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Experiment 9: FDP & LPF, BPF filters.

Aim: To perform FDP and get LPF, BPF filter outputs.

Apparatus: PC/Laptop, MATLAB software and few Images.

Theory: We have deal with images in many domains. Now we are processing signals in frequency domain. Since this fourier series and frequency domain is purely mathematics, so we try to minimize that math's part and focus more on its use in DIP. Till now, all the domains in which we have analyzed a signal, we analyze it with respect to time. But in frequency domain we don't analyze signal with respect to time, but with respect of frequency.

Low pass filter: A low pass filter is the basis for most smoothing methods. An image is smoothed by decreasing the disparity between pixel values by averaging nearby pixels. Using a low pass filter tends to retain the low frequency information within an image while reducing the high frequency information.

Band pass filter: A bandpass filter attenuates very low and very high frequencies, but retains a middle range band of frequencies. Bandpass filtering can be used to enhance edges while reducing the noise at the same point. As the name suggests, it just pass a defined band of frequencies through itself and reject the other.

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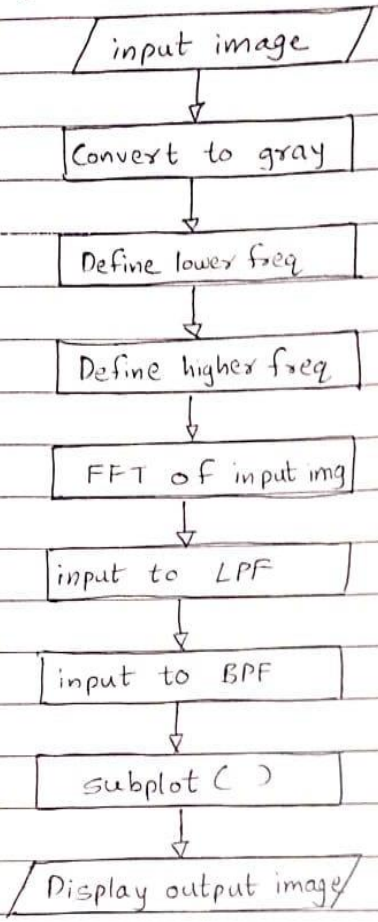
Flowchart & Algorithm:



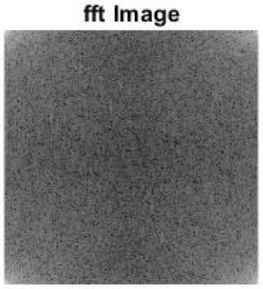
Convert the input image into grey scale image by using the pre-existing function in MATLAB: define frequency limits using variables and further take FFT of the grey image. After this, provide the FFT input and get the band pass and lowpass image of the input image. & display it using imshow() function of MATLAB.

Coding and Output:

```
% Vighnesh Vikas Salgaonkar | B-21 | TY-EXTC
clc;
close all;
clear all;

mygrayimg = imread('IPMV1.jpg');

subplot(221);
imshow(mygrayimg);
title('Original Image');
mygrayimg = imresize(rgb2gray(mygrayimg), [256 256]);
myfftimage = fft2(mygrayimg);
tmp =abs(myfftimage);
mylogimg = log(1+tmp);
subplot(222);
imshow(mat2gray(mylogimg));
title('fft Image');

[m,n] = size(myfftimage);

low = 62;
band1 = 15;
band2 = 60;
mylowpassmask = ones(m,n);
mybandpassmask = ones(m,n);
for u = 1:m
for v =1:n
temp = ((u-(m+1))/2)^2+(v-(n+1)/2)^2;
raddist = round((sqrt(temp)));
disp(raddist)
if raddist > low
mylowpassmask(u,v) = 0;
end
if raddist > band2 ||raddist < band1;
mybandpassmask(u, v) = 0;
end
end
end
f1 = fftshift(mylowpassmask);
f3 = fftshift(mybandpassmask);

resimage1 = myfftimage.*f1;
resimage3 = myfftimage.*f3;

r1 = abs(ifft2(resimage1));
subplot(223);
imshow(r1, []);
title('Lowpass Filtered Image');

r3 = abs(ifft2(resimage3));
subplot(224);
imshow(r3, []);
title('Bandpass Filtered Image');
```

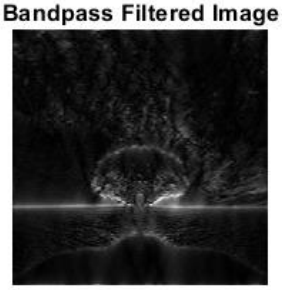
Original Image

fft Image



Lowpass Filtered Image

Bandpass Filtered Image



Conclusion: Thus, I conclude that, I have studied understood and performed the experiment based on ~~image segmentation~~ LPF & BPF filters and have converted the image from one domain to another domain.