Practical Exercises for Image Processing

Exercise B

B1. By using “sin” command, generate a sine wave signal.

B2. By using “fft” command, compute the Fourier transform of the sine wave signal you generated in B1. Observe the amplitude and phase of the signal by using “plot” command. Change the frequency of the sine wave and re-compute the Fourier transform of it. By using “ifft” command, take the inverse Fourier transform of the signal in frequency domain to get back the original signal. What are the values of the imaginary part of the signal, you got back by using “ifft” and why?

B3. Repeat B2 for the following signals:

a) Cosine signal with some various frequencies (generated by using “cos” command)
b) A Step signal
c) An Impulse signal

B4. Generate a two dimensional sine wave and compute its Fourier transform by using “fft2” command. By using “mesh” command, observe the amplitude and phase of the Fourier transform of the 2D sine wave. Change the frequency of the sine wave and repeat B4.

B5. Generate a Box function and a Gaussian function (by using “fspecial” command) and repeat B4 for both functions.

B6. By using “imread”, load the Lena image and compute its Fourier transform. Observe the amplitude and phase of the Fourier transform of the Lena image by using “imshow”. By using “fftshift”, bring the zero frequencies to the centre of the figure.

B7. By using “ifft2”, compute the inverse Fourier transform of the transformed image in frequency domain to get back the original image. What are the values of the imaginary part of the image you got back by using “ifft2” and why?

B8. Once again, compute the Fourier transform of the original image. Now set all pixels in the phase to zero and take the inverse Fourier transform. What do you observe?

B9. Now set all pixels in the amplitude of the Fourier transform of the original image to unity, and re-compute the inverse Fourier transform. What do you observe?

B10. Rotate the original Lena image by 90 degree by using a transpose in matlab and repeat B6. What are the differences between the results you got here with the results you got in B6?