CS510 Intro to Multimedia Networking: Homework #2

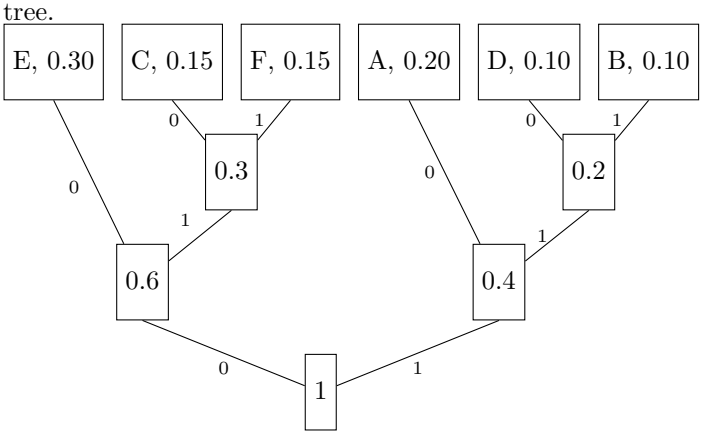
Due on September 30, 2015 at 2:00pm

Wu-chi Feng Fall 2015

Konstantin Macarenco

Problem 1

Knowing distribution we can estimate approximate size of the encoded string. First we need to build encoding tree.



- A 10
- B 111
- C 010
- D 110
- E 00
- F 011

Considering a text that contains 100 characters, each character 8bits $100 * 8 = 800$ bits total. With Huffman compression we get $20 * 2 + 10 * 3 + 15 * 3 + 10 * 3 + 30 * 2 + 15 * 3 = 250$ bits, we get compression ratio $3.2 : 1$ However this calculation doesn't account for the size of encoding table.

Problem 2

(a) What is the maximum frame rate that we can achieve over this channel?
frame size $= 640 \times 480$ $times3 = 921600$ bits
Bandwidth $= 11 \times 10^6 = 11000000$ bits
Maximum fps $= \dfrac{Bandwidth}{framesize} = \dfrac{11000000}{921600} \approx 11.93576$
Answer: maximum frame rate ≈ 11.93576 **fps**

(b) What compression ratio would we need to achieve 30fps? One frame size at 30 fps is $640 \times 480 \times 3 \times 30 = 27648000$
To be able to transmit it over USB we have to compress it to $\dfrac{27648000}{11000000} \approx 2.514$ times.
Answer: maximum frame rate ≈ 11.93576 **fps**

(c) What is the maximum sized 4:3 aspect ratio video that can be captured over the USB channel?
Maximum px $= \dfrac{11000000}{30 \times 3} \approx 122222.222$
where $x \times y = 122222.222$ and $\dfrac{4}{3} = \dfrac{x}{y}$,

Solving for : $x = \frac{4}{3} \times y$

$\frac{4}{3} \times y \times y = 122222.222$

$\frac{4}{3} \times y^2 = 122222.222$

$y^2 = \frac{3}{4} \times 122222.222$

$y^2 = \frac{3}{4} \times 122222.222$

$y^2 = 91666.666$

$y = \sqrt{91666.666}$

$y \approx 302.765$

And $x = \frac{302.765 * 4}{3} \approx 403.686$

Answer: Max sized aspect $\approx 403 : 302$

Problem 3

A B C A C A B C B A B

w	k	dictionary entries	output
	A		
A	B	< 256 > AB	A
B	C	< 257 > BC	B
C	A	< 258 > CA	C
A	C	< 259 > AC	A
C	A	exists	
CA	B	< 260 > CAB	< 258 >
B	C	exists	
BC	B	< 261 > BCB	< 257 >
B	A	< 262 > BA	B
A	B	exists	
AB			AB

Problem 4

Decompress:
F A B _ L < 257 > _ C < 261 > < 264 > T < 257 >
FAB_LAB_CAB_AB_ATAB

w	k	entry	dictionary	output
F	F	F		F
F	A	A	< 256 > FA	A
A	B	B	< 257 > AB	B
B	_	_	< 258 > B_	_
_	L	L	< 259 > _L	L
L	< 257 >	AB	< 260 > LA	AB
AB	_	_	< 261 > AB_	_
_	C	C	< 262 > _L	C
C	< 261 >	AB_	< 263 > CA	AB_
AB_	< 264 >	AB_A	< 264 > AB_A	AB_A
AB_A	T	T	< 265 > AB_AT	T
T	< 257 >	AB	< 266 > TA	AB