Assignment 4 Report

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q1

```
len = 30;
theta = 0;
nsr = .03;

I = imread('Assign4_imgs/restore_01.jpg');

psf = fspecial('motion', len, theta);

restored = deconvwnr(I, psf, nsr);
restored = uint8(restored)
imwrite(restored, 'restored01.jpg');

len = 25;
theta = 0;
nsr = .035;

I = imread('Assign4_imgs/restore_02.jpg');

psf = fspecial('motion', len, theta);

restored = deconvwnr(I, psf, NSR);
restored = uint8(restored)
imwrite(restored, 'restored02.jpg');

len = 20;
theta = 30;
nsr = .025;

I = imread('Assign4_imgs/restore_03.gif');
I = ind2rgb(I, map);

psf = fspecial('motion', len, theta);

restored = deconvwnr(I, psf, nsr);
restored = uint8(restored)
imwrite(restored, 'restored03.jpg');


len = 25;
theta = -15;
nsr = .025;

I = imread('Assign4_imgs/restore_04.jpg');

psf = fspecial('motion', len, theta);

restored = deconvwnr(I, psf, NSR);
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restored = uint8(restored)
imwrite(restored, 'restored04.jpg');
```

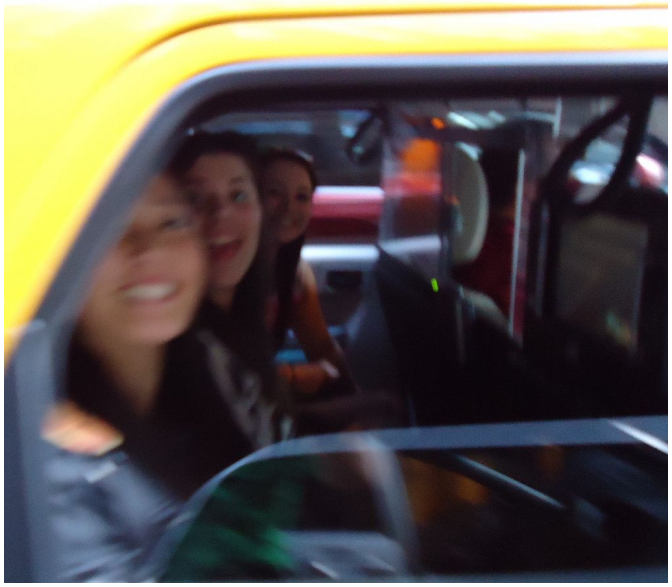

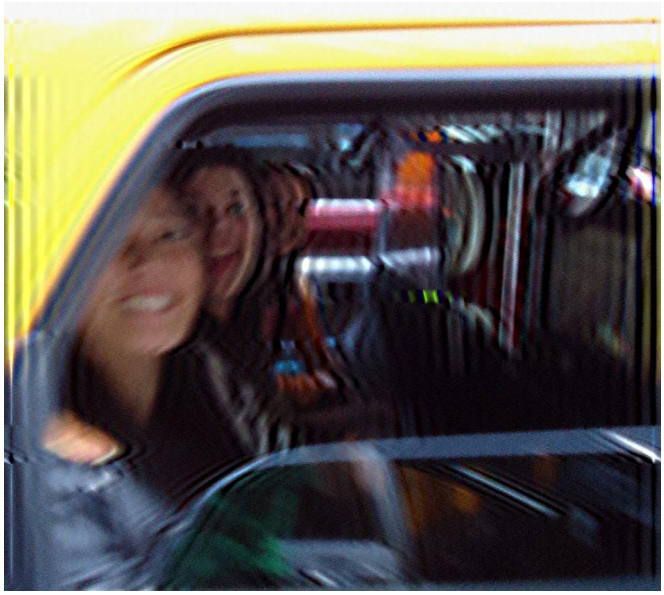

q2

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im = rgb2gray(imread('./Assign4_imgs/Uncompressed_01.bmp'));

c = 1;

qm = double([16 11 10 16  24  40  51  61
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        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]);

