Error Correction for Codes from Designs by Groups

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(joint work with Alfred Wassermann)

Dedicated to Spyros Magliveras on occasion of his 70’s birthday.

Abstract. The characteristic vectors of the blocks of a Steiner system are considered as code vectors. Large blocks with small intersections allow to correct many errors. We use the construction of such designs from orbits of a prescribed group action for a fast error correction. In the case of a 3-(q^n, q + 1, 1) with the prescribed action of PGL(2, q) up to q − 1 errors can be corrected by a few matrix multiplications. The Las Vegas type algorithm needs m multiplications with a probability decreasing rapidly with m growing. The approach is generalized to t-wise balanced designs obtained from the 3-(q^n, q + 1, 1) by truncating sets from systems of imprimitivity and to Steiner packings.

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