Abstract

Construction of a new $\mathbb{Z}_4$-linear code whose Gray image has excellent minimum distance

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About 40 years ago in papers of Nordstrom, Robinson, Preparata and Kerdock [1, 2, 3], some nonlinear binary codes with better minimum distance than that of any comparable linear code were constructed. Later it was found out [4, 5] that these codes are images of linear codes over $\mathbb{Z}_4$ under the so-called Gray map. In our talk we will present another code with the same properties. Although it was found by a heuristic computer search, we can give an easy but interesting geometric construction based on a hyperoval in $\mathrm{PHG}(2, \mathbb{Z}_4)$. Its Gray image has the parameters $[58, 2^7, 28]$, thus exceeding the upper bound on the minimum distance of binary linear codes, which is 27 [6]. It also rises the lower bound on the maximal size of binary block codes of length 58 and minimum distance 28 from currently 124 (see [7]) to 128.

This is joint work with Michael Kiermaier.

References

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