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Quantum State Transfer and Strong Cospectrality

A quantum spin network can be modelled by an undirected graph G whose vertices are the qubits in the network, where an edge exists between two interacting qubits. Depending on the dynamics, the evolution of the quantum spin network at time t is given by the matrix $\exp(-itM)$, where M is a Hermitian matrix associated to G . One major problem involving quantum spin networks is determining a time t such that a state of a qubit q_1 is transferred to another qubit q_2 with a particular level of probability. We call this phenomenon quantum state transfer, and the level of probability gives rise to various types of state transfer. In this presentation, we introduce different types of quantum state transfer on graphs, and present known facts. We also discuss the concept of strong cospectrality, a necessary condition for some types of quantum state transfer.