

Department of Computer Science and Engineering

CS4093D IMAGE PROCESSING LABORATORY - *Practice Questions*

March 2, 2021

1. Perform following operations on any sample gray level image of size 256*256.

- (a) Find DFT of the given image.
- (b) Find the magnitude spectrum.
- (c) Find the phase spectrum.
- (d) Double the magnitude spectrum.
- (e) Reconstruct the image using the IDFT.
- (f) Reconstruct the image removing phase spectrum.
- (g) Put the results together in one window.

Explain your results

2. Pick any sample gray level image of size 256*256 image and follow the operations given below.

- (a) Multiply image by $(-1)^{x+y}$.
- (b) Compute the DFT.
- (c) Take the complex conjugate of the transform.
- (d) Compute the IDFT.
- (e) Multiply the real part of the result by $(-1)^{x+y}$.

Compare the input image and the output images. Explain (mathematically) why does the output image appear as it does.

3. Obtain the Fourier spectrum of a given image. Pad the image with zero's, and obtain Fourier spectrum.

- (a) Explain the variation in the overall image contrast.
- (b) Explain the significant increase in signal strength along the vertical and horizontal axes of spectrum on the second output image.

4. What is the result of two DFTs performed in succession? Apply a DFT to an image, and again DFT to the resultant image. Can you account for what you see?
5. Compute the 2D basis vectors of 2D DCT using the separability property of DCT.
6. Compute the 2D basis vectors of 2D Haar Transform using the separability property.
7. Compute the Walsh transform of the following image.

$$\begin{bmatrix} 1 & 2 & 3 & 4 \\ 2 & 3 & 4 & 5 \\ 4 & 5 & 6 & 7 \\ 5 & 6 & 7 & 8 \end{bmatrix}$$

8. Convolve the following sequences.
 $f(x) = [1, 2, 3, 4]$ and $g(x) = [1, -1, 1]$
9. Use DFT to convolve the sequences.
 $f(x) = [1, 2, 1, 1]$ and $g(x) = [1, -1, 1]$
10. Compute and plot the histogram of any sample gray level image of size 256*256.