Projective Nested Cartesian Codes

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In this work we introduce a new type of code, called projective nested cartesian code. It is obtained by the evaluation of homogeneous polynomials of a fixed degree on the set

$$[A_0 \times A_1 \times \cdots \times A_n] := \{(a_0 : \cdots : a_n) | \, a_i \in A_i \text{ for all } i\} \subset \mathbb{P}^n(\mathbb{F}_q),$$

where $A_0, A_1, \ldots, A_n$ is a collection of non-empty subsets of $\mathbb{F}_q$ such that for all $i = 0, \ldots, n$ we have $0 \in A_i$, and for every $i = 1, \ldots, n$ we have $A_j A_{i-1} \subset A_j$ for $j = i, \ldots, n$. These codes may be seen as a generalization of the so-called projective Reed-Muller codes. We calculate the length and the dimension of such codes, a lower bound for the minimum distance and the exact minimum distance in the special case where the sets A_i are subfields of $\mathbb{F}_q$ (so it includes the projective Reed-Muller codes).

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