

Monday April 1 → Term Exam

April 8 → lecture at USC

April 15 → ICT open house

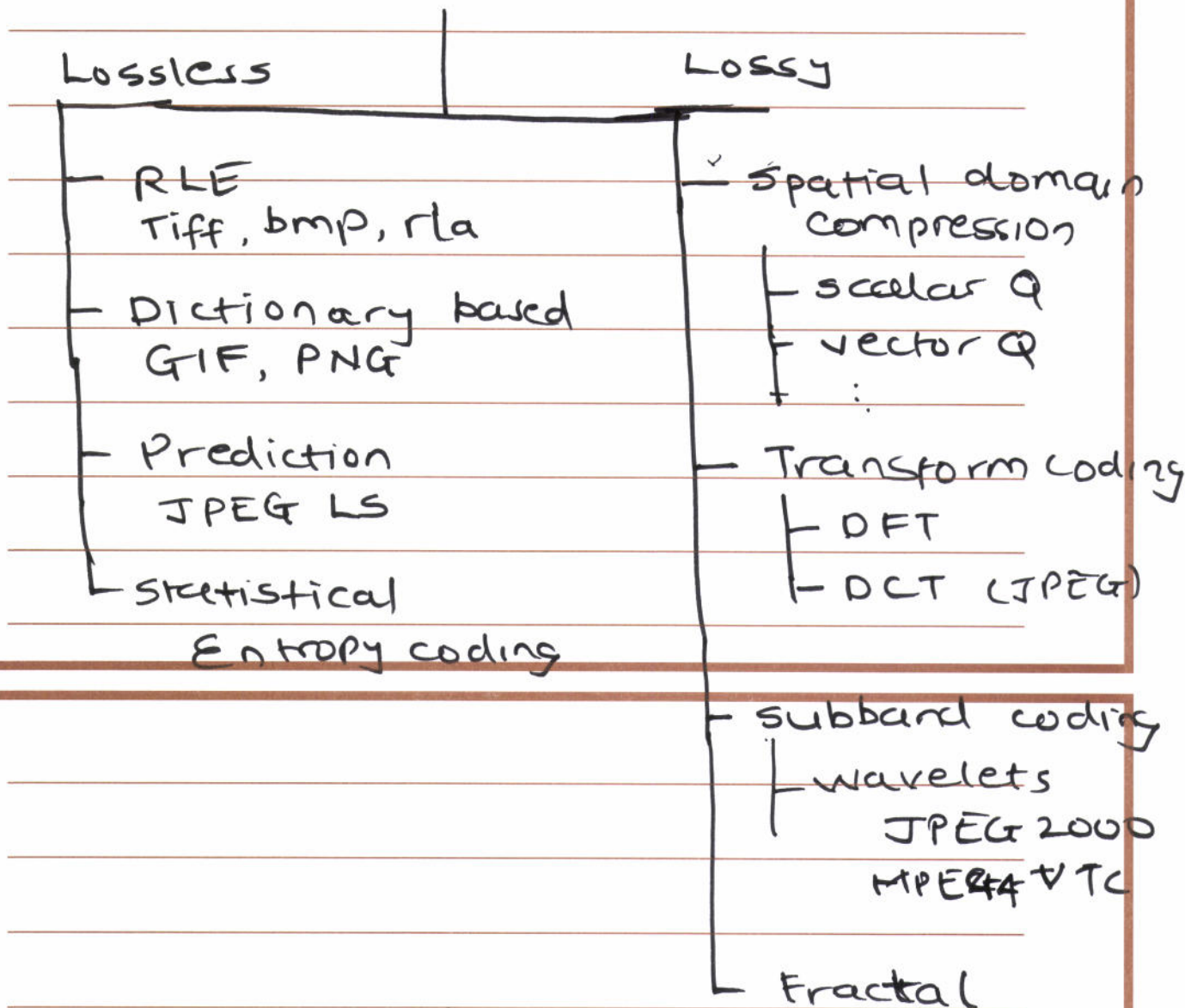
leave campus at 4:30

April 22 → ICT

leave campus at 5:00

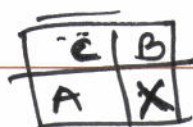
computer graphics & vision

Image Compression



Prediction based

JPEG Lossless

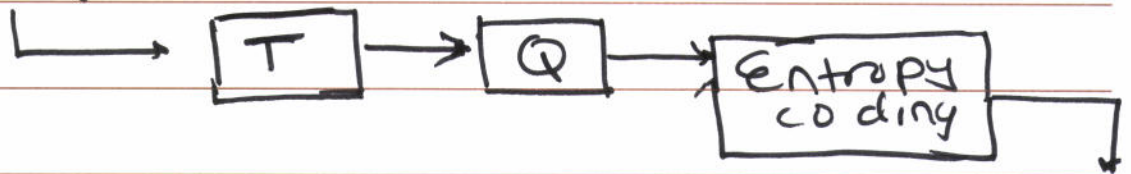


