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Graph Spectra and Quantum Computing

If A is the adjacency matrix of a graph X, we define a transition matrix $H_X(t)$ by

$$H_X(t) := \exp(itA).$$

This is a symmetric unitary matrix, underlying a so-called continuous quantum walk. Work in quantum computing leads to a number of questions which can be attacked using ideas from the theory of graph spectra. I will present examples, along with a number of open questions.