Abstract Submitted
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Scaling of Quantum Walks on Complex Networks[1] STEFAN BOETTCHER, STEFAN FALKNER, Physics Dept., Emory University, RENATO PORTUGAL, Laboratório Nacional de Computação Científica — I will describe the renormalization group method (RG) as applied to master equations with a unitary propagator. It allows to determine many asymptotic properties of quantum walks, although I will focus here on the walk dimension d_w, which describes the similarity solution, $\rho(x,t) \sim f\left(|x|^{d_w}/t\right)$, for the probability density function ρ. We can calculate d_w to arbitrary accuracy for a number of networks, such as the dual Sierpinksi gasket, small-world Hanoi networks, or Migdal-Kadanoff lattices, which we have verified with direct simulations. However, due to unitarity, the asymptotic solution of the RG equations as well as procedures to implement RG approximately for arbitrary networks remain elusive. Yet, based on the exact RG for those fractal networks, we can conjecture a few general conclusions, for instance, that d_w for a discrete-time quantum walk is always half of that for the random walk on the same r-regular network, when driven with the Grover coin. (This talk summarizes our work in http://dx.doi.org/10.1103/PhysRevA.90.032324 and http://arxiv.org/abs/1410.7034.)

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