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On the invariant measure of random walks in the quarter plane: a characterisation via geometric distributions and bounds on performance measures

Abstract

We consider random walks in the quarter plane that have transitions to neighbouring states that have distance at most one in each coordinate, where the transition probabilities are translation invariant except for the states at the boundary of the state space. First we investigate the class of random walks for which the invariant measure can be characterised as a sum of geometric distributions. We show that each term in this sum must individually satisfy the global balance (or equilibrium) equations in the interior of the quarter plane. For random walks for which the invariant measure cannot be characterised as a sum of geometric terms, for various performance measures we use the class of random walks that have a sum of geometric terms to obtain upper and lower bounds. This is joint work with Yanting Chen and Jasper Goseling.