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%Akshay BT23ECE050
clc;
clear all;
close all;

I=imread("image_1.jpg");
if size(I,3)==3
    I=rgb2gray(I);
end
I=double(I);
%Loading the grayscale image and converting it into double for DCT operations.

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];
%Defining the standard JPEG quantization matrix.

factor=10;
Q=Q*factor;
%Increasing quantization values to introduce stronger compression effects.
blockSize=8;
%JPEG processes the image in fixed 8x8 pixel blocks.
[m,n]=size(I);
reconstructed=zeros(m,n);
%Initializing an empty matrix to store reconstructed compressed output.

for i=1:blockSize:(m-blockSize+1)
    for j=1:blockSize:(n-blockSize+1)

        block=I(i:i+7,j:j+7);
        %Extracting one valid 8x8 block from the image.
        block=block-128;
        %Shifting pixel values around zero to improve DCT efficiency.
        dctBlock=dct2(block);
        %Applying Discrete Cosine Transform to convert block into frequency
domain.
        quantBlock=round(dctBlock./Q);
        %Quantizing the DCT coefficients which causes lossy compression.
        dequantBlock=quantBlock.*Q;
        %Reversing quantization step for decompression during reconstruction.
        idctBlock=idct2(dequantBlock);
        %Applying inverse DCT to bring the frequency block back to spatial
form.
        idctBlock=idctBlock+128;
        %Shifting pixel values back to the original intensity range.
        reconstructed(i:i+7,j:j+7)=idctBlock;
        %Placing the reconstructed block back into the output image.

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    end
end

reconstructed=uint8(reconstructed);
%Converting reconstructed image back into uint8 format for display.

figure;
imshow(uint8(I));
title("Original Image");
%Displaying the input image before compression.

figure;
imshow(reconstructed);
title("Reconstructed Image After High JPEG Compression");
%Displaying the decompressed output image after DCT compression.
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**Reconstructed Image After High JPEG Compression**



*Published with MATLAB® R2025b*