DISCRETE INDEPENDENT MEMORYLESS SOURCE

1. Given a Discrete Memoryless Source (DMS) which is statistically independent,

$$S=\{s_1,s_2,\ldots,s_n\}$$

and the associated probabilities of the occurrence is

$$\{p(s_1),p(s_2),\ldots,p(s_n)\}$$

2. The information content is defined by the following formula with unit "bit,"

$$I(s_i) = \log_2 \frac{1}{p(s_i)}$$

ENTROPY: AVERAGE AMOUNT OF INFORMATION

The average amount of information of the signal source S is defined as an entropy,

$$H(S) = \sum_{i=1}^{n} p(s_i) I(s_i)$$

$$= -\sum_{i=1}^{n} p(s_i) \log_2 p(s_i) \text{ (bit/symbol)}$$

EXAMPLE

Now let's consider the calculation of an entropy H(S) of a given signal source S.

Given a DMS S={00,01,11,10}={α_1, α_2, α_3, α_4 }, and

$P(\alpha_1)=0.60$, $P(\alpha_2)=0.30$

$P(\alpha_1)=0.05$, $P(\alpha_2)=0.05$

Then,

$$H(S)= -\sum_{i=1}^{4} p(s_i) \log_2 p(s_i) = 1.40 \text{ bit/symbol}$$

N^{th} EXTENSION OF DMS SOURCE

Consider DMS S with alphabet of size n where the output of the source is grouped into blocks of N symbols,

Then each block may be considered as a single source symbol with alphabet of size n^N.

And the source S^N is called the N^{th} extension of source S.

HANDOUT

CMPE 296S
Video
Compression

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