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```
% This code demonstrates JPEG image compression  
% Part 1: Manual JPEG steps (DCT + Quantization)  
% Part 2: JPEG compression using MATLAB built-in command  
  
clc;  
clear;  
close all;
```

---

### Read and preprocess image

---

```
img = imread('lena.png');  
img = double(img);  
  
if ndims(img) == 3  
    img = rgb2gray(uint8(img));  
    img = double(img);  
end  
  
img = img - 128; % Level shifting  
[M,N] = size(img);
```

---

### JPEG Quantization Matrix (Standard)

---

```
Q = [16 11 10 16 24 40 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 56 68 109 103 77;  
     24 35 55 64 81 104 113 92;  
     49 64 78 87 103 121 120 101;  
     72 92 95 98 112 100 103 99];
```

---

### Manual JPEG Compression

---

```
compressed = zeros(M,N);  
  
for i = 1:8:M  
    for j = 1:8:N  
        block = img(i:i+7, j:j+7);  
        dct_block = dct2(block);  
        quant_block = round(dct_block ./ Q);  
        dequant_block = quant_block .* Q;
```

```

    idct_block = idct2(dequant_block);
    compressed(i:i+7, j:j+7) = idct_block;
end
end

manual_jpeg = compressed + 128;
manual_jpeg = uint8(manual_jpeg);

```

## JPEG Compression using MATLAB Command

```

imwrite(uint8(img+128), 'jpeg_builtin.jpg', 'jpg', 'Quality', 30);
builtin_jpeg = imread('jpeg_builtin.jpg');

```

## Display Results

```

figure;
subplot(1,3,1);
imshow(uint8(img+128));
title('Original Image');

subplot(1,3,2);
imshow(manual_jpeg);
title('Manual JPEG Compression');

subplot(1,3,3);
imshow(builtin_jpeg);
title('JPEG using imwrite');

```



