

Random walks in the quarter plane, harmonic functions and conformal mappings

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Abstract

In this talk I will present a new approach for finding positive harmonic functions for random walks in a quarter plane. When the drift of the random walk is zero, we prove that there exists a unique harmonic function. In addition, in the non-zero drift case, we rediscover many recent results on harmonic functions (in particular, their number and their explicit expression). The two key-ingredients of our approach are a functional equation satisfied by any harmonic function, and, surprisingly, a certain conformal mapping (introduced in the 90's by Fayolle, Iasnogorodski and Malyshev). Finally we shall see some extensions of our methods.