Abstract

Exponential Growth of Designs with Affine Parameters

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The affine geometry design $AG_d(n, q)$ is the design whose points are the points of an affine geometry of dimension n over $GF(q)$, and whose blocks are the affine subspaces of dimension d of the same affine geometry. Designs are closely related to graphs, error-correcting codes, and finite geometries. In particular, the binary code spanned by the incidence matrix of $AG_d(n, q)$ is known as an affine geometry code. If $q = 2$, then this code is equal to the Reed-Muller code of length 2^n and order $r = n - d$. It is well known that the number of designs with the parameters of a hyperplane design $AG_{n-1}(n, q)$, $n \geq 3$, grows exponentially with linear growth of n. We will examine the history of the question of exponential growth in finite geometry designs, and provide some new exponential lower bounds on the number of designs with the parameters of $AG_d(n, q)$, for each $2 \leq d \leq n - 1$. We will also provide similar exponential bounds on the number of resolvable designs and 3-designs with affine parameters.