COMP 408/508 - ASSIGNMENT 1

REPORT

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- **myFilter():** This function applies a given filter on a given image and returns the filtered image as its output. For this purpose, my algorithm firstly creates a padded version of the original image (depending on the padding style given as a parameter). The size of padding is computed using the size of the filter. Then the padded image is splitted into its channels (R, G, B) to be able to filter them individually. Using 3 nested loops (for row, column and channel), the filter is applied to each submatrix (in the size of the filter) of each channel of the original image. Then these channels are merged back to form the output image.

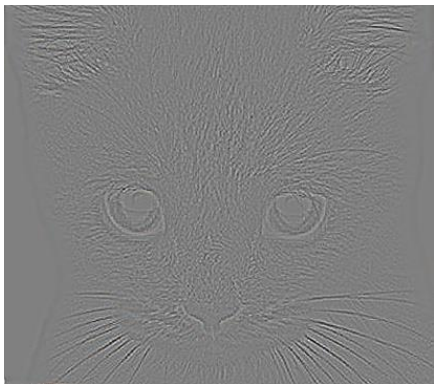
- **Output Images (myFilter):**

Identity filter

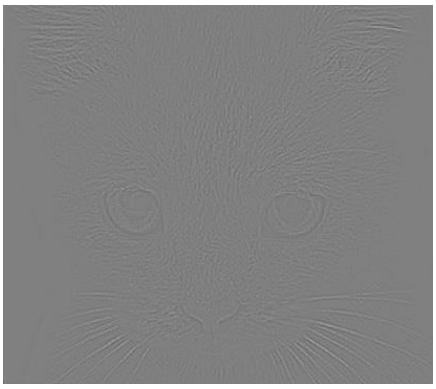
Blurred image

Large-blurred image

Sobel image



Laplacian image

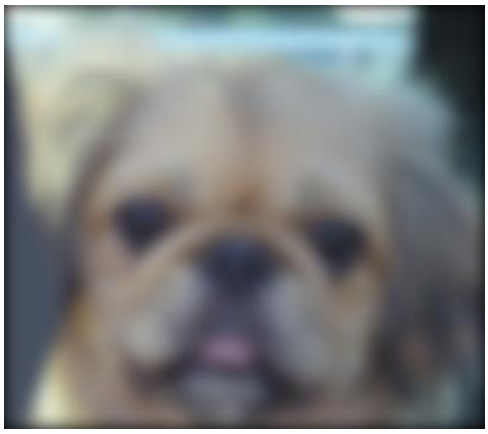


High pass filtered image

- **DFT_Spectrum():** This function returns the dft spectrum of a given image. My algorithm firstly creates the padded image that is suitable for dft process. Padding size is computed using getOptimalDTFSize() function. Then it creates a template matrix with two layers (real and imaginary) to be used as the complex matrix obtained from dft. The algorithm then applies dft on the image matrix and place the resulting complex matrix back into the same matrix. After this, the magnitude of the complex matrix is computed and switched to logarithmic scale for visualization purposes (a greyscale image is formed with low frequencies are dark and high frequencies are white). Then, the quadrants of the spectrum matrix is found and rearranged again for visualization purposes. Top-left quadrant is switched with bottom-right, and top-right quadrant is switched with bottom-left.

- **main():** My algorithm in the main function firstly applies low-pass filter on the first (dog) image and applies high-pass filter on the second (cat) image (by subtracting low-pass filtered image from the original one). Then, these two filtered image matrices are summed to get an hybrid image.

- **Output Images (High/low-pass and hybrid):**



Low-pass filtered dog image

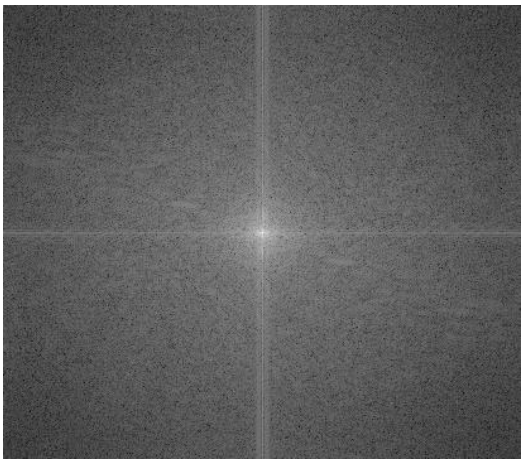
High-pass filtered cat image

Hybrid image

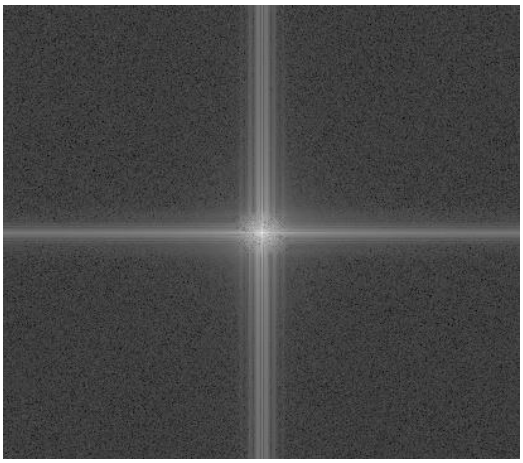
- **Output Images (DFTs):**

We can see that the points on the DFT of low frequency image are gathered at the center of the image, while they are scattered away from the center on the DFT of high frequency image. Because, the further away from the center a DFT image point is, the higher is its frequency.

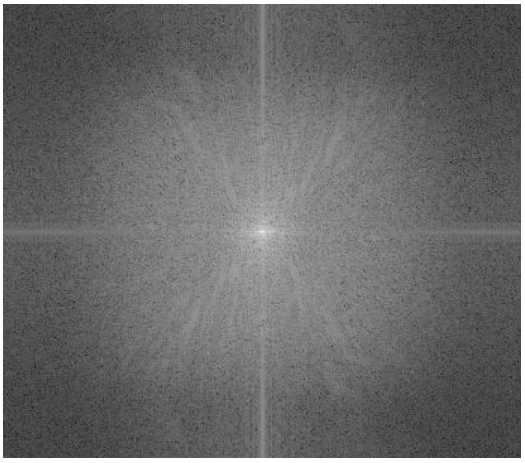
DFTs also contain some geometric structure information about the original images. As we see in the following DFTs, there are two (vertical and horizontal) dominating directions (most visible on the DFT of low frenquency dog image).



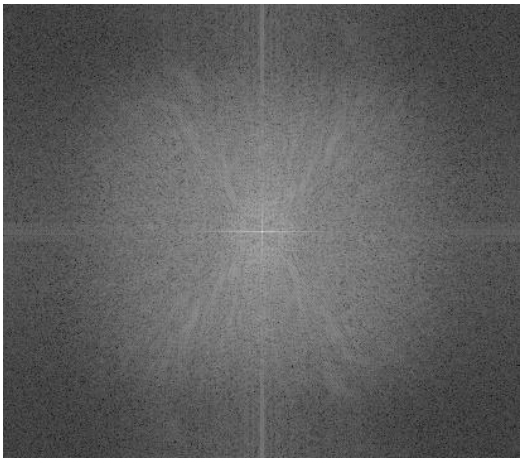
DFT of dog image



DFT of low frequency dog image



DFT of cat image



DFT of high frequency cat image