On the Construction of Some Optimal Binary Linear Codes

Authors : Skezeer John B. Paz, Ederlina G. Nocon

Abstract : Finding an optimal binary linear code is a central problem in coding theory. A binary linear code C = [n, k, d] is called optimal if there is no linear code with higher minimum distance d given the length n and the dimension k. There are bounds giving limits for the minimum distance d of a linear code of fixed length n and dimension k. The lower bound which can be taken by construction process tells that there is a known linear code having this minimum distance. The upper bound is given by theoretic results such as Griesmer bound. One way to find an optimal binary linear code is to make the lower bound of d equal to its higher bound. That is, to construct a binary linear code which achieves the highest possible value of its minimum distance d, given n and k. Some optimal binary linear codes were presented by Andries Brouwer in his published table on bounds of the minimum distance d of binary linear codes for $1 \leq n \leq 256$ and $k \leq n$. This was further improved by Markus Grassl by giving a detailed construction process for each code exhibiting the lower bound. In this paper, we construct new optimal binary linear codes by using some construction processes on existing binary linear codes. Particularly, we developed an algorithm applied to the codes already constructed to extend the list of optimal binary linear codes up to $257 \leq n \leq 300$ for $k \leq 7$.

Keywords : bounds of linear codes, Griesmer bound, construction of linear codes, optimal binary linear codes
Conference Title : ICMCSE 2015 : International Conference on Mathematical, Computational Science and Engineering
Conference Location : Toronto, Canada
Conference Dates : June 15-16, 2015