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Hamming Codes

tags: Linear Block Codes

concept

minimum hamming distance	error detection	error correction
3	2 bit	1 bit

formulas

error detection, $s = d_{min} - 1$
max error correction, t :
$d_{min} = 2t - 1$
here t would be a floor value

Steps to correct a corrupted codeword (c/w)

`step1` get the d_{min} for given codeword table.
`step2` get value of t using the formula
`step3` for each codeword in table do $\mathrm{c/w} \oplus \mathrm{recieved\ c/w}$
`step4` for each c/w , total number of 1 in the result from step 3 is the difference
`step5` if difference matches t ,then replace received c/w with that c/w from table.

practice :

Table 10.2 *A code for error correction (Example 10.3)*

Dataword	*Codeword*
00	00000
01	01011
10	10101
11	11110

17. Using the code in Table 10.2, what is the dataword if one of the following codewords is received?
    a. 01011
    b. 11111
    c. 00000
    d. 11011
18. Prove that the code represented by Table 10.8 is not a linear code. You need to find only one case that violates the linearity.

Table 10.8 *Table for Exercise 18*

Dataword	*Codeword*
00	00000
01	01011
10	10111
11	11111

minimum hamming distance can indicate how many bits can be corrected. using the *max error correction* formula above.