

Abstract

Codes and Designs in the Grassmann Scheme

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Codes in the Grassmann scheme have found recently an application in network coding. These codes can be viewed as packing designs over $\text{GF}(q)$. The related designs were considered for over twenty years. Except for one family of nontrivial designs with $\lambda = 1$, known also as spreads, all known nontrivial designs are for $\lambda > 1$. The application of codes in the Grassmann scheme for error-correction in network coding, led to several new techniques for construction of such codes, i.e., packing designs. We will survey these methods and consider various necessary conditions for the existence of such packing designs with $\lambda = 1$, known as Steiner structures. We will consider also the related problem of covering designs over $\text{GF}(q)$ and give evidence that it is easier to find good covering designs than packing designs. The quality of the packing and covering designs will be measured by the related Johnson bound.