**INDRA GANESAN COLLEGE OF ENGINEERING**

**DEPARTEMENT OF INFORMATION TECHNOLOGY**

 **ASSIGNMENT NO 1**

**Subject : Information Coding Technique**

**Subject Code : IT1302**

**Year/Sem : III / V**

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1. Given the message s1, s2, s3 & s4 with respective probabilities of 0.4, 0.3, 0.2, 0.1 construct a binary code by applying Huffman code procedure. Determine the efficiency and redundancy of the code so formed
2. Given the message x1, x2,x3 ,x4,x5, x6 with respective of the probabilities of 0.4 ,0.2, 0.2, 0.1,0.07, 0.03 construct a binary code by applying Huffman encoding procedure. Determine the efficiency and redundancy of the code so formed
3. consider the zero memory source with s= s1, s2 **,**s3, s4, s5,s6, s6, s7 p=0.4 , 0.2 , 0.1,0.1 ,0.1, 0.05,0.05
4. construct a binary Huffman code by placing the composite symbol as low as possible
5. Repeat (i) by moving the composite symbol as high as possible
6. Consider a source with 8 alphabets A to H with respective probabilities of 0.22,0.20,0.18, 0.15, 0.10,0.08,0.05,0.02
7. Construct a binary compact ( Huffman code) and determine code efficiency
8. Construct a ternary compact code and determine the efficiency of the code
9. Construct a quaternary compact code and determine the code efficiency compare and comment on the result. Draw codes trees for all three cases
10. Apply Huffman encoding procedure for the following set of message and determine the efficiency of the binary code so formed

|  |  |  |
| --- | --- | --- |
| X1 | X2 | X3 |
| 0.7 | 0.15 | 0.5 |

1. If the same technique is applied to the 2nd order extension for the above message. How much will the efficiency be improved
2. A discrete memoryless source has five symbols x1, x2, x3,x4,x5 with probabilities 0.4, 0.19, 0.16, 0.15, and 0.15 respectively attached to every symbol
3. Construct a Shannon fano code for the source and calculate code efficiency
4. Repeat (i) Huffman code compare the two technique of the same coding
5. Compare the Huffman coding and Shannon Fano coding algorithms for data compression . for discrete memory less source ‘X’ with six symbols x1, x2,….x6 find a compact code for every symbol if the probability distribution is as follows

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| P(X1) | P(X2) | P(X3) | P(X4) | P(X5) | P(X6) |
| 0.3 | 0.25 | 0.2 | 0.12 | 0.08 | 0.05 |

Calculate entropy of the source , average length of the code , efficiency and redundancy of the code

1. A DMS has fice symbols s0, s1, s2,s3,s4 characterized by probability distribution as 0.4, 0.2, 0.1 ,0.2 and 0.1 respectively. Evaluate two distinct variable length Huffman codes for the source to illustrate non uniqueness of Huffman technique calculate the variance of the ensemble a defined as

1. A DMS has following alphabets with probability of occurrence as shown bellow

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Symbol  | S0 | S1 | S2 | S3 | S4 | S5 | S6 |
| Probability | 0.125 | 0.0625 | 0.25 | 0.0625 | 0.125 | 0.125 | 0.25 |

Generate the Huffman code with minimum code variance . Determine the code variance and code efficiency . comment on the code efficiency

1. A discrete memory less source consists of three symbol x1,x2,x3 with probabilities 0.45, 0.35, 0.2 respectively. Determine the minimum variance Huffman code for the source for the following two alternatives
2. Considering symbol by symbol occurrence
3. Considering second order block extension of the source

Determine the code efficiency for the two alternatives and comment on the efficiency

1. A source generates 5 message with probabilities of occurrence as shown below

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Symbol  | m0 | m1 | m2 | m3 | m4 |
| Probability | 0.55 | 0.15 | 0.15 | 0.10 | 0.05 |

 Apply Huffman coding algorithm and place the combined message a low as possible when its

 Probability is equal to that of another message

1. Calculate codeword for the message
2. Calculate average code word length
3. Given five symbols s0, s1, s2, s3, and s4 with their probabilities 0.4, 0.2, 0.2 , 0.1 and 0.1 use Huffman encoding for the symbols and find the average code word length. Also prove that it satisfied source coding theorem.
4. A statistical encoding algorithm is being considered for the transmission of a large number of long text files over a public network. Analysis of the file contents have shown that each file comprises only the six different character M,F,Y,N,O and I each of which occurs with a relative frequencies of occurrences of 0. 25 , 0.25, 0.125, 0.125, 0.125, and 0.125 respectively . use Huffman algorithm for encoding these character and find the following
5. Code words for each of the character
6. Average number of bits per code word
7. Entropy of the source

1. A discrete memory less source X has five symbols x1, x2, x3,x4,x5 with probability p(x1)=0.4, p(x2)=0.19 , p(x3)= 0.16, p(x4)=0.15 , p(x5)=0.1
2. Construct a Shannon Fano code for X and calculate the efficiency of the code
3. Repeat for the Huffman code and compare the result
4. Consider a DMS with seven possible symbols xi=1,2…7 and corresponding probabilities p1=0.37, p2=0.33, p3= 0.16, p4= 0.07, p5=0.04, p6=0.02, p7=0.01 we first arrange the probabilities in the decreasing order and then construct the Huffman tree.
5. Consider a DMS with seven possible symbols xi=1,2…7 and corresponding probabilities p1=0.46, p2=0.30, p3= 0.12, p4= 0.06, p5=0.03, p6=0.02, p7=0.01 we first arrange the probabilities in the decreasing order and then construct the Huffman tree
6. A discrete memory less source has an alphabet of seven symbols with probabilities of its output as described below

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Symbol  | S0 | S1 | S2 | S3 | S4 | S5 | S6 |
| Probability | 0.25 | 0.25 | 0.125 | 0.125 | 0.125 | 0.0625 | 0.0625 |

Compute Shannon-Fano code for this source. Find coding efficiency. Explain why the computed source code has an efficiency of 100%

1. For the given ensemble apply shanon fano coding algorithm and determine its coding efficiency and coding redundancy “ WE ARE THE BEST”
2. For the given ensemble apply Huffman coding algorithm and determine its coding efficiency and coding redundancy “ YOU ARE WELCOME”

**ON OR BEFORE SUBMIT 20 JULY 2012**

**ALL THE BEST**