JPEG — Quantization

Quantization Effect (1)

An 8 × 8 block from the Y image of 'Lena'

```
200 202 189 188 189 175 175 175        515 65 -12  4  1   2 -8  5
200 203 198 188 189 182 178 175       -16  3   2  0  0 -11 -2  3
203 200 200 195 200 187 185 175       -12  6  11 -1  3   0  1 -2
200 200 200 200 197 187 187 187        -8  3  -4  2 -2  -3 -5 -2
200 205 200 200 195 188 187 175         0 -2   7 -5  4   0 -1 -4
200 200 200 200 200 190 187 175         0 -3  -1  0  4   1 -1  0
205 200 199 200 191 187 187 175         3 -2  -3  3  3  -1 -1  3
210 200 200 200 188 185 187 186        -2  5  -2  4 -2   2 -3  0
          f(i,j)                              F(u,v)
```

Fig. 9.2: JPEG compression for a smooth image block.

$f(i,j)$ 基础图像

↓ DCT

$F(u,v)$

Quantization

Quantization Effect (2)

Q^{-1}

$\hat{F}(u,v)$

```
32  6 -1 0 0 0 0 0        512 66 -10 0 0 0 0 0
-1  0  0 0 0 0 0 0        -12  0   0 0 0 0 0 0
-1  0  1 0 0 0 0 0        -14  0  16 0 0 0 0 0
-1  0  0 0 0 0 0 0        -14  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          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 0          0  0   0 0 0 0 0 0
      F̂(u,v)                    F̃(u,v)
```

Inverse DCT

error 误差

```
199 196 191 186 182 178 177 176         1  6 -2  2  7 -3 -2 -1
201 199 196 192 188 183 180 178        -1  4  2 -4  1 -1 -2 -3
203 203 202 200 195 189 183 180         0 -3 -2 -5  5 -2  2 -5
202 203 204 203 198 191 183 179        -2 -3 -4 -3 -1 -4  4  8
200 201 202 201 196 189 182 177         0  4 -2 -1 -1 -1  5 -2
200 200 199 197 192 186 181 177         0  0  1  3  8  4  6 -2
204 202 199 195 190 186 183 181         1 -2  0  5  1  1  4 -6
207 204 200 194 190 187 185 184         3 -4  0  6 -2 -2  2  2
          f̃(i,j)                      ε(i,j) = f(i,j) - f̃(i,j)
```
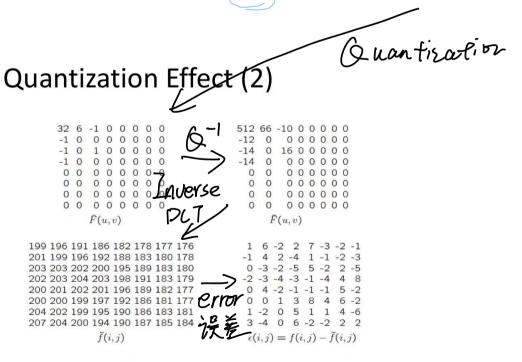
Fig. 9.2 (cont'd): JPEG compression for a smooth image block.