Abstract

Linear codes arising from projective spaces

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The n-dimensional projective space $\mathrm{PG}(n,q)$ over the finite field $\mathbb{F}_q$, $q = p^h$, can be used to construct the linear codes $C_{n-1}(n,q)$ and $C_{n-1}^{\perp}(n,q)$ by interpreting the incidence matrix of the points and hyperplanes as the generating matrix or parity check matrix of the code [4]. In the first part of this talk, we discuss the code $C_{n-1}^{\perp}(n,q)$ for q even. In this case, the minimum distance is known [1]. We focus mainly on characterisation results for small weight codewords.

In [2], codes closely related to $C_1^{\perp}(2,q)$, q even, were introduced. Considering a regular hyperoval H in $\mathrm{PG}(2,q)$, two classes of lines, secant lines and skew lines, and two classes of points can be distinguished. The incidence matrices of the skew lines and the non-hyperoval points, the secant lines and all points, and the secant lines and the non-hyperoval points are the parity check matrices for the binary codes $C_{SkNH}(q)$, $C_{SeA}(q)$ and $C_{SeNH}(q)$. In the second part of this talk, some new results about these codes are presented [3].

References

[1] N.J. Calkin, J.D. Key and M.J. de Resmini, Minimum Weight and Dimension Formulas for Some Geometric Codes, *Des. Codes Cryptogr.*, **17** (1999), pp. 105-120,

[2] C. Castleberry, K. Hunsberger and K.E. Mellinger, LDPC codes arising from hyperovals, *Bull. Inst. Combin. Appl.*, **58** (2010), pp. 59-72

[3] M. De Boeck and P. Vandendriessche, Some results on LDPC codes arising from hyperovals, in preparation,

[4] M. Lavrauw, L. Storme and G. Van de Voorde, On the code generated by the incidence matrix of points and hyperplanes in $PG(n,q)$ and its dual, *Des. Codes Cryptogr.*, **48** (2008), pp. 231-245.