# Configurations from strong deficient difference sets

Marién Abreu
*Università degli Studi della Basilicata*
marien.abreu@unibas.it
Martin Funk
*Università degli Studi della Basilicata*
martin.funk@unibas.it
Domenico Labbate
*Università degli Studi della Basilicata*
domenico.labbate@unibas.it
Vedran Krčadinac
*University of Zagreb*
vedran.krcadinac@math.hr

In [1] we have studied combinatorial configurations with the associated point and line graphs being strongly regular, which we call *strongly regular configurations*. In the talk "Strongly regular configurations" of this minisymposium, Vedran Krčadinac will present existing known families of strongly regular configurations; constructions of several other families; necessary existence conditions and a table of feasible parameters with at most 200 points.

Let $G$ be a group of order $v$. A subset $D \subset G$ of size $k$ is a *deficient difference set* the left differences $d_1^{-1}d_2$ are all distinct. Considering the elements of $G$ as points and the *development* $devD = \{gD | g \in G\}$ as lines a symmetric $(v_k)$ configuration is obtained and it has $G$ as its automorphism group acting regularly on the points and lines. Let $\Delta(D) = \{d_1^{-1}d_2 | d_1, d_2 \in D, d_1 \neq d_2\}$ be the set of left differences of $D$. For a group element $x \in G \setminus \{1\}$, denote by $n(x) = |\Delta(D) \cap x\Delta(D)|$. If $n(x) = \lambda$ for every $x \in \Delta(D)$, and $n(x) = \mu$ for every $x \notin \Delta(D)$, $D$ is said to be a *strong deficient difference set* ($SDDS$) for $(v_k; \lambda, \mu)$.

Here, we present one of the new families of strongly regular configurations constructed in [1], with parameters different from semipartial geometries and arising from strong deficient difference sets, as well as two examples arising from Hall's plane and its dual. Moreover, from the exhaustive search performed in groups of order $v \leq 200$ further four examples corresponding to strong deficient difference sets, but not in the previous families, are obtained.

[1] M. Abreu, M. Funk, V. Krčadinac, D. Labbate, Strongly regular configurations, preprint, 2021. https://arxiv.org/abs/2104.04880