MCBU

CSE3113/CSE3214 Introduction to Digital Image Processing

Homework 2 Report

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1. Tools

MATLAB Production Server R2015a Version 2.1

2. Problems

I found 4 problems in my image (2.tif). These problems were salt-pepper noise problem, low-brightness problem, periodic noise problem, of fine details and sharpen problem.

3. Solutions

For Salt Pepper Noise Problem of Solution

Firstly, I read/get these photo (2.tif and original.tif). When I was solving the problem, I applied medfilt2 filter (median filter).

Code.m

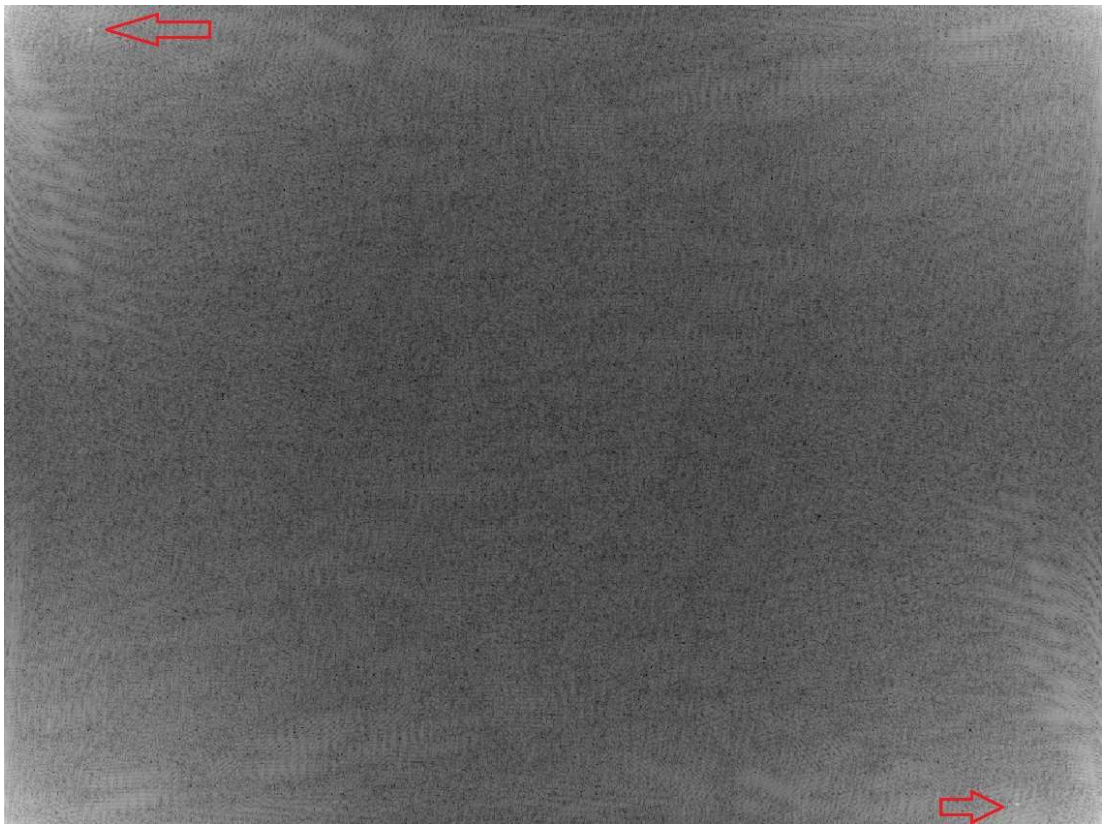
```
close all;
clc;
clear;
a = imread('images/original.tif');
subplot(1,2,1);
imshow(a);
title('Original Picture');
I1=imread('images/2.tif');
subplot(1,2,2);
imshow(I1)
title('My Ids end = 2 ,so This is 2.tif');

I1=medfilt2(I1,[2 3]);
%When applying 2-3, the fluctuation in the photo is lower.
figure, imshow(I1)
title('After applied median filter');
```

After that, I saw periodic noise problem and when I was solving the problem, I applied notch filter. I paid attention to spectrum of the image. (Fc = F) I saw the white points in the photo. These points' pixels numbers are 80,24 and 922,727.

