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Strongly regular graphs with generalized Denniston parameters

In 1969, Denniston [2] introduced a family of maximal arcs in Desarguesian planes of even order, a construction that gives rise to a classical family of partial difference sets—objects that correspond to strongly regular graphs and have deep connections to finite geometry. These partial difference sets, later named after him, are defined within the additive group of a finite field of characteristic 2.

This naturally raises the question: Do Denniston partial difference sets exist in fields of odd characteristic? For over five decades, no progress was made on this problem—until recent breakthroughs by multiple research groups established the construction of Denniston partial difference sets in elementary abelian groups [1, 3, 4].

Building on this momentum, we extend Denniston partial difference sets to a significantly broader class of elementary abelian groups [5], which lead to a family of strongly regular graphs with generalized Denniston parameters. This is joint work with James Davis, Sophie Huczynska, Laura Johnson, and John Polhill.

References

[1] J. Bao, Q. Xiang, and M. Zhao. Partial difference sets with Denniston parameters in elementary abelian p-groups. *Finite Fields and Their Applications*, 2025.

[2] R.H.F. Denniston. Some maximal arcs in finite projective planes. *Journal of Combinatorial Theory*, 1969.

[3] J.A. Davis, S. Huczynska, L. Johnson, and J. Polhill. Denniston partial difference sets exist in the odd prime case. *Finite Fields and Their Applications*, 2024.

[4] S. De Winter. Projective two-weight sets of Denniston type. *Combinatorial Theory*, 2025.

[5] S. Li, J.A. Davis, S. Huczynska, L. Johnson, and J. Polhill, Strongly regular graphs with generalized Denniston and dual generalized Denniston parameters. *Combinatorial Theory*, 2026.