Fourier Optics

Visualizing the 2f arrangement through python

Input image

Storing as array

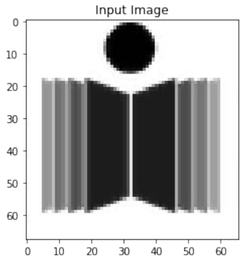
An input image is stored as an array with values between 0 and 255 that represent pixels and their RGB representation.

Using Gray Scale

We use ‘gray scale’ here as our viewing option which is just a choice.

Input image

Gray Scale Image



Fast Fourier Transform

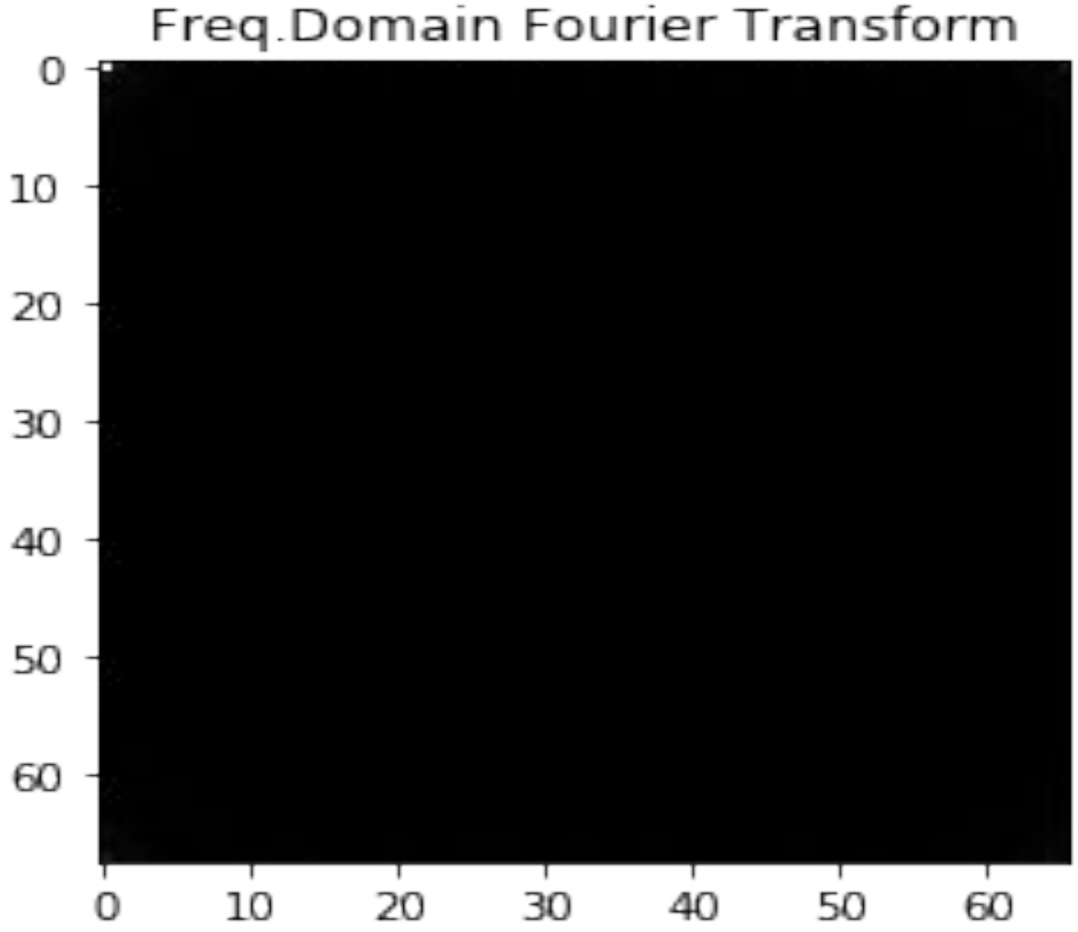
Using numpy

Python numpy offers a method - numpy.fft.fftn( ) which performs an ‘n’ dimensional fft.

