Statistical coding

TEST

Let us consider a source S which sends 8 symbols s_i with the following probabilities $Pr(s_i)$:

S	s_1	s_2	s_3	s_4	s_5	s_6	s_7	s_8
$Pr(s_i)$	0.1	0.19	0.21	0.3	0.05	0.05	0.07	0.03

1- Calculate the entropy H(S) of the source S.

2- Build the natural binary code C_1 (fixed length code) corresponding to this source. Deduce the efficiency η_1 and the redundancy ρ_1 of this code.

3- Build the Huffman code C_2 corresponding to this source (binary alphabet). Calculate the average length of the code. Deduce the efficiency η_2 and the redundancy ρ_2 of this code. Compare the results with the code C_1.

4- Let us consider that the source S sends the 8 symbols s_i with the new probabilities $Pr(s_i)$:

S	s_1	s_2	s_3	s_4	s_5	s_6	s_7	s_8
$Pr(s_i)$	0.12	0.19	0.19	0.25	0.07	0.06	0.04	0.08

Each symbol s_i has the same code-word than it had before with the Huffman code C_2. Calculate the average length of this code, deduce the efficiency η_3 and the redundancy ρ_3 of the code. Compare with the results of the code C_2. Conclude.

5- What kind of code would allow you to compensate this loss? Why?