prediction index

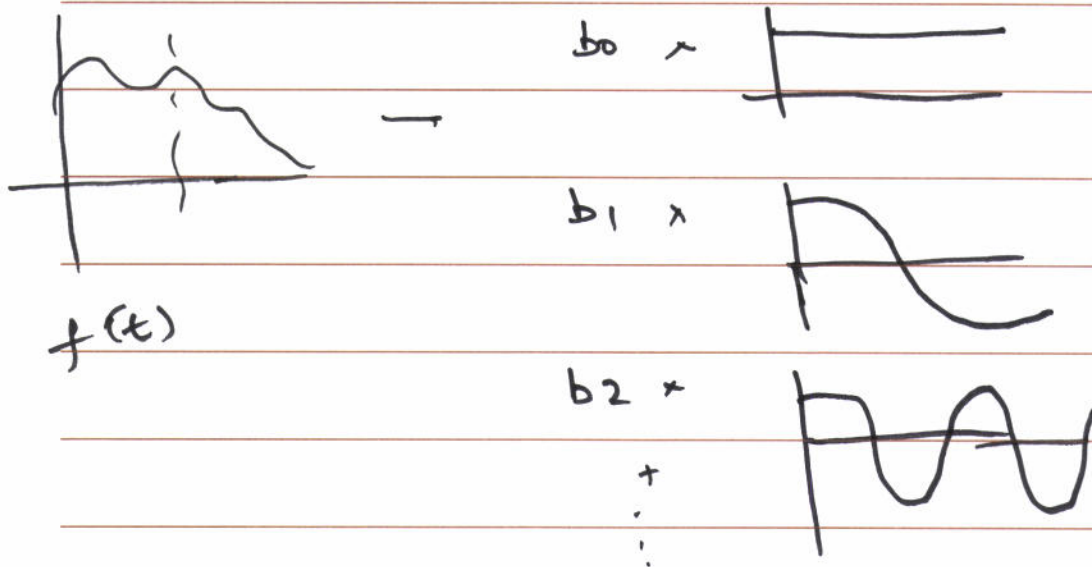
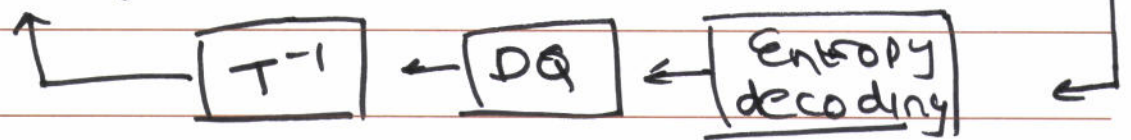
0	A
1	B
2	C
3	A+B-C

Transform Based Coding

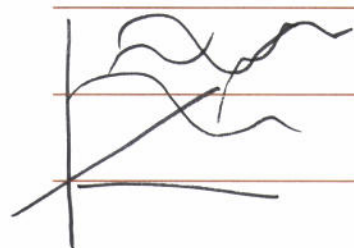
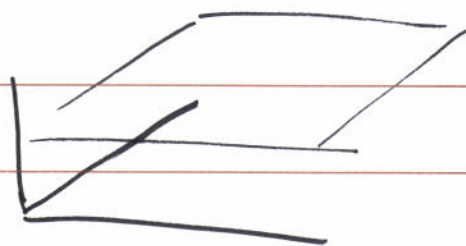
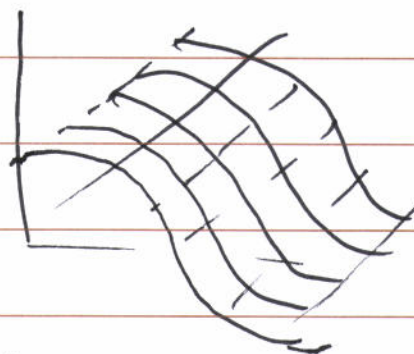
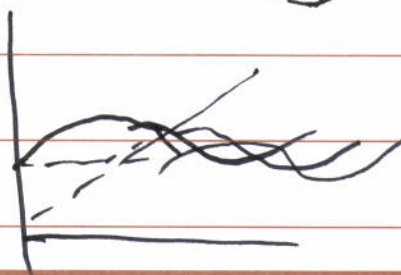
Image



