**Explicit construction of unitary designs**

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Unitary design is a finite subset of the unitary group which approximates the unitary group well concerning integrals. It rises from the study of quantum information theory. Formally a unitary $t$-design is a subset $X$ of the unitary group $U(d)$ such that

$$\frac{1}{|X|}\sum_{U\in X} U^{\otimes t}\otimes (U^{\dagger})^{\otimes t} = \int_{U(d)} U^{\otimes t}\otimes (U^{\dagger})^{\otimes t}\,\mathrm{d}U.$$

In this talk we will give an explicit inductive construction of the unitary $t$-design on $U(d)$ for arbitrary positive integers $t$ and $d$. In fact the inductive construction works for designs on compact groups. As a by-product, we obtain a new explicit construction of (real or complex) spherical designs.

This talk is based on joint work with Eiichi Bannai, Yoshifumi Nakata, and Takayuki Okuda.