



SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
An Autonomous Institution



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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

19ECB301 – ANALOG AND DIGITAL COMMUNICATION

III B.E. ECE₁ / V SEMESTER

UNIT 5 – INFORMATION THEORY AND ERROR CONTROL CODING

TOPIC – HUFFMAN CODING



HUFFMAN CODING



- The most popular technique for removing coding redundancy is due to Huffman (1952)
- When coding the symbols of an information source individually, Huffman coding yields the smallest possible number of code symbols per source symbol
- In terms of the noiseless coding theorem, the resulting code is optimal for a fixed value of n , subject to the constraint that the source symbols be coded one at a time



HUFFMAN CODING

The first step in Huffman's approach is

- To create a series of source reductions by ordering the probabilities of the symbols under consideration
- Combining the lowest probability symbols into a single symbol that replaces them in the next source reduction



HUFFMAN CODING

Huffman Coding

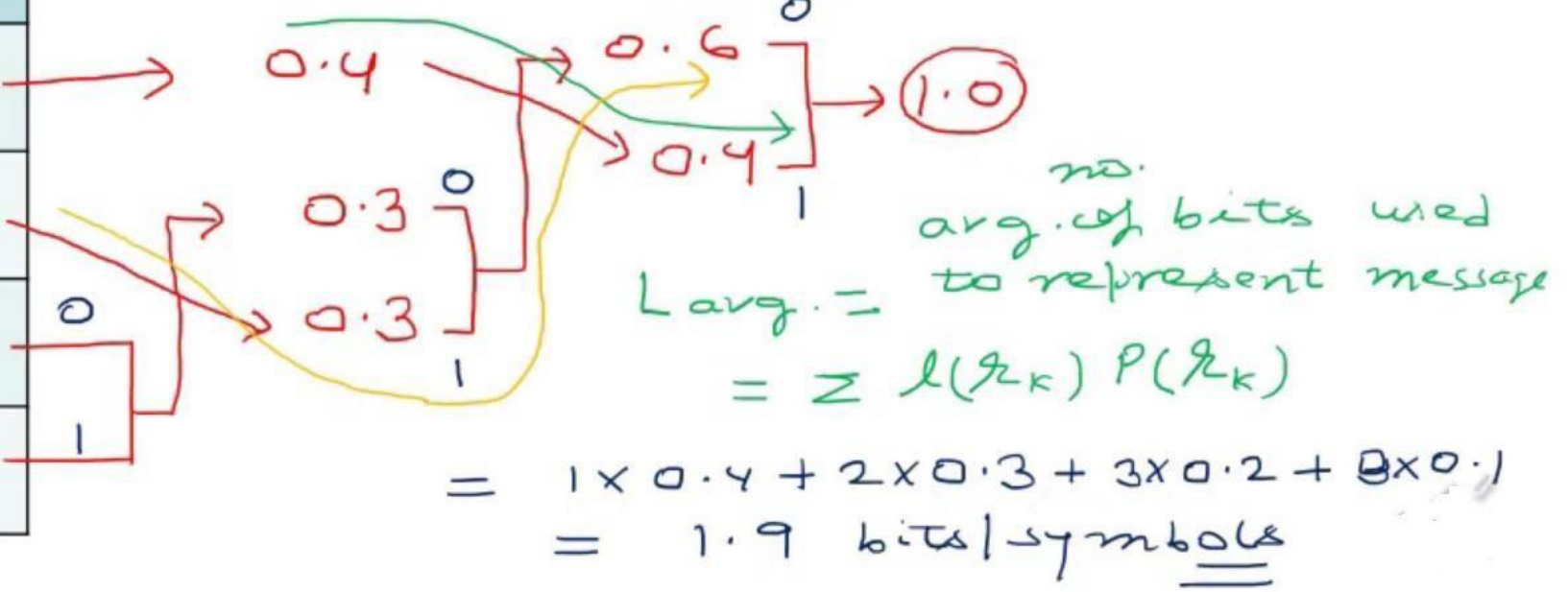
Example: Calculate the Huffman Codes for the set of symbols as shown in table.

Symbols	A	B	C	D
Probability	0.4	0.3	0.2	0.1

Solution:

Symbol	Probability
A	0.4
B	0.3
C	0.2
D	0.1

$l(r_k)$
 Codewords \rightarrow length of code word
 A \rightarrow 1 \rightarrow 1
 B \rightarrow 01 \rightarrow 2
 C \rightarrow 000 \rightarrow 3
 D \rightarrow 001 \rightarrow 3





HUFFMAN CODING



HUFFMANN CODING

1. To Find the average code word length

$$L = \sum_{k=1}^5 P_k [\text{length of } m_k \text{ in bits}]$$

2. To Find the Entropy of the source

$$H = \sum_{k=1}^5 P_k \log_2 \left(\frac{1}{P_k} \right)$$

3. Code efficiency $\eta = \frac{H}{L} \times 100 \%$



Thank
you!