Continuous Time Quantum Walks on Complex Network Topologie

Poster

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We study the stability of continuous time quantum walks(CTQWs) on complex network topologies like scale-free, Erdos-renyi and small world networks. Quantum walks are quantum analog for classical random walks. Our work focuses on analyzing metrics such as fidelity of initial and evolved states, quantum classical distance and von neumann entropy. We also study the density matrix visualization to get a better understanding of populations in each node and quantum coherences. We present a comprehensive study of how different network topologies influence the behavior of CTQWs through simulation results. Our findings reveal the variations in quantum walk dynamics across different network topologies and provide insights into the impact of network topologies on stability of quantum walks. Through detailed simulations and comparisons, we aim to get a better understanding of the stability of quantum networks, which can impact both theoretical research and practical applications in quantum computing and network analysis.

References

[1] M. A. Nielsen and I. L. Chuang, Quantum Computation and Quantum Information. Cambridge University Press, 2002.

[2] O. M. lken and A. Blumen, "Continuous-time quantum walks: Models for coherent transport on complex networks," arXiv, 2011.

[3] M. G. A. P. Gabriele Bressanini, Claudia Benedetti, "Decoherence and classicalization of continuous-time quantum walks on graphs," Quantum Information Processing, 2002.