Periodic Noise Reduction by Frequency Domain Filtering

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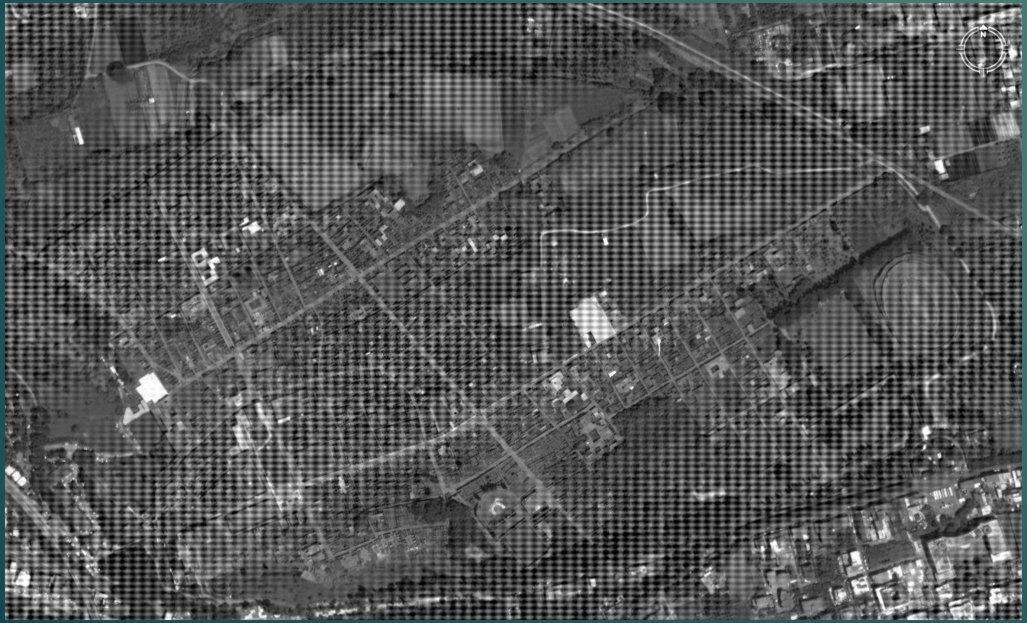
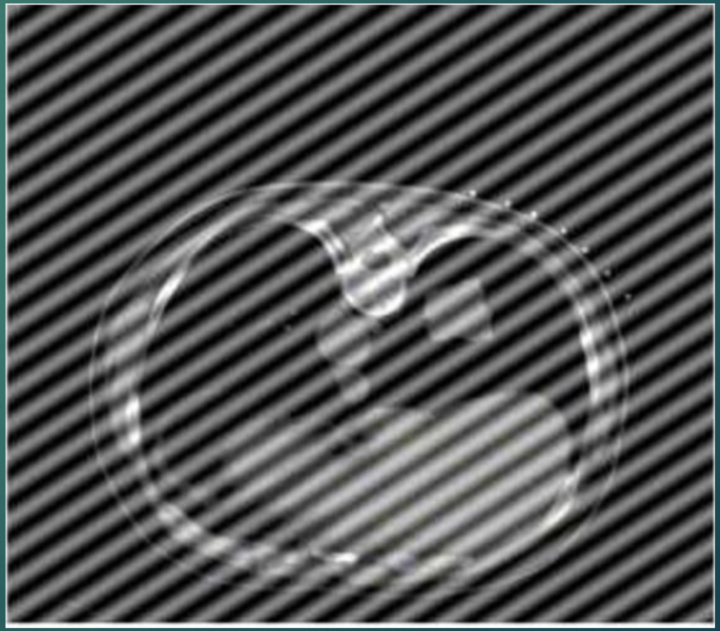
Periodic Noise: is the noise which arises from electrical or electromechanical interference during image acquisition.

An image affected by periodic noise will look like a repeating pattern has been added on top of the original image.





