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diary on
format compact
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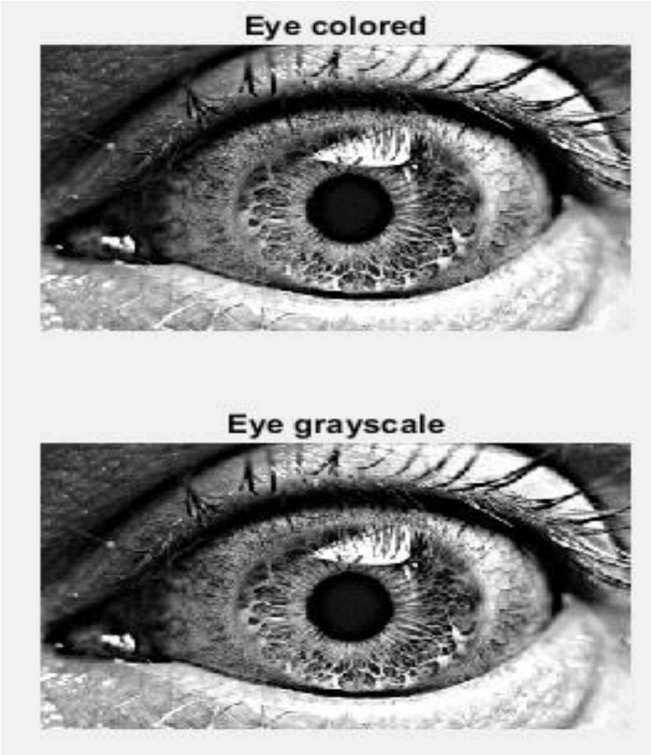
%EEL3135 Fall 2018
%Lab 10 Part 1

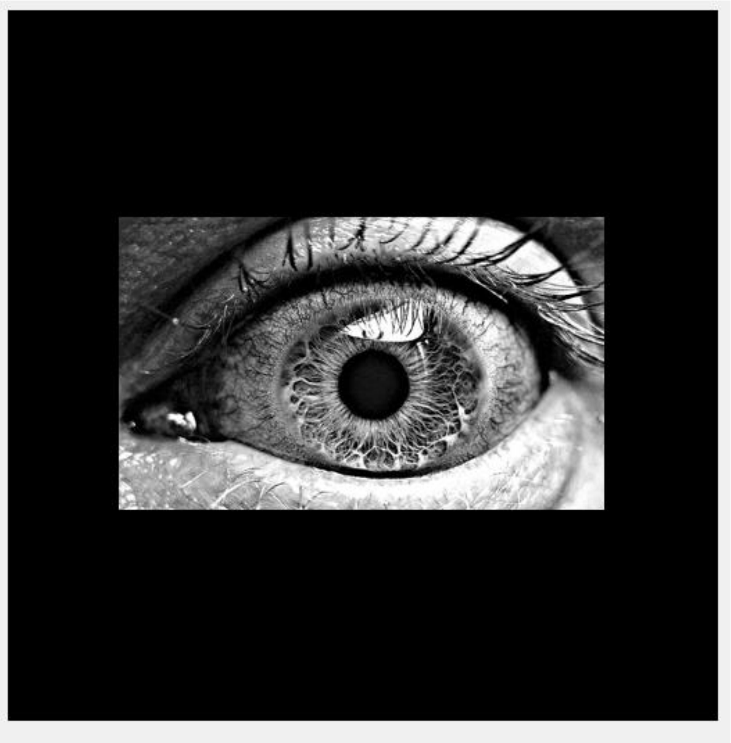
%1.1.1

%Import eye.png to Matlab and turn current color image to grayscale image.
%Plot both colored and grayscale versions of the eye.png image.
%Eye colored
eyec=imread('eye.png');
%Eye grayscale
eyeg=rgb2gray(eyec);
%Plot
subplot(2,1,1);
imshow(eyec);
title('Eye colored');
subplot(2,1,2);
imshow(eyeg);
title('Eye grayscale');
```



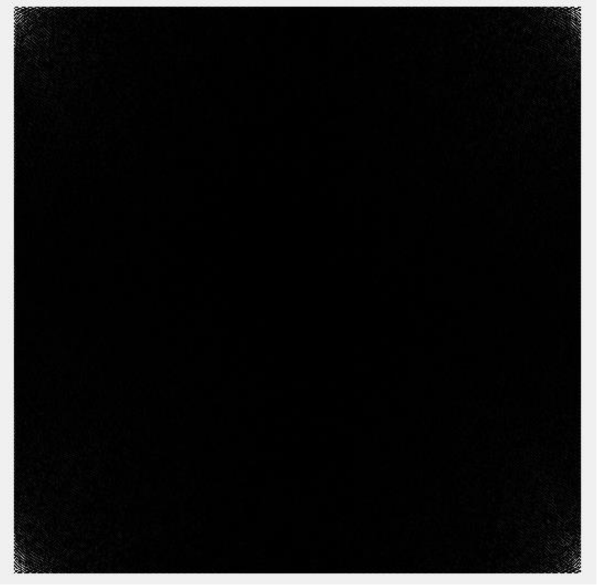
```
%1.1.2

