
Fourier transform function and preprocessing

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This function applies a Sobel filter for 0° and 90° , after that both are transformed to the frequency domain and the outputs are the resulting images

Function declaration

In this part the image is the input for the function and as result the output are two images

```
function [fh, fv]=spect1(ima)

ima=imresize(ima,.5);
[fil,col,capa]=size(ima);
```

Sobel filtering

If the image is in RGB converts to grayscale

```
if capa==3
    grey(ima);
end

imaexp=zeros(fil+2,col+2);
[fil,col]=size(imaexp);
for i=2:fil-1
    for j=2:col-1
        imaexp(i,j)=double(ima(i-1,j-1));
    end
end
```

Apply the convolution matrix for horizontal filtering

```
CM=[-1, 0, 1;-2, 0, 2;-1, 0, 1]
```

$CM =$

$$\begin{bmatrix} -1 & 0 & 1 \\ -2 & 0 & 2 \\ -1 & 0 & 1 \end{bmatrix}$$

-1 0 1

```
for i=2:fil-1
    for j=2:col-1
        Hh(i-1,j-1)=(1*imaexp(i-1,j-1)+ 0*imaexp(i-1,j)+(-1)*imaexp(i-1,j+1)+2*ima
    end
end
```

Apply the convolution matrix for vertical filtering

CM=[1,2,1;0,0,0;-1,-2,-1]

CM =

1 2 1
 0 0 0
 -1 -2 -1

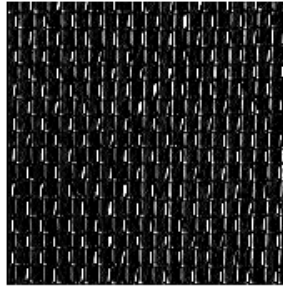
```
for i=2:fil-1
    for j=2:col-1
        Hv(i-1,j-1)=((-1)*imaexp(i-1,j-1)-2*imaexp(i-1,j)+(-1)*imaexp(i-1,j+1)+0*i
    end
end

% imaf=Hh+Hv;
```

Show modified images

```
figure
subplot(221), imshow(uint8(Hh)),title('Horizontal filtering');
subplot(222), imshow(uint8(Hv)),title('Vertical filtering');
subplot(224), imshow(uint8(ima)),title('Original image');
```

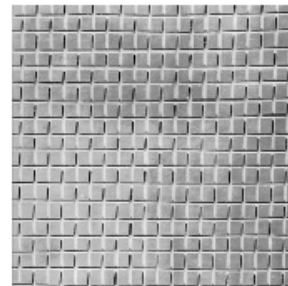
Horizontal filtering



Vertical filtering



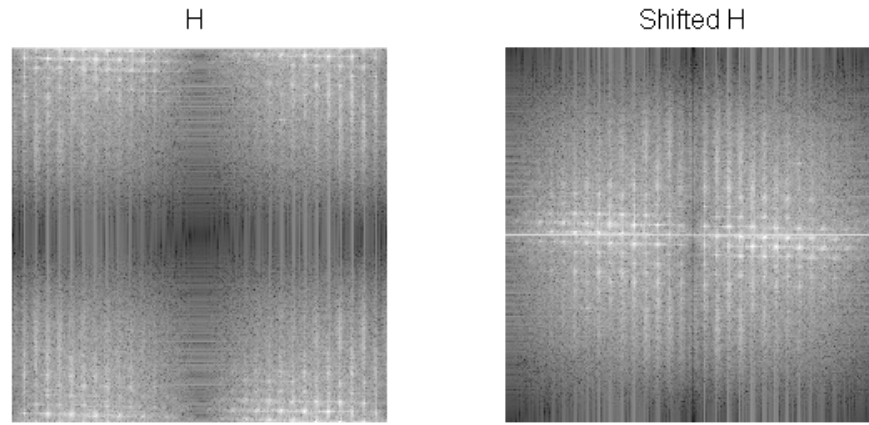
Original image



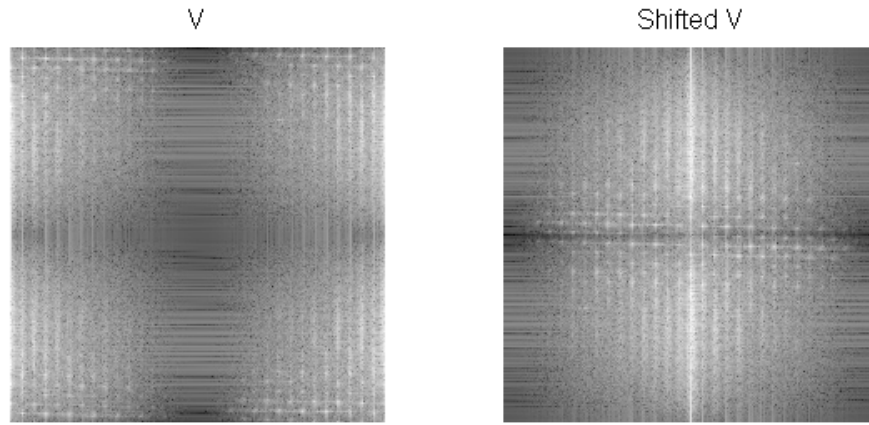
Transformation to the frequency domain

Here the program uses the Fast Fourier Transform(fft2) to obtain the spectrum of both images

```
%Create the horizontal filtered spectrum
fo=fft2(Hh);
fh=fo;
fr=fftshift(fo);
fos=log(1+abs(fo));
fis=log(1+abs(fr));
S=abs(fr);
figure,subplot(121), imshow(fos,[]),title('H ');
subplot(122), imshow(fis,[]),title('Shifted H');
```



```
%Create the vertical filtered spectrum
fo=fft2(Hv);
fv=fo;
fr=fftshift(fo);
fos=log(1+abs(fo));
fis=log(1+abs(fr));
S=abs(fr);
figure, subplot(121), imshow(fos,[]),title('V');
subplot(122), imshow(fis,[]),title('Shifted V');
```



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