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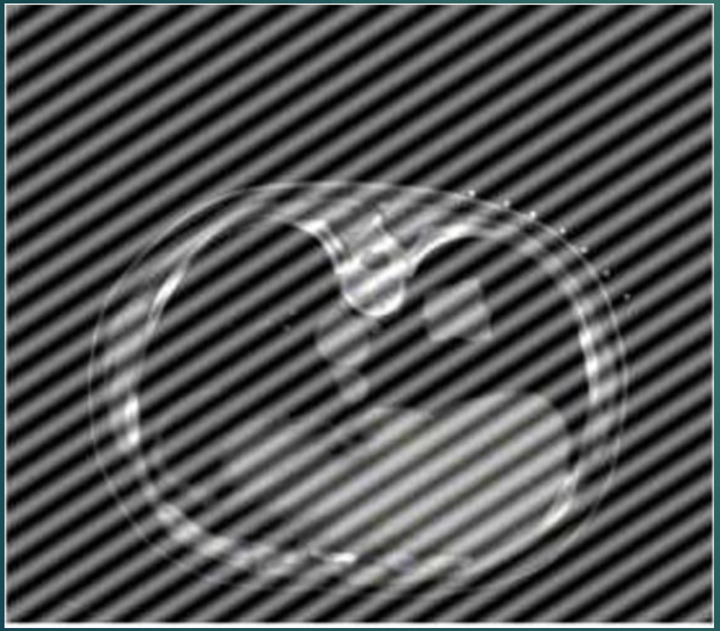
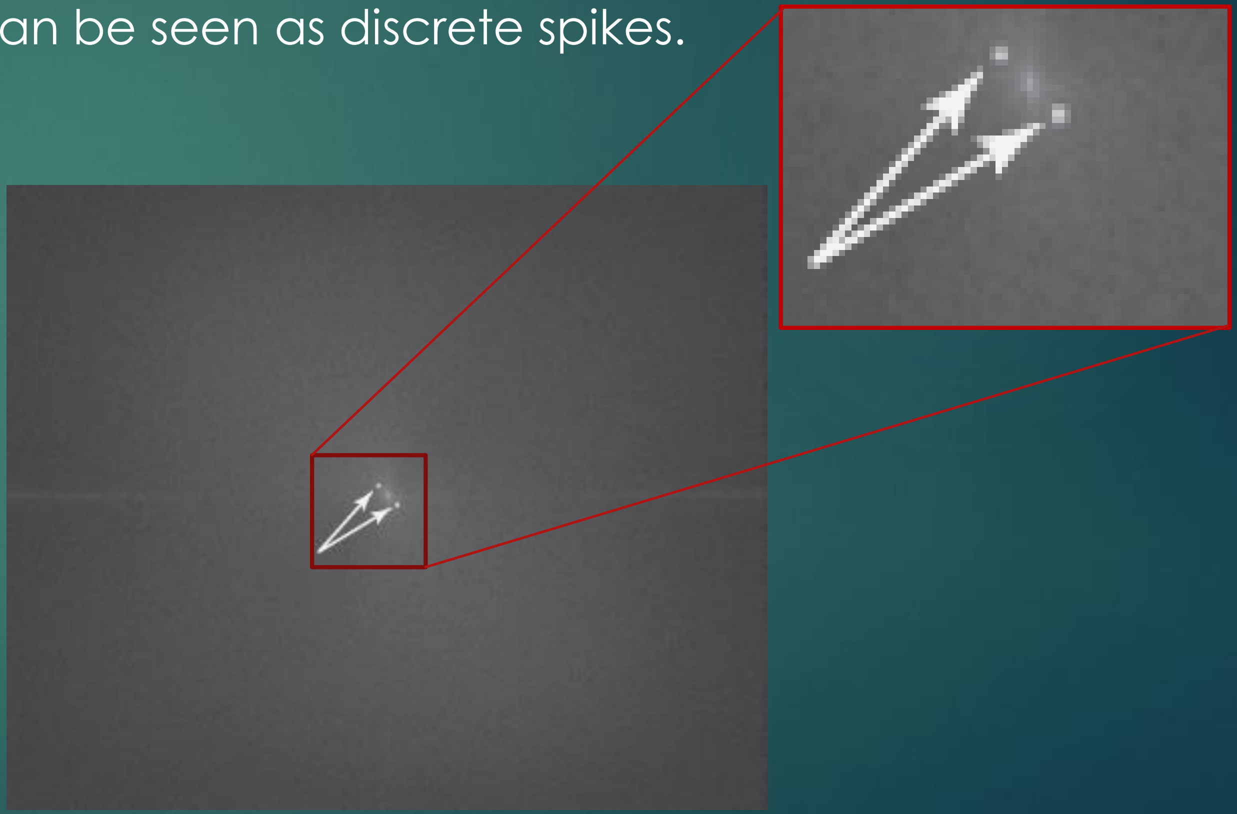
In the frequency domain periodic noise can be seen as discrete spikes.



