EECS 122: Homework 5

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Due: April 13, 2006

Questions 1, 2, 3:

Kurose and Ross Chapter 4: Problems 31, 35, 36 respectively.

Questions 4, 5, 6:

Kurose and Ross Chapter 7: Problems 8, 11, 21 respectively.

Question 7:

Consider the 2-dimensional parity check code discussed in class on Tuesday, April 4. There are m x m data bits. Suppose we have a parity-check bit for each row and a parity-check bit for each column.

1. What is the data rate in terms of information bits transmitted per coded bit? Is there more or less redundancy in this code compared to the one-dimensional single-bit parity check code with the same number of data bits?

2. For m= 3, list out all the codewords in the 2-D code. How many of them are there? What is the minimum Hamming distance d_{min} in this special case?

3. Compute the minimum Hamming distance d_{min} for general m.

4. Up till how many errors are we guaranteed to be able to detect using this code? Give an example of an error pattern that cannot be detected using this code.

5. Up till how many errors are we guaranteed to be able to correct using this code? Give an example of an error pattern that cannot be corrected using this code.

6. Suppose now we have one more redundancy bit by adding modulo 2 all the row parity-check bits. Repeat parts 1) - 5) for this new code.