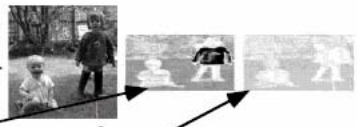
Downsample Chrominance Components



Do the following on each of the three channels

Do the following to each block

$$\begin{bmatrix} .299 & .587 & .144 \\ -.159 & -.332 & .050 \\ .500 & -.419 & -.081 \end{bmatrix} \times \begin{bmatrix} R \\ G \\ B \end{bmatrix} = \begin{bmatrix} Y \\ Cb \\ Cr \end{bmatrix}$$

Transform Colour Space

JPEG Compression

Pixel values

49	61	69	61	78	89	100	112
68	60	51	42	62	69	80	89
90	81	58	49	69	72	68	69
100	91	79	72	69	68	59	58
111	100	101	91	82	71	59	49
131	119	120	102	90	90	81	59
148	140	129	99	92	78	59	39
151	140	142	119	98	90	72	39

Forward DCT

672	101	13	21	-13	0	6	9
-104	-144	35	-5	9	-17	-3	0
31	-21	-1	-7	-9	0	0	4
22	-21	-9	-13	-2	3	2	2
9	-2	-17	-11	0	5	1	-2
4	6	1	0	-2	-7	0	-1
21	-12	-3	2	-4	3	0	-1
-5	8	-3	2	1	-6	0	2

Quantisiation Factors

16	11	10	16	24	42	51	61
12	12	14	19	26	58	60	55
14	13	16	24	40	57	69	56
14	17	22	29	51	87	80	62
18	22	37	58	68	109	123	77
24	35	55	64	81	104	113	92
49	64	78	87	103	121	120	101
72	92	95	98	122	100	103	99

Quantising

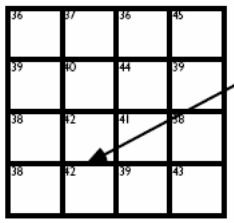
42	9	1	1	-1	0	0	0
-9	-12	3	0	0	0	0	0
2	-2	0	0	0	0	0	0
2	-1	0	0	0	0	0	0
1	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0