Spatial domain



Frequency domain

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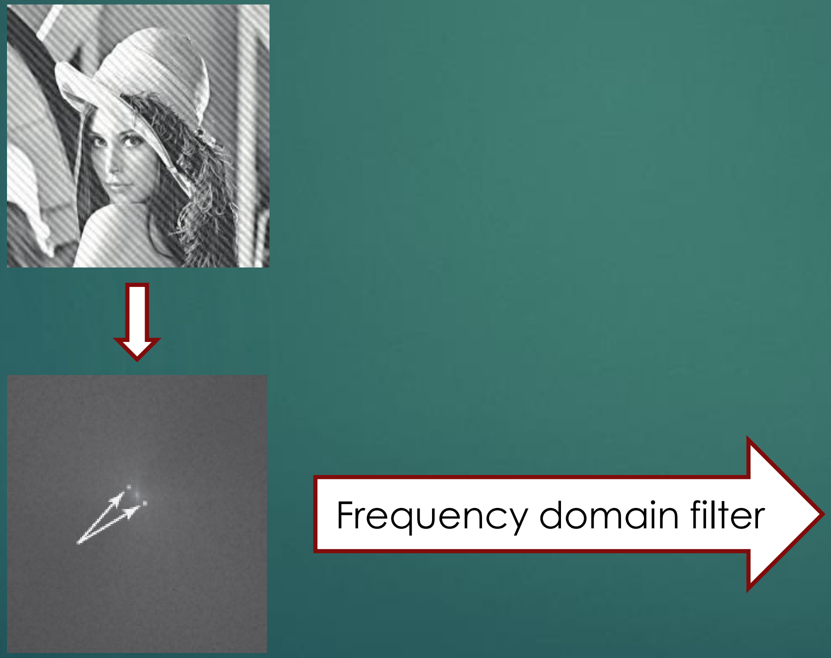
Eliminating or reducing these impulses in the frequency domain will eliminate or reduce the sinusoidal noise in the spatial domain.