%Create zeros matrix of size 512 x 512
padEye = uint8(zeros(512,512));
%Superimpose the eye image in the middle of the matrix.
padEye(150:360,81:430) = eyeg;
%Plot
imshow(padEye);
```

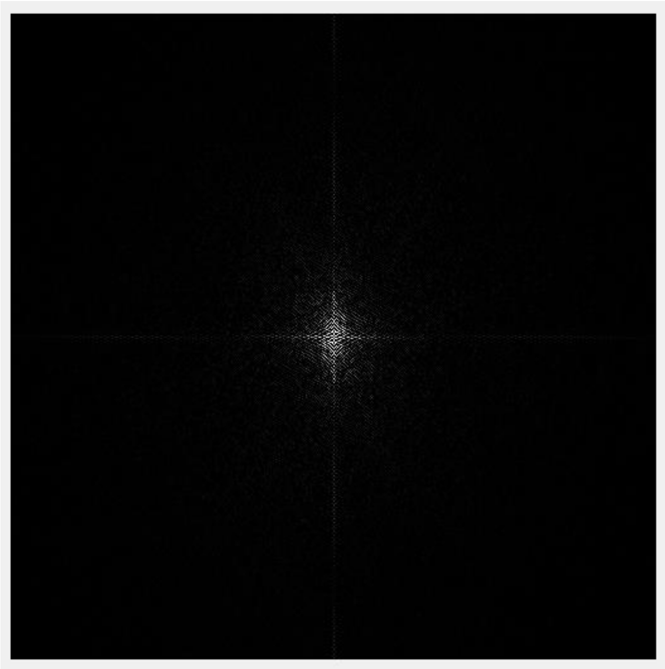


```
%1.1.3

%Plot the FFT of the zero-padded eye image without using fftshift().
eye=fft2(padEye);
eye = eye/(length(padEye(:,1))*length(padEye(1,:));
imshow(eye);
```



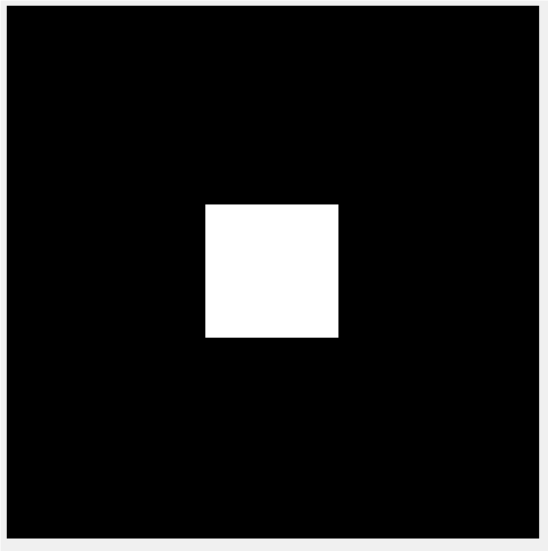
```
%Plot the FFT of the image with using fftshift().
eye=fftshift(padEye);
imshow(eye);
```



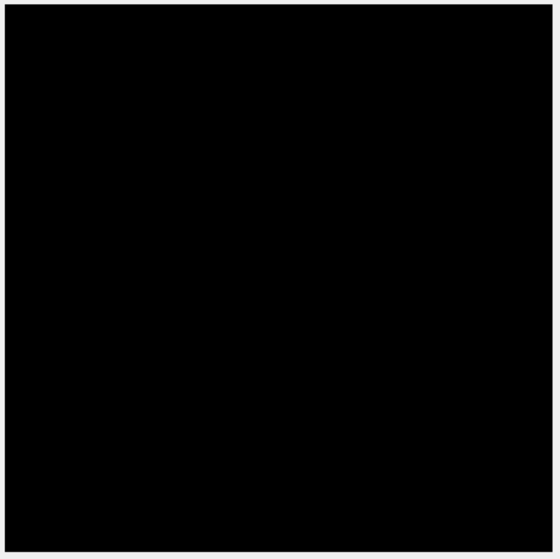
```
%Describe the FFT of the image.
%The frequency components are dominate in the image is the low amplitude
%covering nearly all the image being close to that of a black square, but
%there are traces of the high amplitude, being the white specks in the
%center of the image. This mean that the original image is quite dark and
%which makes sense since its a grayscale image padded with zeros, darkness.

