**Image and Video Processing**

**Programming Assignment**

**Week 9**

% DCT based block quantization

img = double(imread('barbara.bmp'));

% Parameterizing scaling Factor

fact = [0.5 1 2 4 8];

% JPEG standard quantization table

quantM = [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];

PSNR = cell(1,length(fact));

dctImg = cell(1,length(fact));

DCTfn = @(block) dct2(block.data);

% Block Processing

dctBlock = blockproc(img,[8 8], DCTfn);

for i = 1:length(fact)

Q = quantM.\*fact(i);

DCTfn = @(block) floor((block.data + Q/2)./Q);

dctI = blockproc(dctBlock,[8 8],DCTfn);

dctImg{i} = dctI;

PSNR{i} = psnr(dctI, img);

inDCTfn = @(block) floor(block.data.\*Q);

iqDCTImg = blockproc(dctI,[8 8],inDCTfn);

% Generating Quantized Image Block

dctBlockFn = @(block) floor(idct2(block.data));

qblock = blockproc(iqDCTImg,[8 8], dctBlockFn);

% Reconstructions

subplot(3,2,i); imshow(qblock,[]);

str = sprintf('Scaling Factor: %g',fact(i));

title(str);

end

% Count Zero Coefficients

count = cell(1,length(fact));

npix = cumprod(size(img));

for k = 1:size(dctImg,2)

t = 0;

for i = 1:size(img,1)

for j = 1:size(img,2)

if dctImg{k}(i,j) ~= 0

t = t+1;

end

end

end

count{k} = t;

end

avgCount = cell(1,length(fact));

K = npix(2)/64;

for i = 1:length(fact)

avgCount{i} = count{i}/K;

end

% Plotting error/distortion

PSNR = cell2mat(PSNR);

avgCount = cell2mat(avgCount);

count = cell2mat(count);

figure(2);

subplot(1,3,1); plot(fact,PSNR);

xlabel('Scaling Factor'); ylabel('PSNR');

subplot(1,3,2); plot(fact,avgCount);

xlabel('Scaling Factor'); ylabel('Coeffs per block');

subplot(1,3,3); plot(avgCount,PSNR);

xlabel('Coeffs per block'); ylabel('PSNR');



