Medical Image Processing

DFT and Wavelet Transformations (auxiliary materials)

Some important properties of the Fourier transform (2D-DFT) in image processing

1. The Fourier image (the image after applying Fourier transform) contains only ‘dots’ corresponding with the magnitude of the complex element in the frequency domain. The dots are some non-zero values only at some specific locations.
2. The coordinates of the dots are corresponding with the the frequencies of the sinusoids occurring in the original image, higher image frequencies cause the dots to move away from the origin.
3. The point (value) corresponding to the zero frequency (F(0, 0)) is the most important point in the frequency domain and is called DC (Direct Current) element.
4. The points corresponding with non-zero frequency values are less important than DC and are called AC (Alternative Current) elements.

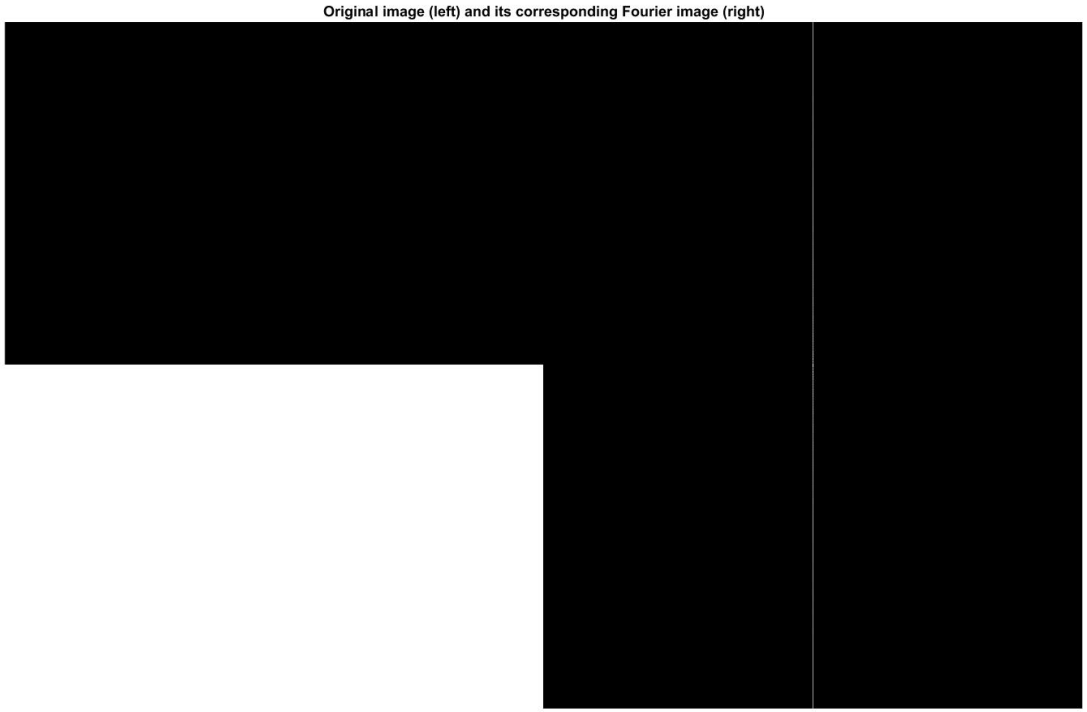
Some important properties of the Fourier transform (2D-DFT) in image processing

5. The non-zero dots lines in the Fourier image are orthogonal to the direction of the edges in the original image.

6. The original image can be constructed by applying inverse Fourier transform on the Fourier image using all Fourier elements or just partial Fourier elements including DC element.

