

NECESSARY CONDITIONS FOR THE INVARIANT MEASURE OF A RANDOM WALK TO BE A SUM OF GEOMETRIC TERMS

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We consider the invariant measure of homogeneous random walks in the quarter-plane. In particular, we consider measures that can be expressed as an infinite sum of geometric terms. We present necessary conditions for the invariant measure of a random walk to be a sum of geometric terms. We demonstrate that each geometric term must individually satisfy the balance equations in the interior of the state. We show that the geometric terms in an invariant measure must have a pairwise-coupled structure. We further show that the random walk cannot have transitions to the North, Northeast or East. Finally, we show that for an infinite sum of geometric terms to be an invariant measure at least one coefficient must be negative. This paper extends our previous work for the case of finitely many terms to that of countably many terms.