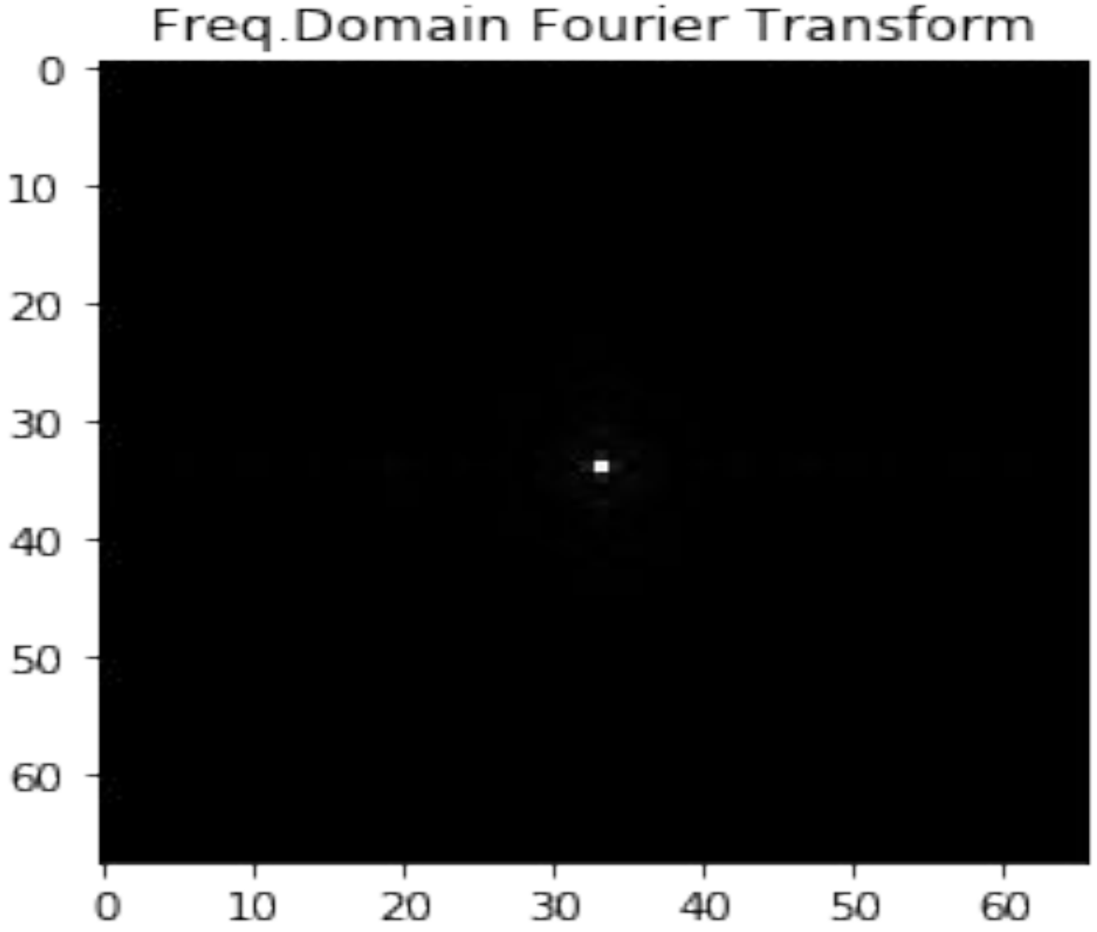
Here, n = ‘2’ since it is an image represented by an AxB matrix.

Shifting it to a central reference

We want to shift our FFT to a central reference, and so we move all the DC frequencies to the center with another method named numpy.fft.fftshift( ).



Without Shift

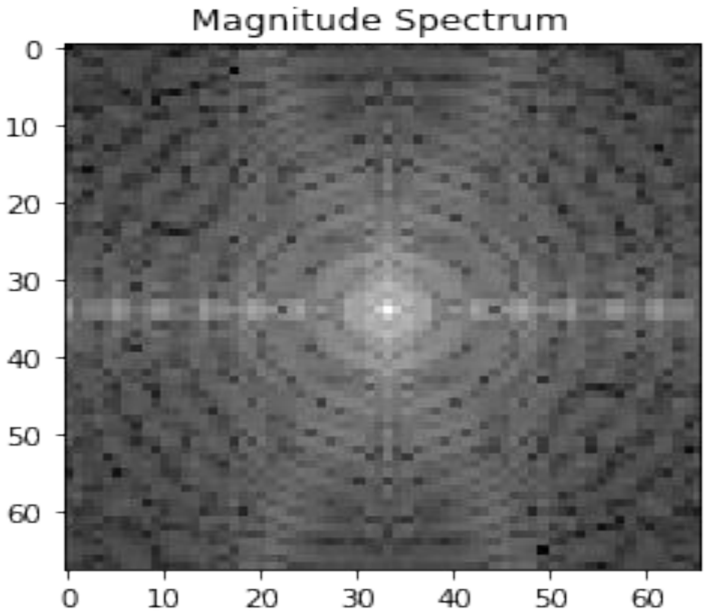


With Shift

Increasing clarity

Using log

Log function is used to provide contrast



Magnitude Spectrum

Ex : HPF

HPF

In the array of the shifted fft, choose a square region, and all frequencies inside it would be zero, apply inverse to shift and inverse FFT to get original image.