Information theory and error control coding/Teoria da informação e códigos corretores de erros

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Tutorial Questions/Lista de Exercícios - 2

1. Consider a source with output alphabet probabilities given by {0.05, 0.1, 0.15, 0.17, 0.18, 0.22 and 0.13}.

1. Design a ternary Huffman code using 0, 1, and 2 as letters.
2. What is the resulting average codeword length?
3. Compare the average codeword length with the entropy of the source. In which base would you compute the logarithms in the expression for the entropy for a meaningful comparison?

2. Consider the following binary source sequence

000100100000011000010000000100000010100001000000110100000001100

a) Find the Lempel-Ziv source code for the sequence.

b) Recover the original sequence back from the Lempel-Ziv source code.

3. Consider the encoding of the random variables $ x\_{1}$ and $x\_{2}$ that are characterised by the joint pdf p($x\_{1}$ , $x\_{2})$ given by

$$p\left(x\_{1},x\_{2}\right)=\left\{\begin{matrix}\frac{15}{7ab}, (x\_{1} , x\_{2}) \in region\\0 , otherwise\end{matrix}\right.$$

where a and b correspond to the limits of the pdf describing the limits of the axes.

a) Compute the bit rates required for uniform quantisation of $x\_{1}$ and $x\_{2}$ separately and when combined (vector quantisation).

b) Determine the difference in bit rate when a=4b;