



Tutorial 4: Block Codes

Question 1:

Given a (7, 4) Hamming code,

1. If add one more parity check bit, which is the binary-sum of all the existing 7 bits, what is the parity-check matrix?
2. What is the minimum Hamming distance of the new code? Prove it.

Question 2:

Given a (7, 4) Hamming code, expurgate some codewords and create a code with even-odd-check.

1. What is the parity-check matrix?
2. What is the minimum Hamming distance of the new code? Prove it.
3. Find out the relationship between the expurgated code and the original code. (Hint: dual code)

Question 3:

Derive the generator polynomial of a (7, 4) Hamming code on the basis of the cyclic property.

Question 4:

For the 3-error-correcting Reed-Solomon code in Example 2.4, if we received $1000\alpha^{12}\alpha^9 100000000$, decode it. Show the calculation result of the Massey algorithm in a table.

Question 5:

If an incident vector of an EG Type I LDPC code is 000000011010001, create the parity-check matrix of this code. What is the density of this matrix.

Question 6:

Based on the code in Question 5, derive a new LDPC code with half of the density of the original code. What is the length of the new code?