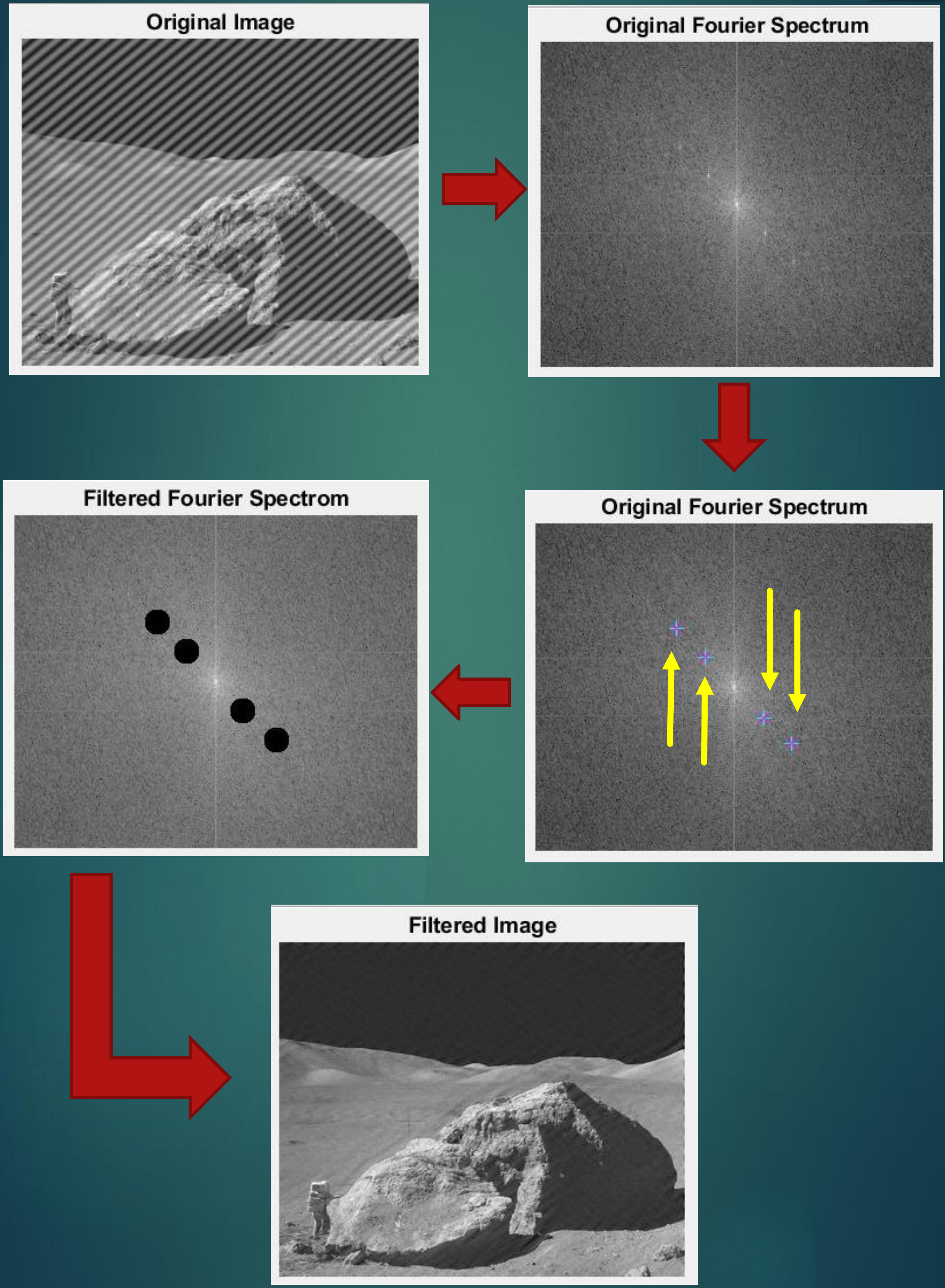


Frequency domain filter

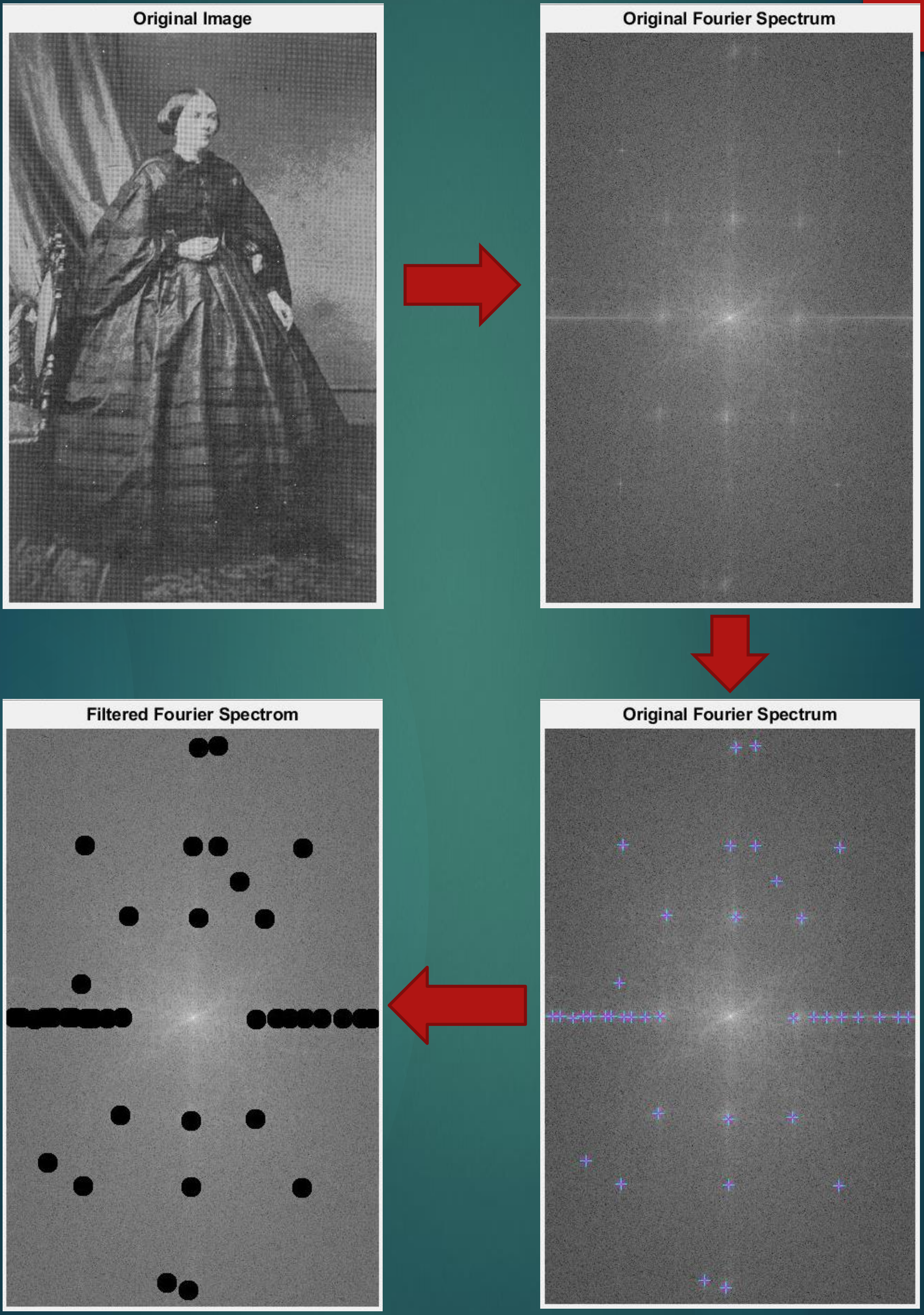
Project idea

The idea of this project is to convert the image to the frequency domain using Fourier transform, and then allow the user to determine the places where he/she finds frequency spikes and then the program covers these points with black spots, and thus when converting the image to the spatial domain, the image will be almost free from periodic noise.

