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Pancyclic PBD block-intersection graphs

A pairwise balanced design PBD$(v, \mathcal{K}, \lambda)$ consists of a set V of cardinality v, a set $\mathcal{K}$ of positive integers, and a set $\mathcal{B}$ of subsets of V with the properties that $|b| \in \mathcal{K}$ for each $b \in \mathcal{B}$, and each pair of elements from V occurs in exactly λ of the subsets in $\mathcal{B}$. The elements of $\mathcal{B}$ are known as the blocks of the design.

Given a combinatorial design $\mathcal{D}$ with block set $\mathcal{B}$, its block-intersection graph $G_{\mathcal{D}}$ is the graph having vertex set $\mathcal{B}$ such that two vertices b_1 and b_2 are adjacent if and only if b_1 and b_2 have non-empty intersection.

Hare showed in 1995 that if $\mathcal{D}$ is a PBD$(v, \mathcal{K}, 1)$ with $\min \mathcal{K} \geqslant 3$, then $G_{\mathcal{D}}$ is edge-pancyclic (*i.e.*, each edge of $G_{\mathcal{D}}$ is contained in a cycle of each length $\ell = 3, 4, \ldots, |V(G_{\mathcal{D}})|$). In this presentation we consider block-intersection graphs of pairwise balanced designs PBD$(v, \mathcal{K}, \lambda)$ for which $\lambda \geqslant 2$.

This is joint work with Graham Case.