EC8395 Communication Engineering

Unit-1-Infromation Theory and Coding

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Session Objectives

•To understand about source coding techniques-Algorithm-3-Lempel-Ziv algorithm (LZ).

• Solving problems related to source coding techniques-Lempel-Ziv algorithm (LZ).

Session Outcomes

- At the end of the session, students will be able to
  - Understand Lempel-Ziv algorithm (LZ).
  - To understand the difference between Shannon Fano Huffman coding and LZ algorithm

Lempel-Ziv algorithm (LZ)

- Shannon Fano and Huffman coding requires the symbol probabilities well in advance. But most real life application do not have the symbol probability in advance.
- Also Huffman coding is optimal for DM source (i.e. Occurrence of one symbol does not alter the probability of subsequent symbols.
- LZ algorithm can compress transmission of English text by about 50% whereas the Huffman code compresses by only 43%.

Encoding or Compression

Encode or compress the string “ABBCBCABA” using the LZ algorithm.

Position	Content	Output
1	A	(0,A)
2	B	(0,B)
3	BC	(2,C)
4	BCA	(3,A)
5	BA	(2,A)

Number of bits transmitted:

Uncompressed string: ABBCBCABA

Number of bits = total number of characters X 8

=9X8=72 bits

- Compressed string:

	(0,A)	(0,B)	(2,C)	(3,A)	(2,A)
Code word index	1	2	3	4	5

- Each code word consists of an integer and a character. The character is represented by 8 bits.
- The number of bits “n” required to represent the integer part of the code word with index “*i*” is given by

$$n = \begin{Bmatrix} 1 & if\ i = 1 \\ \lceil \log_2 i \rceil & if\ i > 1 \end{Bmatrix}$$

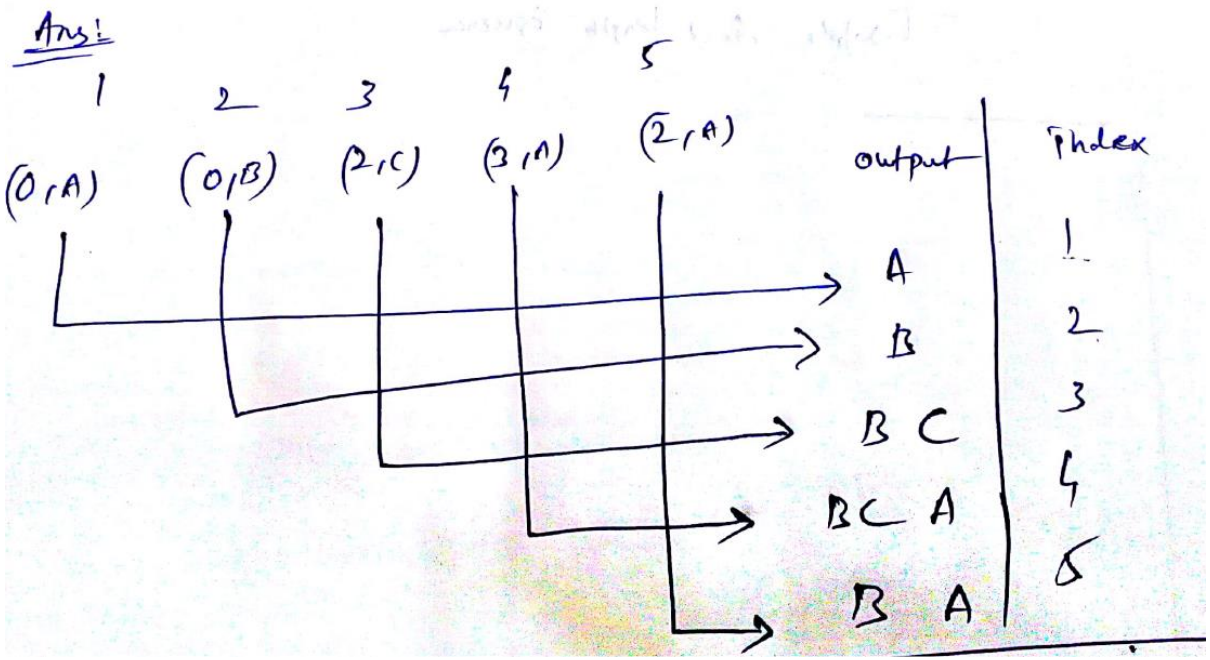
Therefore	(0,A)	(0,B)	(2,C)	(3,A)	(2,A)
Code word index	1	2	3	4	5

Number of bits =

(1+8)+(1+8)+(2+8)+(2+8)+(3+8) = 49 bits.

Decompression or Decoding

- 1. Decode or decompress the sequence (0,A) (0,B) (2,C) (3,A) (2,A)



- 1. Encode the following string using LZ algorithm.

  10101101101010101011