%1.2.1

%Create an ideal 2d low-pass filter (in frequency domain) with the same
%size as the padded eye image, passing all frequencies within centered at
%DC.
lf = zeros(512,512);
lf(192:319,192:319) = ones(128,128);
%Plot the low-pass filter.
imshow(lf);
```



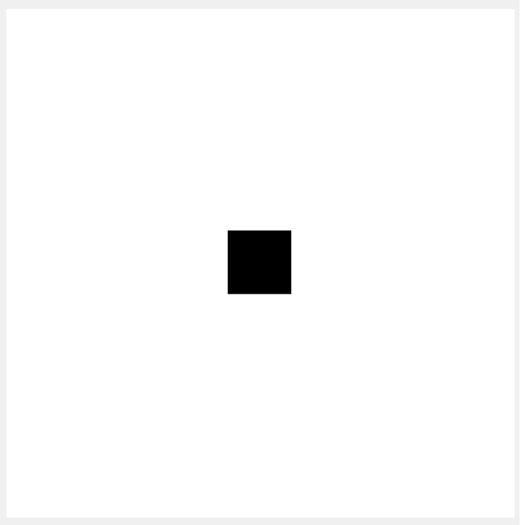
```
%Apply the filter to the padded image.
eyel = lf.*padEye;
%Perform i-FFT
eyel = uint8(ifft2(eyel));
%Plot the filtered image.
imshow(eyel);
```



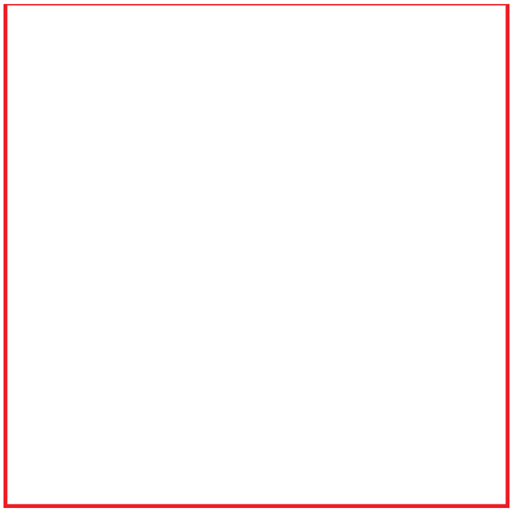
```
%Describe effects of the low-pass filter on the image by comparing the
%filtered image with the original image.
%The original image contains a cluster of white specks at the image center,
%indicating that there were some high frequency values. When passing
%through a low-pass filter, it removes the high frequency values, allowing
%only the low frequency values, pure black pixels, to pass through thus the
%filtered image is pitched black.

%1.2.2

%Create an ideal 2d high-pass filter (in frequency domain) with the same
%size as the padded eye image, passing all frequencies within centered at
%DC.
hf = ones(512,512);
hf(224:287,224:287) = zeros(64,64);
%Plot the high-pass filter.
imshow(high);
```



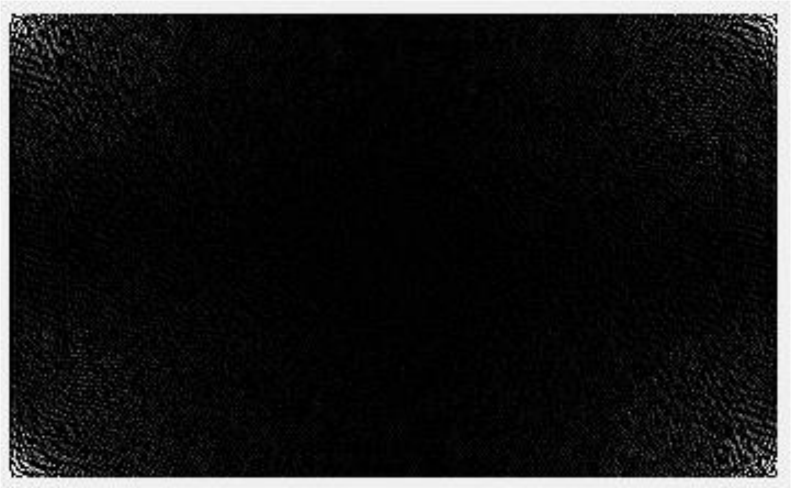
```
%Apply the filter to the padded image.
eyeh = hf.*padEye;
%Perform i-FFT
eyeh = uint8(ifft2(eyeh));
%Plot the filtered image.
imshow(eyeh);
```



```
%Describe effects of the high-pass filter on the image by comparing the
%filtered image with the original image.
%The original image contains a cluster of white specks at the image center,
%indicating that there were some high frequency values while most of it
%contain low frequency values, the surrounding darkness. When passing
%through a high-pass filter, it removes the low frequency values, allowing
%only the high frequency values, pure white pixels, to pass through thus
%the filtered image is blank white.