N = 8;
dct_mat = zeros(N,N);
r0 = sqrt(1/N);
r1 = sqrt(2/N);

for v=0:N-1
   for u=0:N-1
      if v == 0
         dct_mat(v+1,u+1) = r0*cos((pi*(2*u+1)*v)/(2*N));
      else
         dct_mat(v+1,u+1) = r1*cos((pi*(2*u+1)*v)/(2*N));
      end
   end
end

quantize = @(block_struct) (block_struct.data ./ (c*double(qm)));

toDCT = double(im);
toDCT = toDCT - 128;
F = dct_mat
dct = @(block_struct) F * block_struct.data * F';
im_dct = blockproc(toDCT, [8 8], dct);
im_dct = double(im_dct)
im_dct_quantized = blockproc(im_dct, [8 8], quantize);

im_dct = round(im_dct_quantized);

dequantize = @(block_struct) (block_struct.data .* (c*double(qm)));
im_dct_dequantized = blockproc(double(im_dct), [8 8], dequantize);

inv_dct = @(block_struct) F' * block_struct.data * F;
im_idct = blockproc(double(im_dct_dequantized),[8 8],inv_dct);
im_idct = round(im_idct);
im_idct = im_idct + 128;
im_dct = round(im_idct);


Q = zeros(8,8);

temp = ones(1,8);

Q(1:8,1) = temp
Q(1,1:8) = temp
Q(8,1:8) = temp
Q(8,1:8) = temp

dft = @(block_struct) ifft2(Q.*(fft2(block_struct.data)));

im_dft = blockproc(double(im), [8 8], dft);
```

```
[LL,LH,HL,HH] = dwt2(im,'haar');

threshold = 70;
LL = LL.*(LL > threshold);
LH = LH.*(LH > threshold);
HL = HL.*(HL > threshold);
HH = HH.*(HH > threshold);

im_dwt = idwt2(LL,LH,HL,HH,'haar',size(im));

imshow([im,im_dct,im_dft,im_dwt])

RMSE_dct = sqrt(mean(mean((double(im)-double(im_dct)).^2,2),1));
RMSE_dft = sqrt(mean(mean((double(im)-double(abs(im_dft))).^2,2),1));
RMSE_dwt = sqrt(mean(mean((double(im)-double(im_dwt)).^2,2),1));

RMSE_dct,RMSE_dft,RMSE_dwt

RMSE = [ 5.3384, 9.3269, 12.2071 ]
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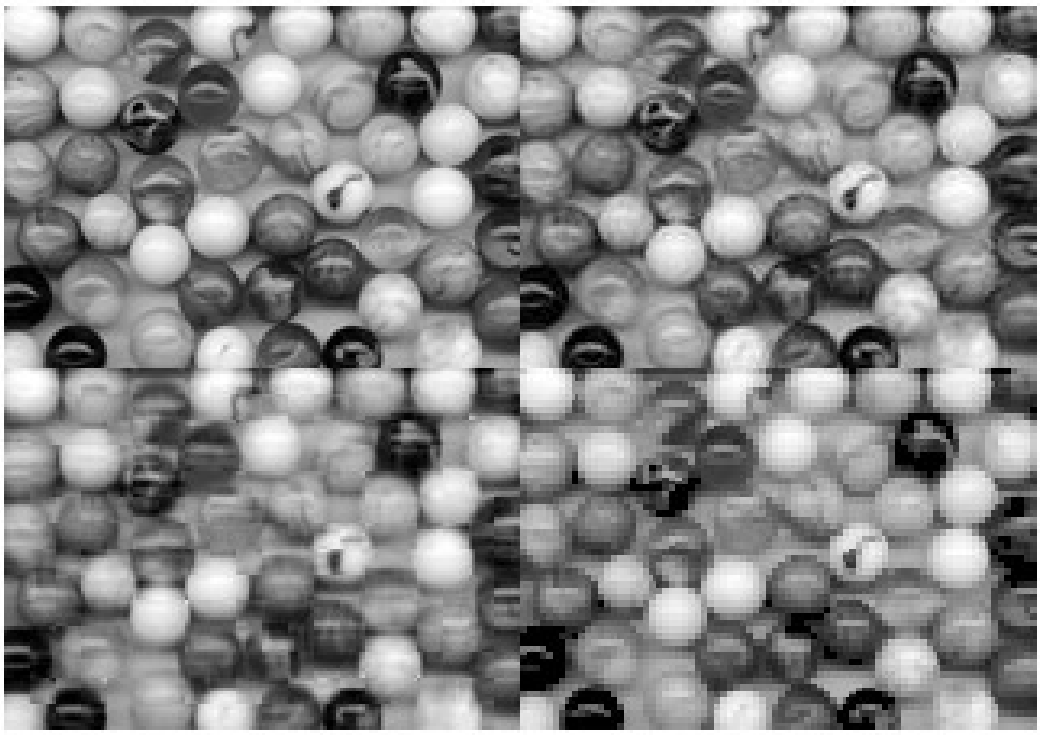
RMSE = [6.5232, 11.0290, 13.7723]



RMSE = [10.0614, 15.7418, 16.9656]