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Perfect state transfer in a graph and its line graph

In the study of continuous quantum walks on graphs, perfect state transfer between $\mathbf{x}$ and $\mathbf{y}$ has been well-explored when $\mathbf{x}$ and $\mathbf{y}$ are standard basis vectors, specifically $\mathbf{e}_v$ and $\mathbf{e}_w$ corresponding to vertices v and w. Chen and Chris extended this by investigating cases where $\mathbf{x} = \mathbf{e}_a \pm \mathbf{e}_b$ and $\mathbf{y} = \mathbf{e}_c \pm \mathbf{e}_d$.

This led us to a graph-theoretic question: Given a graph G that permits perfect state transfer between $\mathbf{e}_a + \mathbf{e}_b$ and $\mathbf{e}_c + \mathbf{e}_d$ for edges $\{a, b\}$ and $\{c, d\}$, does its line graph $\ell(G)$ also exhibit perfect state transfer between $\mathbf{e}_v$ and $\mathbf{e}_w$, where v and w correspond to the edges $\{a, b\}$ and $\{c, d\}$, respectively? Moreover, is the converse true? We will address this question and provide relevant examples.