

General supplementary difference sets (GSDS): A key to the construction of Hadamard matrices

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It is well-known that there are some connections between combinatorial and experimental designs. Difference sets play an important role in block designs. This work proposes a new and unified construction method, namely general supplementary difference sets (GSDS), for Hadamard and near-Hadamard matrices when the run sizes are $4t$ and $4t+2$ respectively. The constructed Hadamard matrices are D -optimal and most near-Hadamard matrices reach the upper bound of D -efficiencies proposed in Ehlich (1964). Similar idea is applied to the construction of circulant partial Hadamard matrices suggested in Craigen et al. (2013), but we successfully obtain large designs with $n > 52$. Some connections to two-level and three-level definitive screening designs are proposed at the end. This is a joint work with Dr. Yuan-Lung Lin, Academia Sinica.