

# Constructive enumeration of the coherent configurations

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A coherent configuration is a partition of the arc set of a complete directed graph with some extra requirements [1]. Coherent configurations correspond to (some) subalgebras of the complete matrix algebra of the corresponding order. As such a two faced concept, coherent configurations play a significant role in algebraic graph theory.

Using a computer we constructed all coherent configurations of orders no more than 15 (up to isomorphism). One result of this enumeration is discovery of (the unique) non-Schurian coherent configuration of order 14 [2]. All coherent configurations of orders up to 13 are Schurian, so this is the smallest non-Schurian coherent configuration.

We will consider this project in a wider context by discussing computer aided enumeration efforts for some subclasses of coherent configurations such as association schemes, Schur rings, and strongly regular graphs.

The talk will also include a description of the techniques used to achieve the reported results.

## References

- [1] E. Bannai and T. Ito. *Algebraic combinatorics. I. Association schemes*, The Benjamin/Cummings Publishing Co., Inc., Menlo Park, CA, (1984).
- [2] M. Klin and M. Ziv-Av *A non-Schurian coherent configuration on 14 points exists*, M. Des. Codes Cryptogr. (2016). doi:10.1007/s10623-016-0258-8