Image



$$f(t) = \sum b_i \cos i \omega t$$

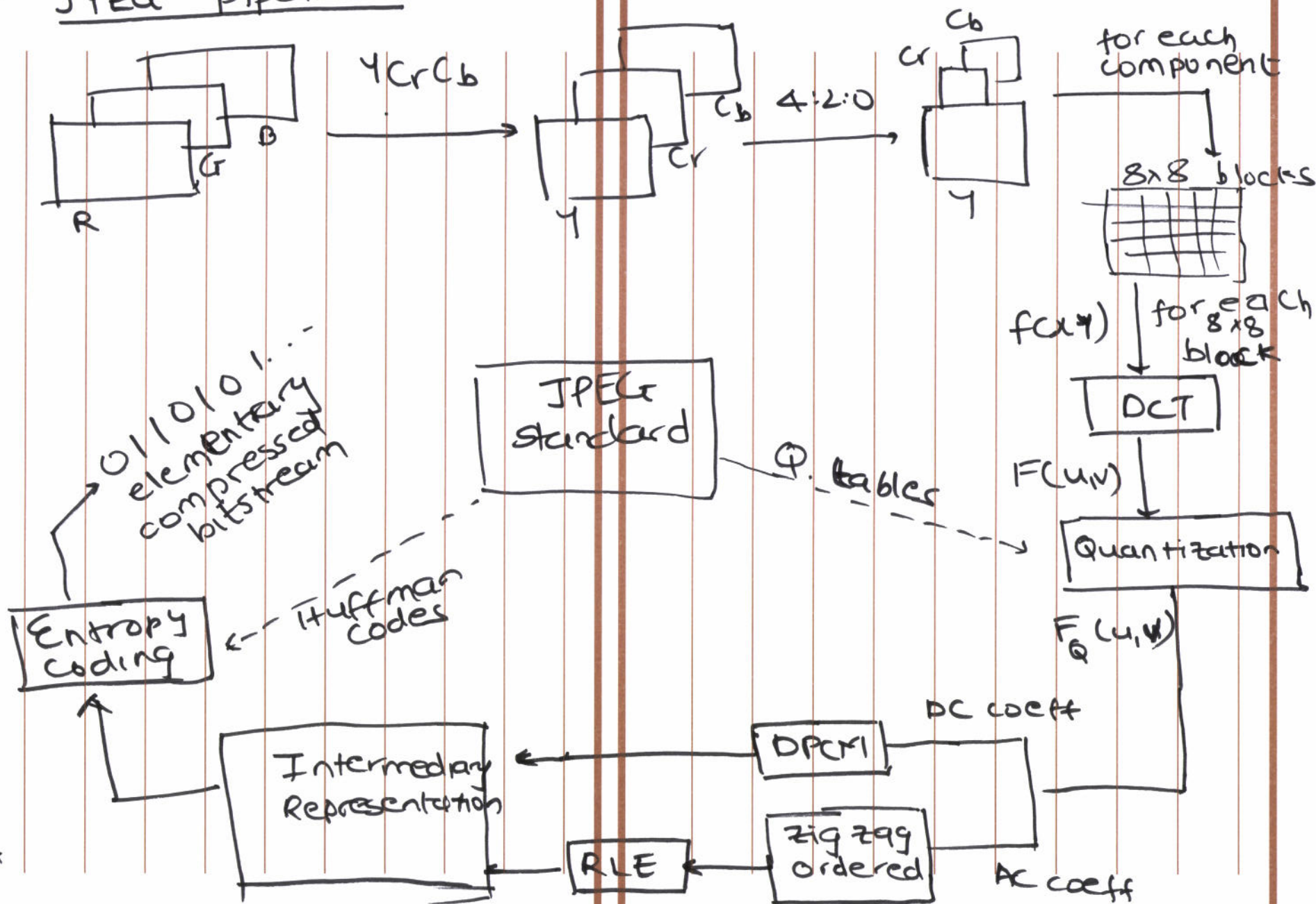

 $f(x, y)$
 $b_{00} \times$

 $b_{10} \times$

 $b_{01} \times$


$$\frac{F(i, j)}{F(i, j)} = \iint f(x, y) \cos i \omega x \cos j \omega y \, dx \, dy$$

$$F(i, j) = \sum \sum f(x, y) \cos i \omega x \cos j \omega y$$

9

JPEG pipeline



DC coeff \rightarrow 15

AC coeff zigzag order

0 -2 -1 -1 -1 0 0 -1 0 0 0 ...

previous blocks DC coeff = 12

need to encode

3 0 -2 -1 -1 -1 0 0 -1 ...

DC \rightarrow $\langle \text{size} \rangle \langle \text{amplitude} \rangle$

AC \rightarrow $\langle \text{runlength, size} \rangle \langle \text{amplitude} \rangle$

DC \rightarrow $\langle 2 \rangle \langle 3 \rangle$

AC \rightarrow $\langle 1, 2 \rangle \langle -2 \rangle$

$\langle 0, 1 \rangle \langle -1 \rangle$

$\langle 0, 1 \rangle \langle -1 \rangle$

$\langle 0, 1 \rangle \langle -1 \rangle$

$\langle 2, 1 \rangle \langle -1 \rangle$

