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Real state transfer

Let X be a graph, and let M be a Hermitian matrix associated to X , which is usually taken to be the adjacency or Laplacian matrix. At time t , the transition matrix of the continuous quantum walk on X relative to M is $U(t) = e^{itM}$. If the initial state of the walk is given by a density matrix D (positive semidefinite matrix of trace 1), then the state of the walk at time t is $D(t) = U(t)DU(-t)$. In this talk, we consider state transfer between real states (all entries of D are real), with focus on when D is rational, for example, when D is the Laplacian matrix of some graph scaled to have trace 1.