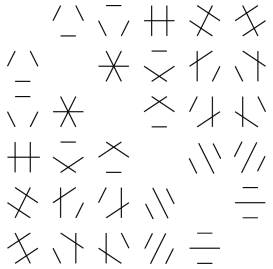
Mathematics Seminar



Rocky Mountain Algebraic Combinatorics Seminar

Resolvable designs and maximal arcs in projective planes

Vladimir D. Tonchev
Michigan Technological University

Let $D = \{X, \mathcal{B}\}$ be a Steiner 2-$(v, k, 1)$ design with point set X, collection of blocks $\mathcal{B}$, and let v be a multiple of k, $v = nk$. A *parallel class* is a set of $v/k = n$ pairwise disjoint blocks, and a *resolution* is a partition R of $\mathcal{B}$ into disjoint parallel classes. A design is *resolvable* if it admits a resolution.

Two resolutions are *compatible* if they share one parallel class, and all other classes pairwise have at most one block in common. In this talk, we discuss an upper bound on the maximum number of mutually compatible resolutions of a resolvable 2-$(nk, k, 1)$ design D. The bound is attainable if and only if D is embeddable as a maximal $(kq - q + k, k)$-arc in a projective plane of order $q = (v - k)/(k - 1)$.

We will report on some recent work on maximal sets of mutually compatible resolutions associated with maximal $(52, 4)$-arcs in the known projective planes of order 16.

Commutative Semifields

Morgan Rodgers
Lake Superior State University

Finite semifields are well studied objects in combinatorics and finite geometry and have many connections to other interesting geometric structures. They play a central role in the theory of projective planes, generalised quadrangles, and polar spaces, and have applications to cryptography, and maximum rank distance codes. Of particular interest are commutative semifields with odd order, for which very few constructions are known. The property of being commutative implies that these semifields have applications to perfect nonlinear functions.

We will first consider commutative semifields which have rank two over their middle nucleus. These objects are equivalent to semifield flocks of a quadratic cone in projective 3-space, and are therefore also equivalent to translation ovoids of Q(4,q). We will also consider commutative semifields with rank 3 over their middle nucleus. In both of these situations, a computer search for new examples can be conducted by searching for certain linear sets. This is joint work with Michel Lavrauw.

Weber 223
4–6 pm
Friday, April 21, 2017
(Refreshments in Weber 117, 3:30–4 pm)
Colorado State University

This is a joint Denver U / UC Boulder / UC Denver / U of Wyoming / CSU seminar that meets biweekly.
Anyone interested is welcome to join us at a local restaurant for dinner after the talks.

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