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Space-homogeneous quantum walks on $\mathbb{Z}$ from the viewpoint of complex analysis. (English)


Summary: The subject of this paper is quantum walks, which are expected to simulate several kinds of quantum dynamical systems. In this paper, we define analyticity for quantum walks on $\mathbb{Z}$. Almost all the quantum walks on $\mathbb{Z}$ which have been already studied are analytic. In the framework of analytic quantum walks, we can enlarge the theory of quantum walks. We obtain not only several generalizations of known results, but also new types of theorems. It is proved that every analytic space-homogeneous quantum walk on $\mathbb{Z}$ is essentially a composite of shift operators and continuous-time analytic space-homogeneous quantum walks. We also prove existence of the weak limit distribution for analytic space-homogeneous quantum walks on $\mathbb{Z}$.

MSC:

46L53 Noncommutative probability and statistics
60F05 Central limit and other weak theorems
60J10 Markov chains (discrete-time Markov processes on discrete state spaces)
81Q99 General mathematical topics and methods in quantum theory

Keywords:
quadratic walk; complex analysis

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References:


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