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Assignment Discussion 5

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

* In order to calculate total size of a video per second, we have to know:
* Resolution of an image (R): Width x Height
* Number of frame per second (Nf): How many frames we need per second
* Number of bits (Nb): How many bits we need to use, e.g., 8 bits = 1 byte, 24 bits = 3 bytes.
* We can get a formula of total size of a video per second (Vs) by:
* Vs = R . Nf . Nb (bytes)
* If we want to calculate total size of a video per n second (Vns) by:
* Vns = R . Nf . Nb . n = Vs . n (bytes)

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

* Resolution of an image (R) is 1024x1024.
* Number of frame per second (Nf) is 60f/s.
* Number of bits (Nb) is 8 bits.
* we calculate total size of a video per second (Vs):

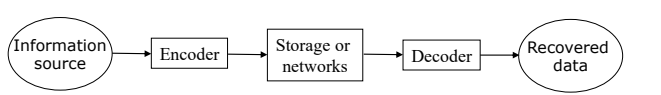
Vs = R . Nf . Nb = 1024x1024x60x1 =62914560 bytes

* Then we calculate total size of a video in 80mn (Vns) by:

n = 80mn = 80x60 = 4800 seconds

Vns = R . Nf . Nb . n = Vs . n = 62914560x4800 = 301989888000 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 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) What is entropy? Give an example of calculating entropy from 3 symbols? You can choose your own values.

* Entropy is the number of bits needed to encode a media source which is lower bounded.
* Give an example of calculating entropy from 3 symbols:

We have P(A) = 0.4

P(B) = 0.3

P(C) = 0.3

Entropy=−(P(A)×log2(P(A))+P(B)×log2(P(B))+P(C)×log2(P(C)))

= −(0.4×log2(0.4)+0.3×log2(0.3)+0.3×log2(0.3))

= -(-0.528+(-0.442)+(-0.442))

= 1.412

Thus we need at least 0.142 bit per symbol in encoding

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

Let's count the occurrences of each letter in the word:

* 'h' occurs 1 time
* 'e' occurs 3 times
* 'l' occurs 3 times
* 'o' occurs 2 times
* 'v' occurs 1 time
* 'r' occurs 1 time
* 'y' occurs 2 times
* 'b' occurs 5 times
* 'd' occurs 1 time
* 'a' occurs 4 times

Total number of letters: 23

Now, let's calculate the probability of each letter:

P(h)=1/23, P(e)=3/23, P(I)=3/23, P(0)=2/23, P(v)=1/23, P(r)=1/23, P(y)=2/23, P(b)=5/23, P(d)=1/23, P(a)=4/23

Entropy= -(P(h)×log2(P(h))+ P(e)×log2(P(e))+ P(I)×log2(P(I))+ P(o)×log2(P(o))+ P(v)×log2(P(v))+ P(r)×log2(P(r))+ P(y)×log2(P(y))+ P(b)×log2(P(b))+ P(d)×log2(P(d))+ P(a)×log2(P(a)))

= -(1/23×log2(1/23)+ 3/23×log2(3/23)+ 3/23×log2(3/23)+ 2/23×log2(2/23)+ 1/23×log2(1/23)+ 2/23×log2(2/23)+ 5/23×log2(5/23)+ 1/23×log2(1/23)+ 4/23×log2(4/23))

= 2.731 bit per symbol