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Pair State Transfer

So far the most studied quantum walks are the ones whose Hamiltonians are the adjacency matrices of the underlying graphs and initial states are vertex states e_a. This talk focuses on Laplacian pair state transfer, that is, the quantum walks whose initial states are pair states $e_a - e_b$ and Hamiltonians are the Laplacians of the underlying graphs.

We extend some known results of vertex state transfer to Laplacian pair state transfer and introduce some basic properties of Laplacian pair state transfer. We will introduce two useful closure properties for perfect Laplacian pair state transfer. One is that complementation preserves perfect pair state transfer. The other is that if G has vertex state transfer and H has pair state transfer, then with some mild assumption on the pairs of vertex states and pair states that have perfect state transfer, the Cartesian product $G\Box H$ also admits perfect pair state transfer. We will talk about one interesting transitivity phenomenon that happens in Laplacian pair state transfer which never happens in vertex state transfer.