EECS225B-Spring 2020 — PROBLEM SET 07

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1 part 1

```
e RMS.m × snr ms.m × part 1.m ×
        img = imread('Fig1.1.jpg');
2 -
        subplot(1, 3, 1), imshow(img), title('origin')
        [m, n] = size(img);
3 -
5 -
        k = 4:
        topmask = uint8(2 \hat{} (k) - 1) * uint8(2 \hat{} (8 - k));
 6 —
        bottonmask = uint8(2 (8 - k) - 1);
7 —
9 —
        img_q = bitand(img, topmask);
       subplot(1, 3, 2), imshow(img_q), title('uniform quantization')
10 —
11 -
        e_uq = e_RMS(img, img_q)
12 -
        snr_uq = snr_ms(img, img_q)
13
14 —
       img_igs = img;
15 - \bigcirc for i = 1:m
            sum = 0.0;
16 -
17 -
     for j = 1:n
18 —
                if(bitand(img(i, j), topmask) == topmask)
                    img_igs(i, j) = topmask;
19 -
                    sum = img(i, j) * 1.0;
20 -
21 -
                 e1se
22 -
                     sum = img(i, j) * 1.0 + bitand(uint8(sum), bottonmask) * 1.0;
                     img_igs(i, j) = bitand(uint8(sum), topmask);
23 -
24 -
                 end
25 -
            end
26 -
27 -
        subplot(1, 3, 3), imshow(img_igs), title('igs')
        e_igs = e_RMS(img, img_igs)
28 -
29 —
        snr_igs = snr_ms(img, img_igs)
```

```
e_RMS.m × snr_ms.m × part_1.m × +
    Function e = e_RMS(img, img_f)
       [m, n] = size(img);
      e = 0;
3 —
    □ for i = 1:m
4 —
    for j = 1:n
6 —
             e = e + (img_f(i, j) - img(i, j))^2;
7 —
          end
8 —
     – end
9 —
      e = double(e);
     e = e / (m * n);
10 —
      e = sqrt(e);
11 -
12 -
      ∟ end
```







>> part_1

e_uq =

0

snr_uq =

Inf

e_igs =

4. 9317

snr_igs =

312. 3444

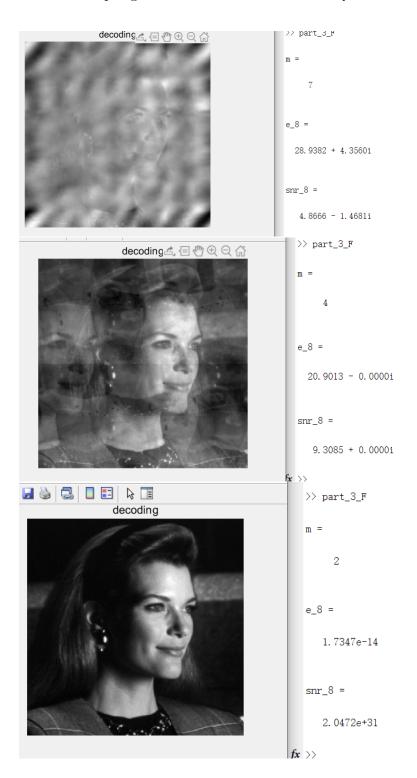
2 part 2

```
entropy.m × part 2.m ×
                          ☐ function h = entropy(img)
    1
                                  [m, n] = size(img);
    3 —
                                 t = zeros(1, 256);
                         \Box for i = 1:256
    4 —
                                                 t(i) = length(find(img == (i - 1))) / (m * n);
    5 —
    6 —
                              – end
    7
                                 h = 0.0:
    8 —
                         \Box for i = 1:256
    9 —
                                                 if(t(i) > 0)
10 —
11 -
                                                                  h = h - t(i) * log2(t(i));
12 -
                                                  end
13 -
                            ∟ end
            e RMS.m × snr ms.m × part 1.m × entropy.m × part 2.m ×
                           img1 = imread('Fig1.2(a).jpg');
1 —
2 -
                          h_fig1 = entropy(img1)
                          img2 = imread('Fig1.2(b).tif');
                          h_fig2 = entropy(img2)
4 -
5
                          subplot(1, 2, 1), imshow(img1), title('fig1');
6 —
                          subplot(1, 2, 2), imshow(img2), title('fig2');
7 —
                                        fig1
                                                                                                                                                        fig2
                                                                                                                                                                                                                                    >> part_2
                                                                                                                   his tendensury most that you
                                                                                                                    appear of our soull one thous
                                                                                                                    af grand of our same, our arrows to the fire Letters of Franciscopy of the Later of the Later of the Later of the Charles of t
                                                                                                                                                                                                                                    h_fig1 =
                                                                                                                                                                                                                                                  6.8046
                                                                                                                                    ford the many to short
                                                                                                                      athe had by third fairful to
                                                                                                                  Jell allew en koff and James on him heirs
                                                                                                                                                                                                                                    h fig2 =
                                                                                                                   Ecitain traits of parell of
                                                                                                                  candaired out thousand one
                                                                                                                                                                                                                                                  0.5299
```

