

Assignment

1. Frequency domain filtering

Enhance the blurred image (“lenna.mat”) by applying an IHPF, BHPF, GHPF in the frequency domain and Laplacian filter in the spatial domain.

Note: the equation as below should be implemented when filters are applied

$$g(x,y) = f(x,y) + c[\nabla^2 f(x,y)]$$

Here, $n=2$ for BHPF. And some other parameters needed to be set, for example $c=10$, cutoff frequency is 100.

- Please display the result by using *subplot()* in Matlab.
- Please discuss the difference of the four sharpening filters (Spatial Laplacian, IHPF, BHPF and GHPF). (You can adjust the parameters c and cutoff frequency to get different images to compare, but all the images you compared should be shown in your report and ppt.)

Note: 1. *fft2()*, *ifft2()* and *fftshift()* can be used in this project.

2. IHPF, BHPF, GHPF should be generated from the formulas in slides/textbook.

2. Pseudo-color enhancement

Assigning colors to gray values based on specified criterion.

- Transform the gray image to color image in spatial domain.

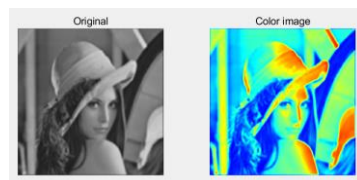


Fig.1. An example of pseudo-color in spatial domain. In this example, colormap “jet” in Matlab was used.

Note: 1. Please DO NOT use *image()/imagesc()* in Matlab to get the color image!

2. Any color table (like “jet” colormap in Matlab) or function (transform function on websites or books) you like can be used in this project, but please make sure we can still recognize “lenna” from your color image.

- Transform the gray image to color image in frequency domain.

1. “Lenna”

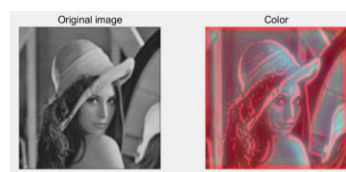


Fig.2. An example of pseudo-color in frequency domain. In your project, you can choose the filters and colors you like.

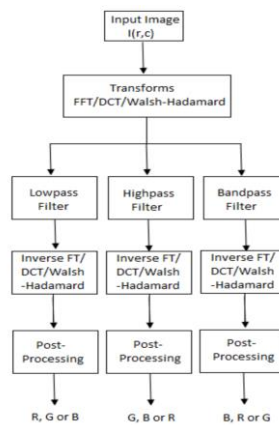


Fig.3. Diagram of process. In this project, we can use *fft2()*, *ifft2()* and *fftshift()* in Matlab.

Note: If you need histogram specification, histogram equalization or some other methods in post-processing, please write it by yourself, NOT using Matlab function.

2. “Remote Sensing Image”

This method is often used in Remote Sensing Image, so please use “RSI.mat” to implement pseudo-color enhancement in frequency domain.

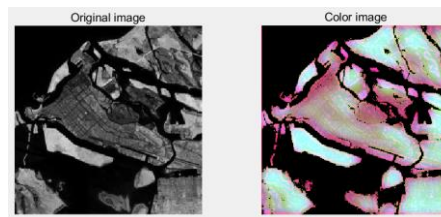


Fig.4. An example of pseudo-color in frequency domain. In this example, both the part of high frequency, low frequency and band pass frequency of image were post-processed.

Submission

Project2_YourName.zip file containing the following files:

- “Project2_1_YourName.m” for assignment 1
- “Project2_2_1_YourName.m” for assignment 2.1
- “Project2_2_2_YourName.m” for assignment 2.2
- “Project2_Report_YourName.pdf” for report
- “Project2_PPT_YourName.ppt” for presentation ppt

Code requirement

Please use “%%” and “%” to help us to check.

```

%% Load Data
% To Do

%% Laplacian
Your_code % Comment out key parts of your code

%% IHPF
% To Do

%% BHPF
% To Do
  
```