%1.3.1

%Plot the FFT of the noisy image. Compare it to the FFT of the original
%image.
%Noisy eye
neyeg=imread('noisy_eye.png');
%FFT
neye=fft2(neyeg);
neye = neye/(length(neyeg(:,1))*length(neyeg(1,:)));
%Plot
imshow(neye);
```



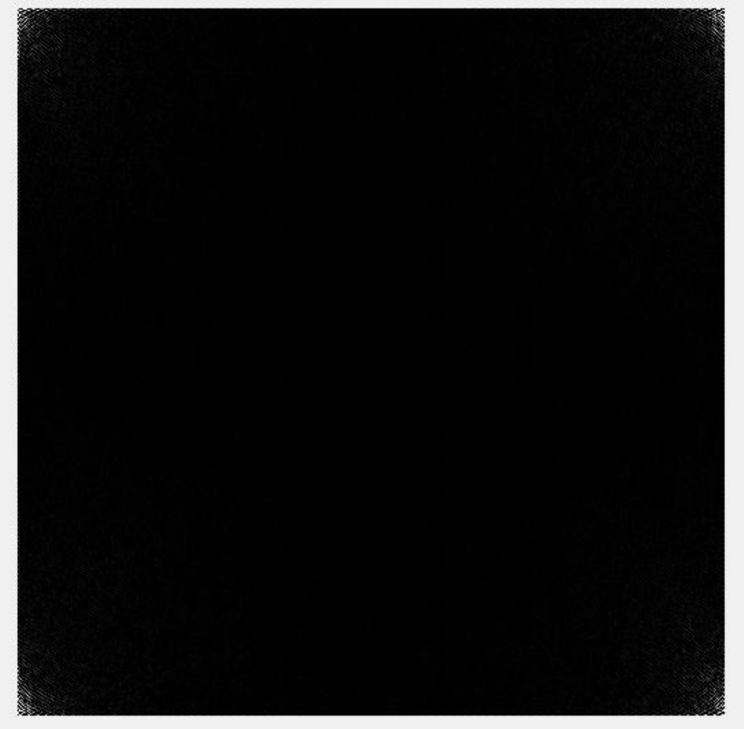
```
%The noisy fft image contains more white specks on the four corners of the
%image than the original image, indicating that there are more high
%frequency inference values which would make it fuzzier.

%1.3.2

%Create a notch filter, where the notch band is the same as the noise band.
%Plot the frequency response of the filter.
%Get size
[m,n] = size(neye);
%Filter
filt = ones(m,n);
fil(192:319,192:319) = ones(128,128);

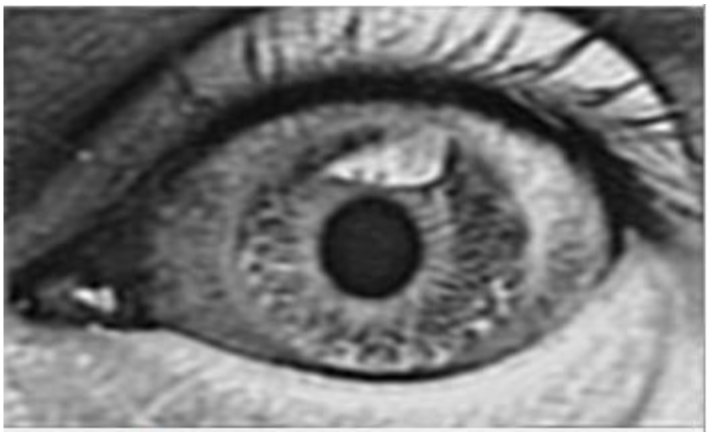
%Apply filter
neye = neye .* filt;

%Plot
imshow(neye);
```



```
%1.3.3

%Reconstruct the filtered image using i-FFT and plot the filtered image.
%Perform i-FFT
neye = uint8(ifft2(neye));
%Plot the filtered image.
imshow(neye);
```



```
%Question: is the filtered image less noisy than the noisy image?
%The filtered image is less noisy than the noisy image as there is less
%bright specks on the image, can be seen in the fft image also, but the
%resulting image is quite blurry.

%Question: what is the disadvantage of this method with regards to image
%quality?
%The disadvantage of this method with regards to image quality is that the
%resulting image is quite blurry, out of focus.
```