3 part 3

3.1 case 1

```
entropy.m × part 2.m × part 3.m × part 3 F.m ×
         img=imread('Fig1.3.jpg');
         [Imgm, Imgn] = size (img);
 ^{2} -
         img_f = double(imcrop(img, [0, 0, floor(Imgn/8)*8, floor(Imgm/8)*8]));
 3 -
 4
         m 📃 8
 5 —
 6
        img_fft=fft2(img_f);
       [fftm, fftn] = size(img_fft);
 8 —
       list=reshape(img_fft, 1, fftm * fftn);
 9 —
10 -
       list = abs(list);
11 -
       t=list(m);
12 -
       a = ones(m, m);
13 -
      = for i=1:m
             for j=1:m
14 -
15 -
                 if(abs(img_fft(i, j))<t)</pre>
                      a(i, j)=0;
16 -
17 -
                 end
18 -
             end
19 -
       ∟ end
         fun = @(block_struct) a. * block_struct.data;
20 -
21 -
         img_tc=blockproc(img_fft, [m m], fun);
22
23
         % fun = @(block_struct) img_tr' * block_struct.data * img_tr;
24 -
         img_tcd=ifft2(img_tc);
         imshow(real(img_tcd), []);title('decoding');
25 -
         e_8 = e_RMS(img_f, img_tcd)
26 -
         snr_8 = snr_ms(img_f, img_tcd)
27 -
                                   m =
                                   e_8 =
                                     1.0124e-08 - 4.1412e-08i
                                   snr_8 =
                                     -2.9536e+18 + 1.5359e+18i
```



```
3.2
    case 2
1 —
        img=imread('Fig1.3.jpg');
2 —
        [Imgm, Imgn] = size (img);
3 —
        img_f = double(imcrop(img, [0, 0, floor(Imgn/8)*8, floor(Imgm/8)*8]));
5 —
        m = 8
        img_dct=dct2(img_f);
        [dctm, dctn] = size(img_dct);
9 —
        list=reshape(img_dct, 1, dctm * dctn);
        list = abs(list);
.0 —
       t=list(m);
.1 —
.2 —
        a = ones(m, m);
      \Box for i=1:m
.3 —
.4 —
             for j=1:m
                 if (abs(img_dct(i, j))<t)</pre>
.5 —
.6 —
                      a(i, j) = 0;
.7 -
                 end
.8 —
             end
.9 —
       ∟ end
        fun = @(block_struct) a. * block_struct.data;
20 —
        img_tc=blockproc(img_dct, [m m], fun);
21 —
22
23
        % fun = @(block_struct) img_tr' * block_struct.data * img_tr;
        img_tcd=idct2(img_tc);
24 —
        imshow(img_tcd, []);title('decoding');
25 —
        e_8 = e_RMS(img_f, img_tcd)
26 —
        snr_8 = snr_ms(img_f, img_tcd)
27 —
                                             >> part_3
               decoding
                                             m =
                                             e_8 =
                                                31.3068
                                             snr_8 =
                                                 5. 2853
```

