibrium condition. The number of sites at which changes occur simultaneously is infinite, and the probability of changing a state at each site is affected by the particles in the range of distance $R$ from the focused particle. As such processes we treat discrete-time stochastic Ising models and interactive exclusion processes on the one-dimensional lattice $\mathbf{Z}$. Applying the relative entropy method carefully, we generally discuss a wide class of discrete-time interacting particle systems satisfying the local equilibrium condition. We then determine the structure of stationary measures for the Ising models and the exclusion processes.

Many results have been obtained concerning time evolutions of interacting particle systems (see [6] and the bibliography in [7]). However, in most cases, their time parameters are continuous. We are interested in discrete-time inter-

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