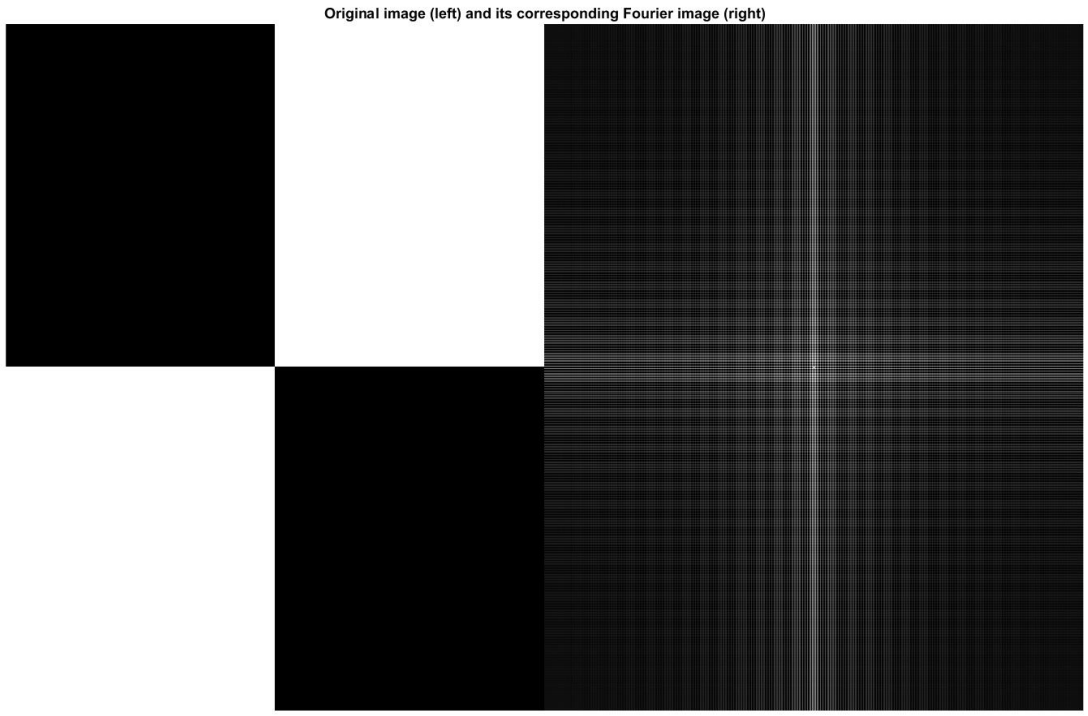
7. The quality of the reconstructed image from full Fourier information is trivially better than the reconstructed image from just DC and some AC elements.

