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Continuous-time quantum walks on dynamic graphs

Continuous-time quantum walks (CTQWs) on static graphs provide efficient methods for search and sampling as well as a model for universal quantum computation. In this talk, we consider an extension of CTQWs to the case of dynamic graphs, in which an ordered sequence of graphs governs free evolution of the quantum walk. We then consider how perfect state transfer during the quantum walk can be used to design dynamic graphs that implement a universal set of quantum logic gates. Additionally, we give explicit examples for a complete logical basis, and we validate implementations using numerical simulations for quantum teleportation and addition circuits. Finally, we discuss how these ideas could be implemented in near-term technologies, such as photonic quantum processors.