Sequencing

9, -9, 2, -12, 1, 1, 3, -2, 2, 1, -1, 0, 0, -1
followed by 49 0s

Lossless Data Compression

Combine DC components for each block into a single sequence



Sequencing

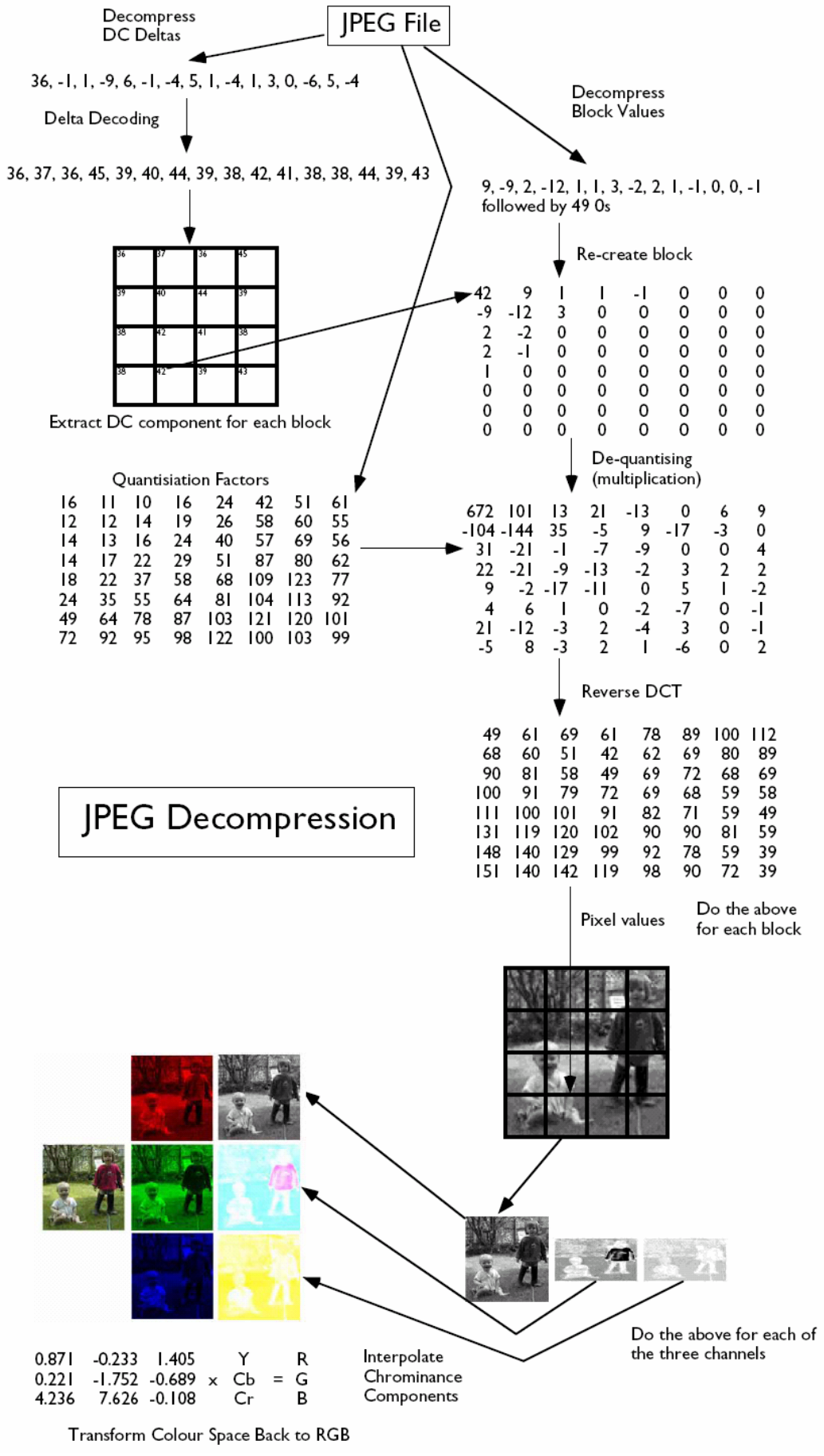
36, 37, 36, 45, 39, 40, 44, 39, 38, 42, 41, 38, 38, 44, 39, 43

Delta Encoding

36, -1, 1, -9, 6, -1, -4, 5, 1, -4, 1, 3, 0, -6, 5, -4

Lossless Data Compression

JPEG File


JPEG File
Decompress DC Deltas
36, -1, 1, -9, 6, -1, -4, 5, 1, -4, 1, 3, 0, -6, 5, -4
Delta Decoding
36, 37, 36, 45, 39, 40, 44, 39, 38, 42, 41, 38, 38, 44, 39, 43
Extract DC component for each block
Decompress Block Values
9, -9, 2, -12, 1, 1, 3, -2, 2, 1, -1, 0, 0, -1 followed by 49 0s
Re-create block
42 9 1 1 -1 0 0 0
-9 -12 3 0 0 0 0 0
2 -2 0 0 0 0 0 0
2 -1 0 0 0 0 0 0
1 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
Quantisiation Factors
16 11 10 16 24 42 51 61
12 12 14 19 26 58 60 55
14 13 16 24 40 57 69 56
14 17 22 29 51 87 80 62
18 22 37 58 68 109 123 77
24 35 55 64 81 104 113 92
49 64 78 87 103 121 120 101
72 92 95 98 122 100 103 99
De-quantising (multiplication)
672 101 13 21 -13 0 6 9
-104 -144 35 -5 9 -17 -3 0
31 -21 -1 -7 -9 0 0 4
22 -21 -9 -13 -2 3 2 2
9 -2 -17 -11 0 5 1 -2
4 6 1 0 -2 -7 0 -1
21 -12 -3 2 -4 3 0 -1
-5 8 -3 2 1 -6 0 2
Reverse DCT
49 61 69 61 78 89 100 112
68 60 51 42 62 69 80 89
90 81 58 49 69 72 68 69
100 91 79 72 69 68 59 58
111 100 101 91 82 71 59 49
131 119 120 102 90 90 81 59
148 140 129 99 92 78 59 39
151 140 142 119 98 90 72 39
Pixel values
Do the above for each block
JPEG Decompression
Do the above for each of the three channels
Interpolate Chrominance Components
0.871 -0.233 1.405 Y R
0.221 -1.752 -0.689 x Cb = G
4.236 7.626 -0.108 Cr B
Transform Colour Space Back to RGB