Merging Coset Geometries: Split extension and Twisting

Claudio Alexandre Piedade

CMUP, Departamento de Matemática, Faculdade de Ciências, Universidade do Porto, Rua do Campo Alegre s/n, 4169-007 Porto (Portugal)

Incidence geometries are in the basis of Tits buildings and related structures. Coset incidence systems are incidence structures derived from group cosets, where points, lines, and higher-dimensional elements correspond to cosets of certain subgroups. These capture symmetry and combinatorial properties of groups, particularly in relation to buildings and flag complexes.

In a project with Philippe Tranchida, we study how various standard operations on groups can be extended to operations on coset geometries, such that properties like flag-transitivity and residually connectedness are preserved.

In this talk, we will describe two distinct ways of building a coset incidence system by split extension. One of these constructions is inspired by the twisted simple groups, preserving the thinness of the original coset incidence systems. This allows us to apply this construction to polytopes and hypertopes, generalising the known twisting operation of polytopes [1].

[1] McMullen, Peter, and Egon Schulte. Abstract regular polytopes. Vol. 92. Cambridge University Press, 2002.

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