Filtering Example


Original Image
Original Fourier Spectrum
Original Fourier Spectrum
Filtered Fourier Spectrom
Filtered Image

Filtering Example



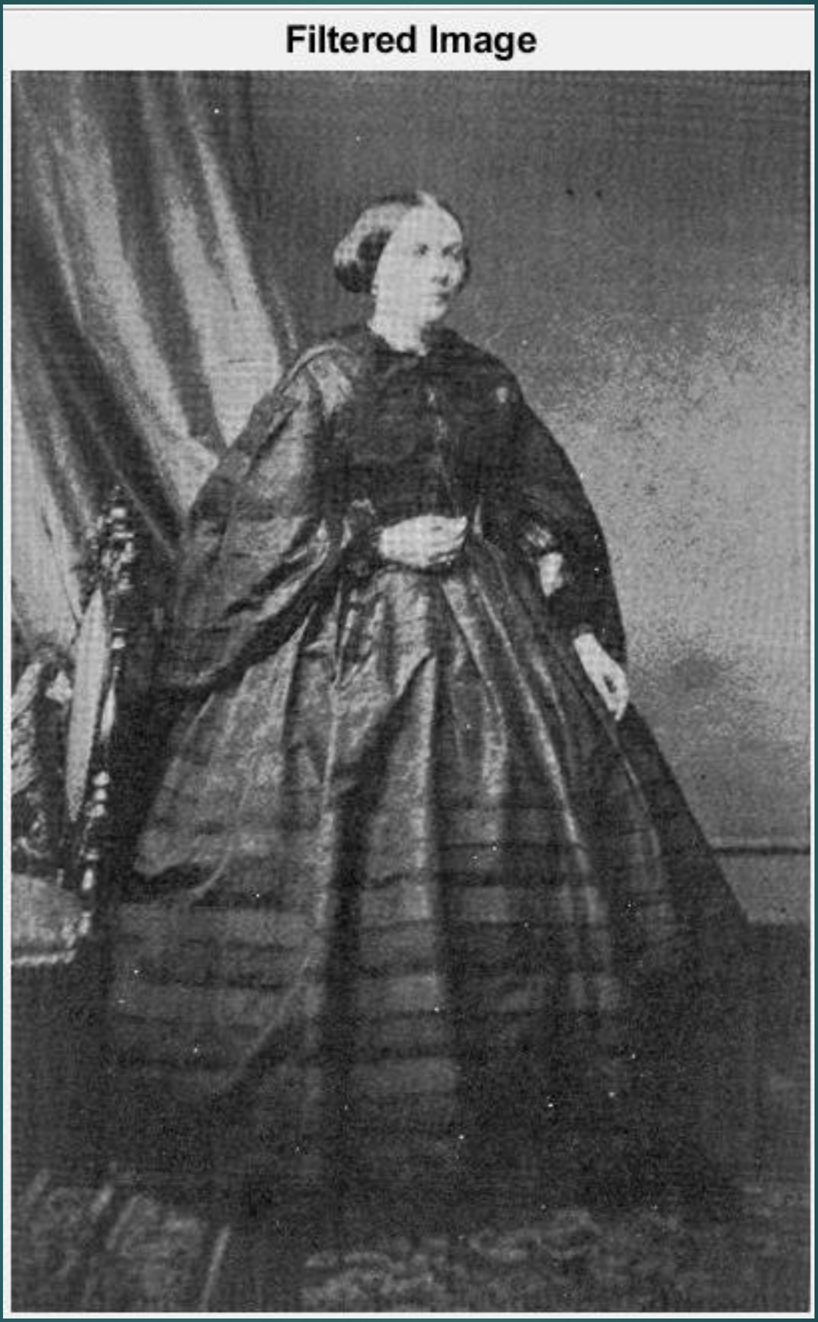
Original Image

Original Fourier Spectrum

Original Fourier Spectrum

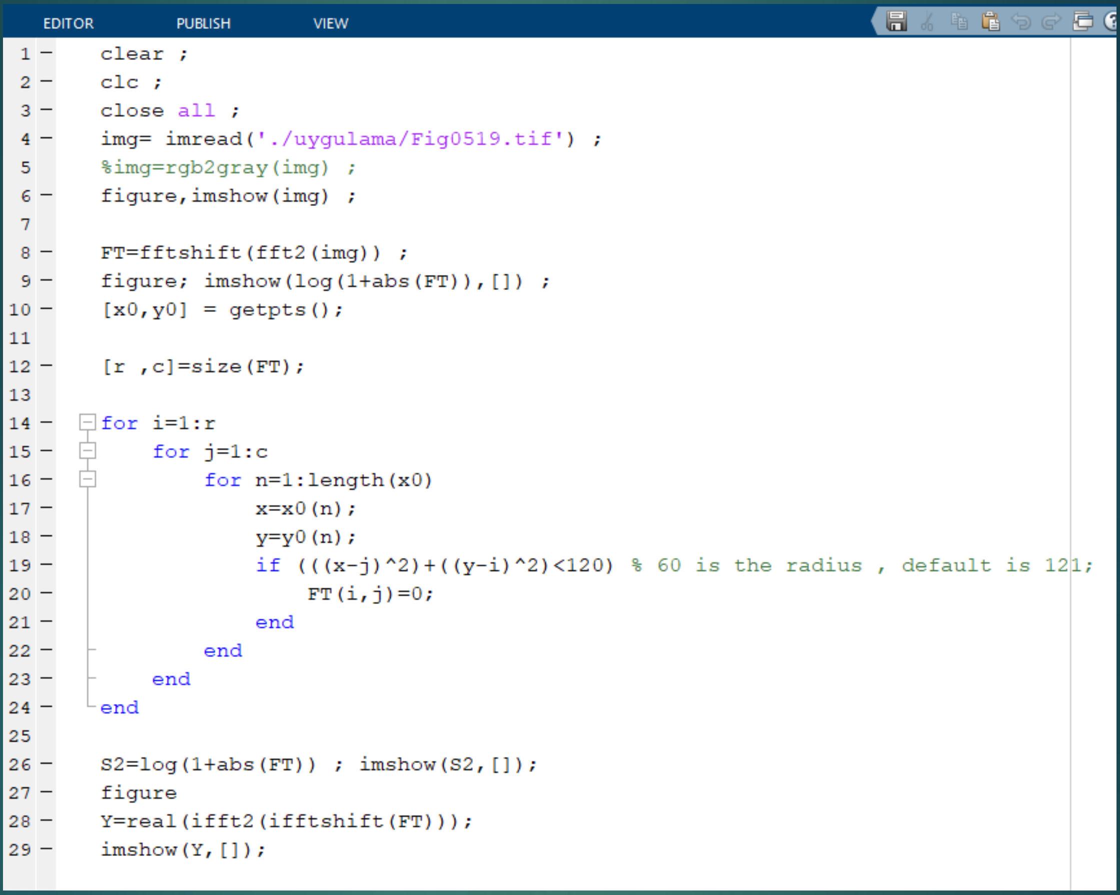
Filtered Fourier Spectrom

Filtering Example



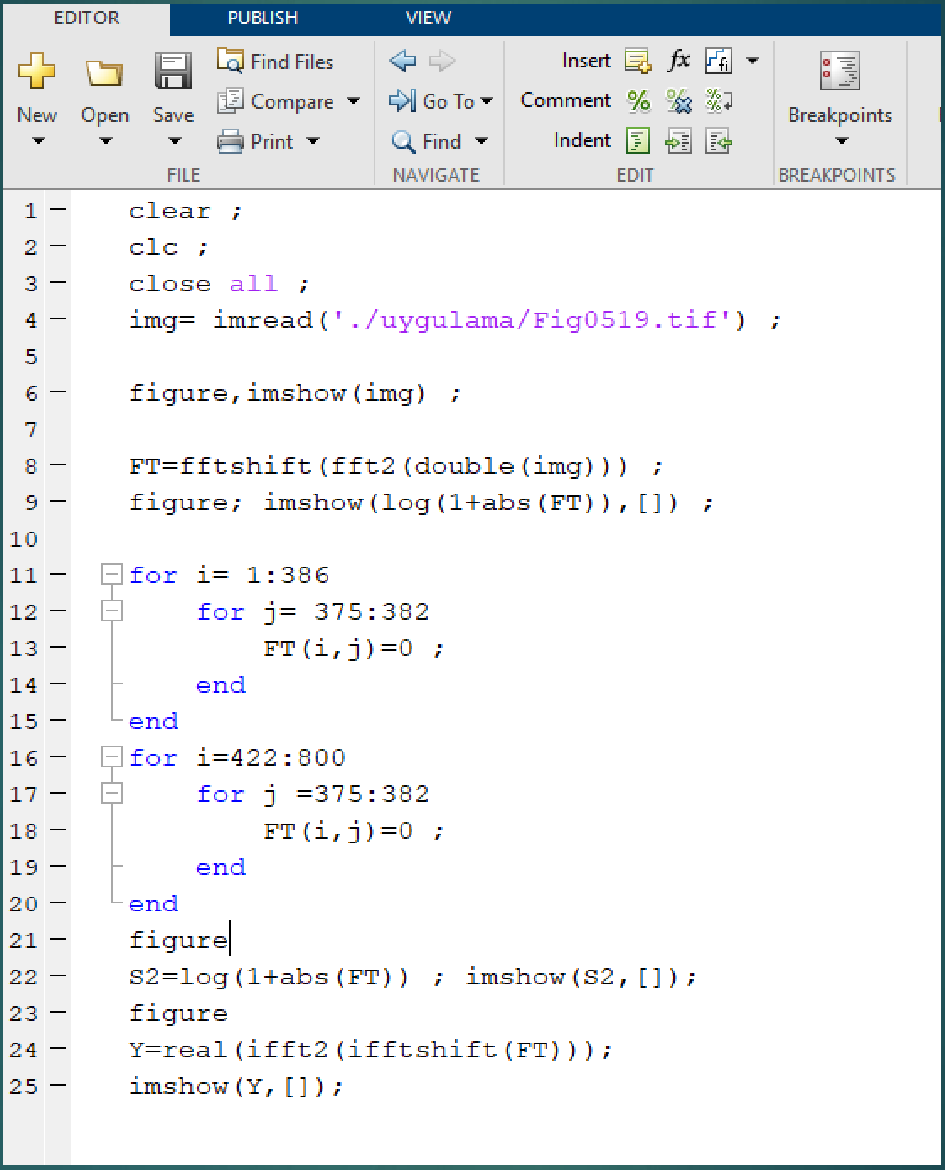
Filtered Image

MATLAB Code



```
clear ;
clc ;
close all ;