Some basic examples

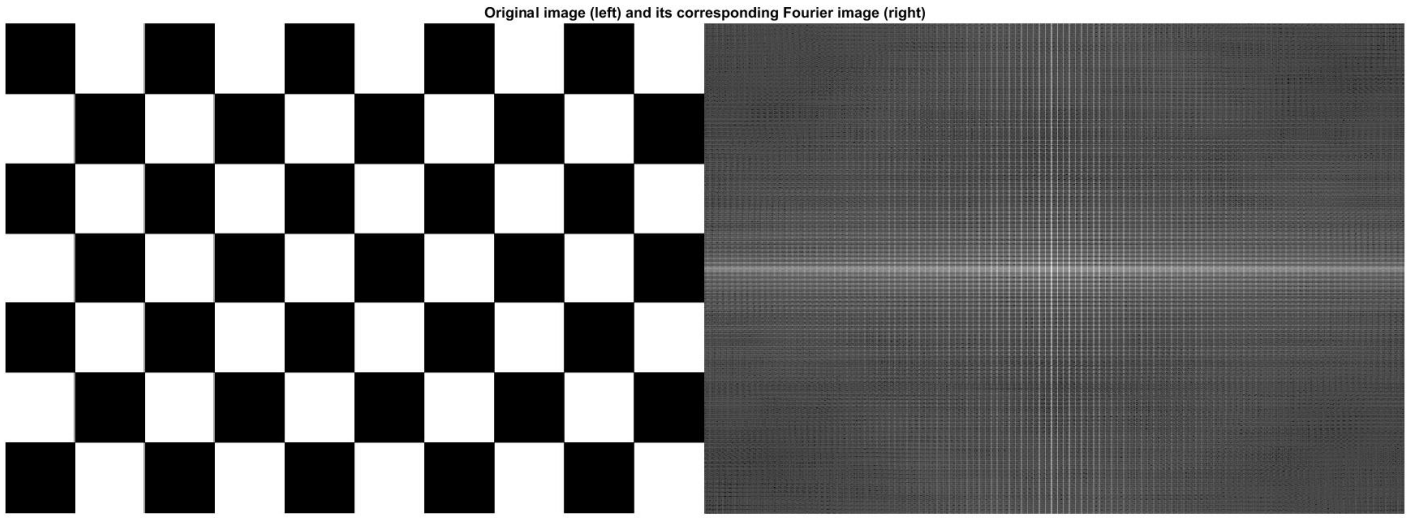


Some basic examples

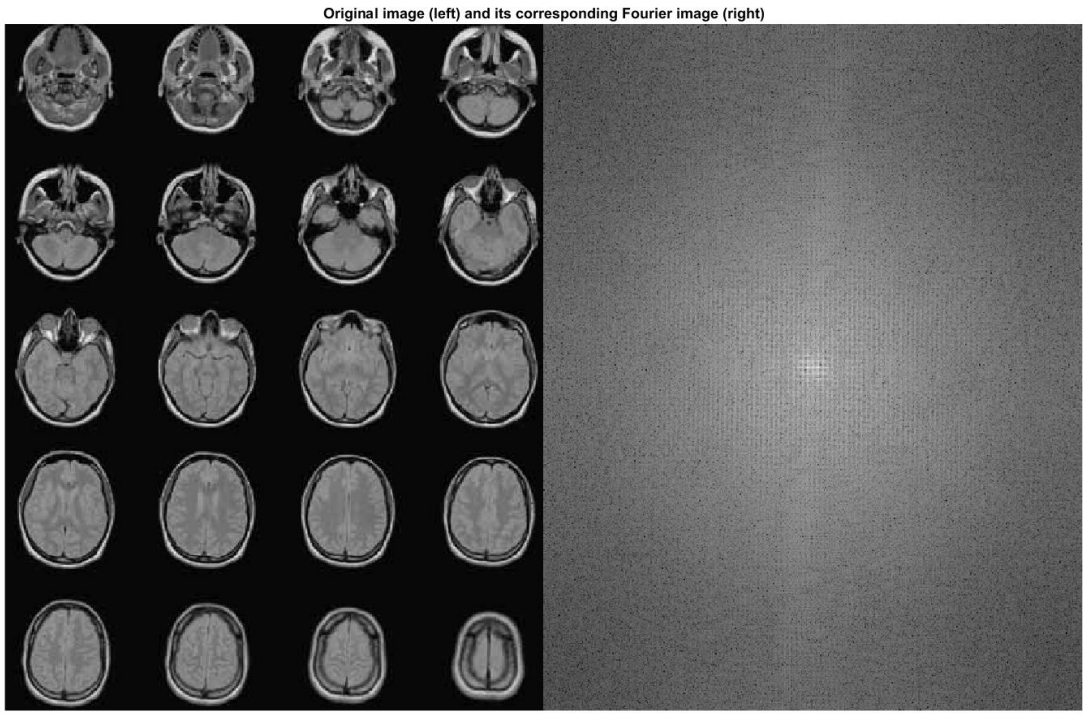
Some basic examples



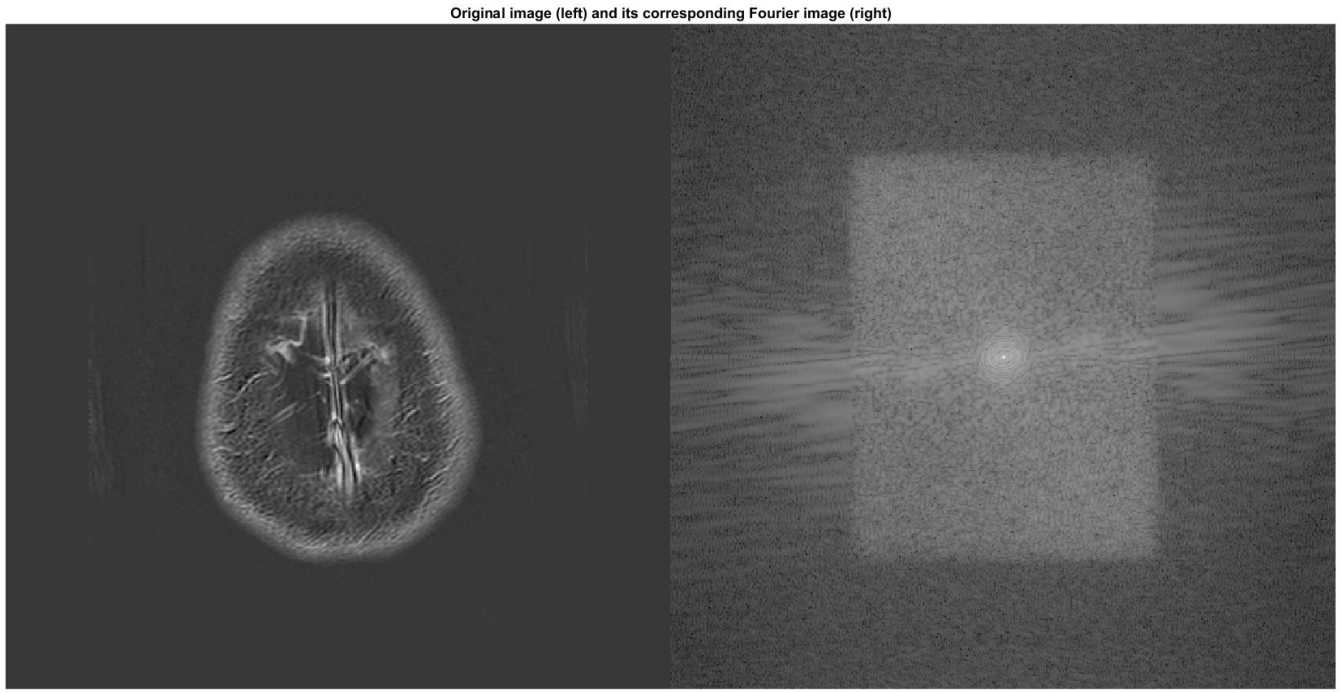
Some basic examples



Some basic examples



Some basic examples



Very useful links and references (strongly recommended)

1. Some basics on Fourier transform from http://homepages.inf.ed.ac.uk/rbf/HIPR2/fourier.htm

2. Chapter 7 on The Fourier Transform from book titles “Digital and Medical Image Processing” by Twan Maintz.