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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 :  $80 * 60 = 4800$

$$\Rightarrow \text{vns} = 921600 * 30 * 3 * 4800 = 39813120000 \text{ bytes}$$

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:

$$H = 0.25 * \log_2(1/0.25) + 0.5 * \log_2(1/0.5) + 0.1 * \log_2(1/0.1)$$

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

$$H = 0.5 + 0.5 + 0.332 = 1.332$$

Thus  $H = 1.332$  bits

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

➤ We have input string: 'helloeverybodyblablabla'

- Total number of symbols:  $n=20$
- Probability of each symbol:
  - $p(h)=1/20$
  - $p(e)=3/20$
  - $p(l)=4/20$
  - $p(o)=2/20$
  - $p(a)=2/20$
  - $p(y)=2/20$

- $p(d)=1/20$
- $p(r)=1/20$
- $p(b)=3/20$
- $p(v)=1/20$
- $$\begin{aligned} \text{entropy} &= 3*0.05\log_2 20+3*0.1\log_2 10+2*0.15\log_2 6.66+0.2\log_2 5 \\ &= 3*0.05*4.31+3*0.1*3.321+2*0.15*2.735+0.2*2.321 \\ &= 2.9275 \end{aligned}$$

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