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**Group 2 Assignment Discussion Lesson 05**

1) How to calculate total size of a video per second?

2) Give an example of calculating total size of a video in 80 minutes? You can choose your own values.

3) Explain the concept of lossless compression?

4) What is entropy? Give an example of calculating entropy from 3 symbols? You can choose your own values.

5) Find the entropy of the word "helloeverybodyblablabla"?

**Answer**

1). To calculate total size of a video per second we need to follow this step:

- Resolution of an image (R): Width \* Height

- Number of frames per second (Nf): find the total frames we need per second.

- Number of bits (Nb): How many bits we need to use, for example: 8 bits = 1 byte, 24 bits = 3 bytes.

2). Give an example of calculating total size of a video in 80 minutes:

- resolution of an image (R): 1280 \* 720 = 921600 pixels

- number of frames: 30 f/s

- number of bites per pixel: 3 bites

- time : 80 \* 60 = 4800

=> vns = 921600 \* 30 \* 3 \* 4800 = 39813120000 bytes

3). Explain the concept of lossless compression:

- Information source or input data : is a sequence of symbols from an alphabet.

- Encoder or compression : is a sequence of code words.

- Storage or network : is a place to store encode data in local or network.

- Decoder or decompression : is a sequence of alphabet.

- Recovered data: is a sequence of symbols from an alphabet which is exactly the same as input data.

4). Entropy is the number of bits needed to encode a media source which is lower bounded.

Give an example of calculating entropy form 3 symbols:

P(A) = 0.25, P(B) = 0.5, P(C) = 0.1

The Entropy will be:

H = 0.25\*log(1/0.25) + 0.5\*log(1/0.5) + 0.1\*log2(1/0.1)

H = 0.25\*2 + 0.5\*1 + 0.1\*3.32

H = 0.5 + 0.5 + 0.332 = 1.332

Thus H = 1.332 bits

5). Find the entropy of the word "helloeverybodyblablabla"?

* We have input string: ‘helloeverybodyblabla’
  + Total number of symbols: n=20
  + Probability of each symbol:
    - p(h)=1/20
    - p(e)=3/20
    - p(l)=4/20
    - p(o)=2/20
    - p(a)=2/20
    - p(y)=2/20
    - p(d)=1/20
    - p(r)=1/20
    - p(b)=3/20
    - p(v)=1/20
    - entropy = 3\*0.05+3\*0.1+2\*0.15+0.2

= 3\*0.05\*4.31+3\*0.1\*3.321+2\*0.15\*2.735+0.2\*2.321

= 2.9275

* **thus, entropy is 2.9275 bits per pixel.**