UIT2521 – Information Theory and Applications

UNIT II INFORMATION THEORY FUNDAMENTALS

Tutorial – IV

Extension of Discrete Memoryless Source

Date & Time: 30.08.2024 (Friday, 5th Hour)

1. A zero memory source contains X = {x_1, x_2, x_3, x_4} with P(X) = {1/2, 1/4, 1/8, 1/8}
   a) Determine the entropy of the source.
   b) Determine the second order extension of the source. Show that $H(X^2) = 2H(X)$.

2. For DMS 'X' with two symbols x_1 and x_2 and $p(x_1) = 0.9$ and $p(x_2) = 0.1$. Find out the second order extension for the source. Find the efficiency η and redundancy of the code.

Hint:

Extension of Discrete Memoryless Source:

The entropy of the extension of discrete memoryless source

$$H(S^n) = n\,H(S) \text{ bits/ symbol}$$

Where S^n is the **extended source alphabet** with K^n **distinct symbols** and **n** is the **order of extension**.

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