

EECS 151/251A Discussion 13

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Problem 1: Hamming Encoding

Using the 7 bit hamming code shown in lecture (4 data bits and 3 parity bits), encode 0010.

Problem 2: Hamming Decoding

You have received a piece of data which was encoded with the 7 bit hamming code shown in lecture: 1010111

Assuming at most 1 bit may have flipped, answer the following questions:

1. Did a bit flip occur?
2. Which bit, if any, flipped?
3. Decode 1010111.

Problem 3: 15 Bit Hamming Code

An example of a 7 bit hamming code (4 data bits and 3 parity bits) was shown in lecture. The rate of the code (the ratio of useful data bits to the total bits in the transmission) is $4/7$.

You are working in an application where the error rate is very low and a $4/7$ rate code is unnecessarily strong. You are interested in using a higher rate (less strong) hamming code to protect your data.

You have been tasked to implement a hamming code that is capable of detecting and fixing 1 error in a 15 bit word. The 15 bits include both the data and parity bits.

1. How many of the 15 bits are data bits? How many are parity bits? What is the code rate?
2. What bits does each parity bit protect?