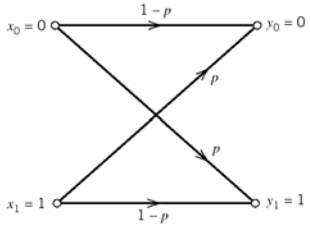
KFUPM-EE DEPT.
EE430: Information Theory and Coding
Problem Set # 3 Dr. Ali Muqaibel

FIGURE 1



Binary Symmetric Channel:

1. Consider the transition probability diagram of a binary symmetric channel shown in the Figure. The input binary symbols 0 and 1 occur with equal probability. Find the probabilities of the binary symbols 0 and 1 appearing at the channel output.

2. Repeat the calculation in Problem 1, assuming that the input binary symbols 0 and 1 occur with probabilities 1/4 and 3/4, respectively.

Mutual Information and Channel Capacity:

3. Consider a binary symmetric channel characterized by the transition probability p. Plot the mutual information of the channel as a function of P1, the *a priori* probability of symbol 1 at the channel input; do your calculations for the transition probability p=0, 0.1, 0.2, 0.3, 0.5.

4. Two binary symmetric channels are connected in cascade, as shown in the Figure below. Find the overall channel capacity of the cascaded connection, assuming that both channels have the same transition probability diagram shown in the Figure 1.

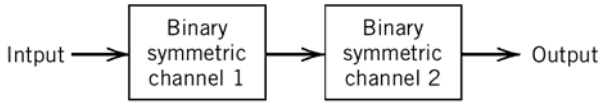


FIGURE 2

5. The *binary erasure channel* has two inputs and three outputs as described in Figure 3. The inputs are labeled 0 and 1, and the outputs are labeled 0, 1, and *e*. A fraction α of the incoming bits are erased by the channel. Find the capacity of the channel.

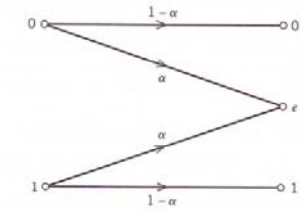


FIGURE 3

From the textbook by *Richard B. Wells*:
2.1.3 -2.1.6, 2.2.6, 2.3.1-2.3.4

Note: *not all answers will be posted.* *Questions are selected from different text books (Wells, Haykin).*

"One man practicing sportsmanship is far better than fifty preaching it."

Quotation from sports that is valid for Engineering Education

Best regards, Dr. Ali Muqaibel