img= imread('./uygulama/Fig0519.tif') ;
%img=rgb2gray(img) ;
figure,imshow(img) ;

FT=fftshift(fft2(img)) ;
figure; imshow(log(1+abs(FT)),[]) ;
[x0,y0] = getpts();

[r ,c]=size(FT);

for i=1:r
    for j=1:c
        for n=1:length(x0)
            x=x0(n);
            y=y0(n);
            if (((x-j)^2)+((y-i)^2)<120) % 60 is the radius , default is 121;
                FT(i,j)=0;
            end
        end
    end
end

S2=log(1+abs(FT)) ; imshow(S2,[]);
figure
Y=real(ifft2(ifftshift(FT)));
imshow(Y,[]);
```

MATLAB Code



```
clear ;
clc ;
close all ;
img= imread('./uygulama/Fig0519.tif') ;

figure,imshow(img) ;

FT=fftshift(fft2(double(img))) ;
figure; imshow(log(1+abs(FT)),[]) ;

for i= 1:386
    for j= 375:382
        FT(i,j)=0 ;
    end
end
for i=422:800
    for j =375:382
        FT(i,j)=0 ;
    end
end
figure
S2=log(1+abs(FT)) ; imshow(S2,[]);
figure
Y=real(ifft2(ifftshift(FT)));
imshow(Y,[]);
```