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A Epistle on an Upper Bound for (n,d)

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Abstract: *In this correspondence, we really want to get an upper bound for the value of (n,d), we have associated with the bounds on the number of code words in linear code Coflengthn. In particular we have given the exact in equality for (n,d).*

Keywords: *Minimum distance, upper bound, minimum Hamming distance, lower bound.*

I. INTRODUCTION

Let fq be a field having q parts, where q=Pm (P a prime and m). A straight code C of perspective k is a subspace of the vector space fq nover fq. C contains n elements which are n-tuples (fq,i=1ton) and elements. The elements of Care called code words of lengthn. The distance between two code words is define as follows.

First, the Hamming weight of a vector $\bar{u} = u_1, u_2, .. u_n$is the number of non$u_i$zero$\bar{u}$ in written $wt(\bar{u})$.Secondly, the

Hamming distance between two vectors $\bar{u} = u_1, u_2, .. u_n$and

$\bar{v} = v_1, v_2, .. v_n$is the number of places whereco-ordinates of $\bar{u}$ and $\bar{v}$ differ and it is denoted by$d(\bar{u}, \bar{v})$.

Evidently,)a $d(\bar{u}, \bar{v}) = wt(\bar{u} - \bar{v})$ sf_q^n isanabelian group with identity

$\bar{0} = 0,0,0, \dots .0$,$f_q^n$and $\bar{u} - \bar{v} \epsilon$ $wt(\bar{u} - \bar{v})$is also well defined.

II.PRELIMINARYRESULTS

Where not given, Proofs or references for the results of this section may be found in section 2 of[7]

The Hamming weight of a vector denoted by is the number of non-zero entries in. For a linear code, the minimum distance is equal to the smallest of the weights of the non-zero code words. If C is an (n-k) code, we let Ai and Bi denoted the number of code words of weight I in C.

2.1 Definition

$d = \min d(\bar{u}, \bar{v})$

The minimum distance of the code is the minimum Hamming distance between its code words. That is,

It is known that the minimum distance of a linear code is the minimum weight of any non-zero code word.

2.2 Definition

A linear code of length n, dimension k, and minimum distanced is known as an[n,k,d]code.

Bounds on the number of code words in a linear code C of length n, and minimum distanced having studied by various authors. See carry Huffman and Verapless[1].

Theorem2.3 (The Mac William's Identities)

Let C bean [n,k] code overGF(q).Then the A_i'sand B_i'ssatisfy

$$\sum_{j=0}^{n-t} \binom{n-j}{t} A_j - q^{k-t} \sum_{j=0}^{t} \binom{n-j}{n-t} B_j \text{ for } t=0,1\ldots n$$

Lemma2.4 For an (n,k, d)code overGF(q), Bi=0foreach value ofi (where1 $\leq i \leq k$)such that there does not existan (n-i, k-i+1,d)code.

Lemma2.5 Suppose $\bar{u}$ and $\bar{v}$ are linearly independent vector inV(n,q)then

$$wt(\bar{u}) + wt(\bar{v}) + \sum_{\lambda \in GF(q)\setminus\{0\}} wt(\bar{u} + \lambda\,\bar{v}) = q(n-z)$$

Where Z denotes the number of co-ordinates places in which both and have zero entries.

ANINE QUALITY FOR B_q(n,d)

It is known thatB_q(n,d)is an on-negative integer power of q.Foran [n,k,d]code B_q

(n,d)=q^kIfd>1thenB_q(n,d)$\leq B_q$(n-1,d-1),forq=2 B_2(n,d)=B_2(n-1,d-1).AlsoB_q(n,n)=q.

Theorem3.1 For $d \geq 1, if\ n \geq 2d-1$, then$B_q(n,d)\leq q^{d-1}(q-1)^{n-d+1}$............(1.1)

Proof In[1] itisshownthat $B_q(\text{n, d}) \leq q\ B_q(\text{n}-1, \text{d})$................

(1.2)Changingdtod-1in(1.2)we obtain

$$B_q(\text{n}, \text{d}-1) \leq B_q(\text{n}-1, \text{d}-1) \qquad ....(1.3)$$

As a code word of length n and minimum distance at least discounted in a code word of minimum distance at least d-1

$$B_q(\text{n}, \text{d}) \leq B_q(\text{n}, \text{d}-1) \qquad ....(1.4)$$

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