Random Signals
Biomedical Engineering Degree
University San Pablo CEU

Seminar

Information Theory: Huffman codes

PART 1

Given a discrete r.v. $X \in \{x_1, x_2, x_3, x_4, x_5, x_6\}$ with the following probabilities:
P(X=x1)=0.04
P(X=x2)=0.3
P(X=x3)=0.1
P(X=x4)=0.1
P(X=x5)=0.06
P(X=x6)=0.4

1) Compute its entropy
2) Find a binary Huffman code for X. When two symbols (or group of symbols) have the same probability select the order randomly
3) Compute the average length of the resulting code for Y
4) Repeat steps 2 and 3 to obtain a different code. The average length must be the same even if the set of lengths of the codes are different.

PART 2

Given a discrete r.v. $Y \in \{y_1, y_2, y_3\}$ with the following probabilities:
P(Y=y1)=0.2
P(Y=y2)=0.7
P(Y=y3)=0.1

5) Compute H(Y)
6) Find a binary Huffman code for Y. When two symbols (or group of symbols) have the same probability select the order randomly
7) Compute the average length of the resulting code for Y
8) Repeat questions 4, 5 and 6 with a new random variable Y' created from all possible couples, with repetitions, from Y.
   Note: For instance a possible new symbol of Y' is Y'_1=Y1Y2 with probability P(Y'1)=P(Y1)*P(Y2)=0.2*0.7
   Note2: To check if the new code is better than the original one the average length must be divided by 2.