Code.m

```
18      %Determine good padding for Fourier transform
19 -    PQ = paddedsize(size(I1));
20
21      %Create Notch filters corresponding to extra peaks in the Fourier transform
22 -    H1 = notch('btw', PQ(1), PQ(2), 8, 80, 24);
23 -    H2 = notch('btw', PQ(1), PQ(2), 11, 922, 727);
24      %It is more beautiful "btw" than "gaussian".
25
26      %figure, imshow(fftshift(H1.*H2));
27
28      % Calculate the discrete Fourier transform of the image
29 -    F=fft2(double(I1),PQ(1),PQ(2));
30
31      % Apply the notch filters to the Fourier spectrum of the image
32 -    FS_image = F.*H1.*H2;
33
34      % convert the result to the spacial domain.
35 -    F_image=real(ifft2(FS_image));
36
37      % Crop the image to undo padding
38 -    F_image=F_image(1:size(I1,1), 1:size(I1,2));
39
40      %Display the blurred image
41 -    figure, imshow(F_image,[])
42 -    title('Blurred Image And After Applied Notch Filter');
```

While applying the notch filter, I found the spots from the spectrum.



After that, I saw of fine details and sharpen problem when I was solving the problem, I applied imsharpen filter with the data in the photo. (line 45)

```
43      %sharpining
44 -    Isharp1=imsharpen(F_image);
45 -    Isharp2=imsharpen(F_image,'Radius',2,'Amount',2);
46 -    figure, imshow(Isharp1,[])
47 -    title('After Applied Sharpening Filter');
48
49 -    f4 = F_image;
50 -    f5 = Isharp1;
51
52      % Display the Fourier Spectrum
53      % Move the origin of the transform to the center of the frequency rectangle
54 -    Fc=F;
55 -    Fcf=fftshift(FS_image);
```

After that, I saw low- brightness problem when I was solving the problem, I applied for loop with if-else condition. I think/for me, the best was to increase 120.

```
57      % use abs to compute the magnitude and use log to brighten display
58 -    S1=log(1+abs(Fc));
59 -    S2=log(1+abs(Fcf));
60      %figure, imshow(S1,[])
61      %figure, imshow(S2,[])
62
63      %where increasing brightness
64 -    for i=1:375
65 -        for j=1:500
66 -        if f5(i,j)+120 <= 255
67 -            f5(i,j) = f5(i,j)+120;
68 -        elseif f5(i,j)+120 > 255
69 -            f5(i,j) = 255;
70 -        end
71 -        end
72 -    end
73
74 -    figure, imshow(f5,[])
75 -    title('After increased brightness');
```

In conclusion, I thought of using the gamma method for low brightness and got some better results.

```
figure, imshow(f5,[])
title('After increased brightness');

%where increasing brightness with gama
im = g/255;%normalize

gl = 0.6;
outl = 255*(g.^gl);
figure,imshow(outl, []);
title('After increased brightness with gama');
```

4. Conclusions and Observations

According to my observations, the size difference does not matter much when applying the medfilt2 filter. E.g. the difference between 3-3 and 3-4 is hard to see. Also, it was difficult to find the points when applying the notch filter. It was difficult to choose with the naked eyes. So, the for loops and if-else conditions are very similar to the python language.

5. References

- ✓ Wilhelm Burger, Mark J. Burge, “Principles of Digital Image Processing: Fundamental Techniques”
- ✓ http://www.yazilimdilleri.net/YazilimMakale-4564-Goruntu-Isleme-Matlab-ile-Resim-Parlakligini-Artirma-ve-Azaltma.aspx
- ✓ https://www.mathworks.com/help/dsp/ref/fdesign.notch.html
- ✓ http://matlab.izmiran.ru/