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Quantum walk based state transfer algorithms on the complete M-partite graph

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We introduce the general scheme of discrete-time quantum walk algorithm for the search and state transfer algorithm based on discrete-time quantum walk. We prove that adding a loop to each vertex improves success probability of the search algorithm on a complete M-partite graph in the limit of a large graph. We show that the state transfer algorithm performs perfect state transfer between sender and receiver in the case when their are in different partitions of the graph. However, the state transfer algorithm fails to achieve perfect state transfer when sender and receiver are in the same partition of the graph. We propose modification of the state transfer algorithm by adding switch of evolution operator during teh run of algorithm. We show that state transfer algorithm with active switch performs perfect state transfer in all cases of relative position of sender and receiver on the complete M-partite graph.

Primary authors: ŠTEFAŇÁK, Martin (CTU FNSPE);   SKOUPÝ, Stanislav (FJFI CVUT)

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