

The generator of quantum walks and its applications

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Abstract

We represent the dynamics of quantum walks (on the lattices) as a unitary evolution in a Hilbert space. Thereby we find the generator of the dynamics. We can benefit by it some of basic features of the quantum walks. First, by representing the dynamics in the Fourier transform space, we derive the limit distributions of the quantum walks. Second, it enables us to define a continuous time quantum walks not only for discrete time walks. Then we can consider quantum Markov semigroup for quantum walks. Next, in relevance with quantum probability, we can represent the moments of the limit distribution by vacuum expectations of the powers of suitably given real operator in a one mode interacting Fock space.