Partiel 2017-2018

Monday, November 10, 2025 9:42 PM

Exercise 1

a- When 4:2:0 is applied:

Y: $720 \times 480 = 345\,600$ samples

Cr/Cb: $\frac{720 \times 480}{4} = 86\,400$ samples each

Total samples = $345\,600 + 86\,400 + 86\,400$

$= 518\,400$ samples

Each sample is on 8 bits

Size = $518\,400 \times 8$

$= 4\,147\,200$ bits

b- Aspect Ratio = $\frac{720}{480} = \frac{3}{2}$

=> 3:2

c- 512 Kbits/s => 512 000 bits/s (take 1K -> 1000)

$t = \frac{4\,147\,200}{512\,000} \simeq 8.1$ seconds ($\simeq 8$)

d- Image AR = 3:2 = 1.5

Screen AR = 16:3 = 1.78 (wider)

each pixel would have to stretch it

each pixel would have to stretch it horizontally

e- 60 fields interlaced

=> 30 frames/sec

bitrate = 4 147 000 × 30

≃ 124.416 Mbits/sec

10 min video → 600 sec

Total = 124.416 × 600

= 74 649.6 Mbit

time = $\frac{74\,649.6}{1}$ = 74 649.6 sec

≃ 20.7 hours

f- CF = $\frac{124.416}{1}$ ≃ 125

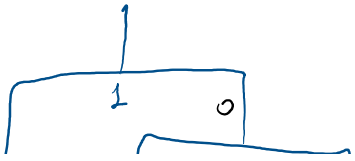
we need a 125:1 to send the video in realtime

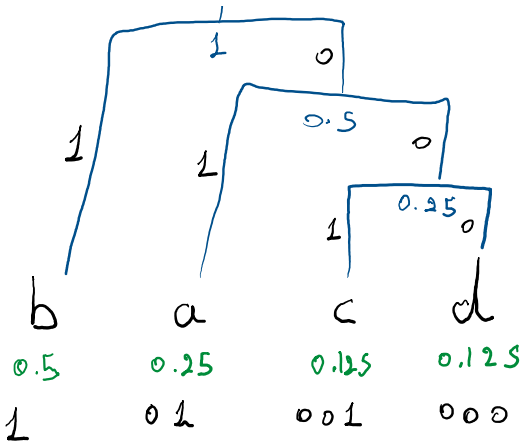
Exercise 2 :

a- Entropy = $-\sum p_i \log(p_i)$

= 1.75 bits/symbol

b-





average length $= 1(0.5) + 2(0.25) + 3(0.125)\times 2$

$= 1.75$ bits

c-

b	0.5	1		
a	0.25	0	1	
c	0.125	0	0	1
d	0.125	0	0	0

average length $= 1.75$ bits

d- $L_{(Huffman)} = L_{(shown)} = H$

=> both are optimal.

e- A: 00
B: 01
C: 10
D: 110
E: 111

000100101101111101
A B A C D E B

f-

symbol	code
A	65
B	66
C	67
D	68
⋮	
AB	256
BA	257
ABC	258
CA	259
ABCD	260

65 66 256 67 258 68 260
A B AB C ABC D ABCD