Galois geometries contributing to coding theory

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A *linear* $[n, k, d]$*-code* C over the finite field of order q is a k-dimensional subspace of the n-dimensional vector space $V(n, q)$ over the *Galois field* $\mathbb{F}_q$ of order q. The *minimum distance* d of the code C is the minimal number of positions in which two distinct codewords of C differ.

A *finite projective space* $\mathrm{PG}(N, q)$ of dimension N over the Galois field $\mathbb{F}_q$ of order q arises from the $(N + 1)$-dimensional vector space $V(N + 1, q)$ over $\mathbb{F}_q$, when one identifies the vector lines of $V(N+1, q)$ as being the *points* of $\mathrm{PG}(N, q)$. These finite projective spaces $\mathrm{PG}(N, q)$ are also called *Galois geometries*.

Many problems in coding theory have equivalent statements as problems in Galois geometries. This means that techniques from Galois geometries can be used to solve problems in coding theory.

Concrete examples include the link between *linear MDS codes* and *arcs in Galois geometries*, *linear codes meeting the Griesmer bound* and *minihypers in Galois geometries*, *covering radius* and *saturating sets*, *linear codes arising from the incidence matrices of geometrical structures*, and *functional codes*.

During this talk, we will describe a number of these links and show how techniques from Galois geometries contribute to coding theory.

References

[1] I. Landjev and L. Storme, Galois geometries and coding theory. In Collected Work *Galois geometries and applications*. NOVA Academic Publishers (Eds. J. De Beule and L. Storme).