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Perfect State Transfer in Cayley and double coset graphs related to linear groups in two dimensions.

Quantum walk on a graph, a quantum analogue of the random walk on a graph, is a model originating from quantum physics and is of interest in quantum information theory. Of central importance to this theory is the perfect state transfer (PST). A result by Godsil shows that for a given maximum valency, there are only finitely many connected graphs that exhibit PST. For this reason, it is interesting to find infinite classes of examples of connected graphs that admit PST. In this talk, we will construct examples of PST admitting Cayley and double coset graphs associated with $\mathrm{SL}(2, q)$ $\mathrm{GL}(2, q)$, and $\mathrm{GU}(2, q^2)$. The Cayley graphs we construct, as far as we know, are the first such PST admitting examples in which the underlying groups are not solvable. This is joint work with Peter Sin.