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Infinite Queueing Systems with Tree Structure

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Abstract: We focus on invariant measures of an interacting particle system in the case when the set of sites, on which the particles move, has a structure different from the usually considered set $\mathbb{Z}^d$. We have chosen the tree structure with the dynamics that leads to one of the classical particle systems, called the zero range process. The zero range process with the constant speed function corresponds to an infinite system of queues and the arrangement of servers in the tree structure is natural in a number of situations.

The main result of this work is a characterisation of invariant measures for some important cases of site-disordered zero range processes on a binary tree. We consider the single particle law to be a random walk on the binary tree. We distinguish four cases according to the trend of this random walk for which the sets of extremal invariant measures are completely different. Finally, we shall discuss the model with an external source of customers and, in this context, the case of totally asymmetric single particle law on a binary tree.

Keywords: invariant measures; zero range process; binary tree; queues;

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