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Linked Simplices

Let X and Y be sets of unit vectors corresponding to regular simplices in \mathbb{R}^v ($v + 1$ vectors with pairwise inner product $-\frac{1}{v}$). We call X and Y a pair of *linked simplices* if, for every $x \in X$ and $y \in Y$, we have $\langle x, y \rangle \in \{\gamma, \zeta\}$ for some fixed values of γ and ζ . We ask the question of when you can find large sets of simplices for which every pair of them are linked using the same inner products γ and ζ . In this talk, we show that any set of w linked simplices corresponds to a linked system of symmetric designs (LSSD) on w fibers. Using the Q -polynomial structure of LSSDs, we then construct linked simplices showing the equivalence between these two objects. Finally we review known examples such as the Cameron-Seidel association scheme and, in restricted cases, use the linked simplices to construct real mutually unbiased bases.