EOB

VLI codes

-1	1	
0	1	
-2	2	3
00	10	11
-3	4	5
000	100	101

-7	-6	-5	-4	
000	001	010	011	

VLI

DC \rightarrow $\langle 2 \rangle \langle 3 \rangle$

AC \rightarrow $\langle 1, 2 \rangle \langle -2 \rangle$

$\langle 0, 1 \rangle \langle -1 \rangle$

$\langle 0, 1 \rangle \langle -1 \rangle$

$\langle 0, 1 \rangle \langle -1 \rangle$

$\langle 2, 1 \rangle \langle -1 \rangle$

~~000~~ $\langle 0, 0 \rangle$

-1

0

-3

00

-7

000

-2

01

-6

001

-5

010

-4

011

1

1

2

10

+4

100

3

11

5

101

6

110

7

111

VLC

$\langle 0, 0 \rangle$

1010

$\langle 0, 1 \rangle$

00

$\langle 1, 2 \rangle$

11001

$\langle 2, 1 \rangle$

11100

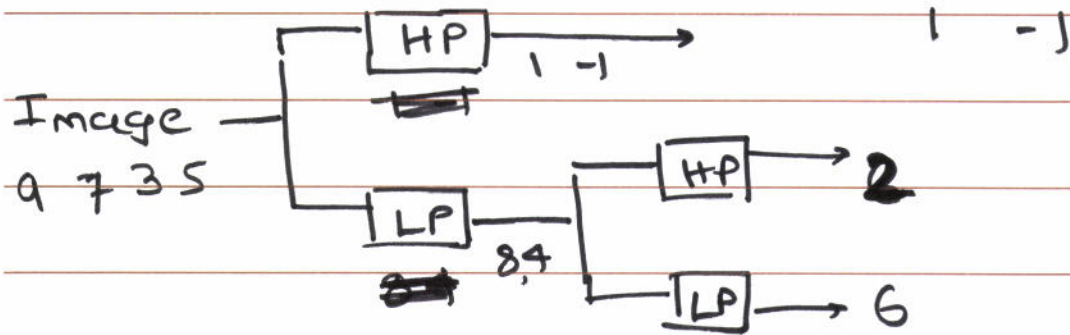
$\langle 2 \rangle$

011

0111 1101101 000 000 0 00 0111000
1010

31 bits from 256 bits

Wavelet analysis



9 7 3 5

8 4 1 -1

6 2 1 -1

8 samples

9 7 3 5 1 1 6 4

8 4 1 5 1 -1 0 1

6 3 2 -2 1 -1 0 1

4.5 1.5 2 -2 1 -1 0 1