EE5175 - Lab 7 Report

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1 Introduction

This report presents the implementation of the Discrete Fourier Transform (DFT) and its inverse (IDFT) in Python. The DFT is applied to input images, and the magnitude and phase spectra are obtained. Furthermore, the IDFT is used to reconstruct images from the magnitude and phase spectra. The implementation is demonstrated with examples.

2 Functions

2.1 Discrete Fourier Transform (DFT)

The DFT function takes an input image and computes its DFT. It returns the magnitude and phase spectra of the transformed image.

2.2 Inverse Discrete Fourier Transform (IDFT)

The IDFT function takes the magnitude and phase spectra obtained from the DFT . As per the question 2 , we have to reconstruct the image with magnitude of first image and phase of second image and another image vice versa.

3 Implementation

The DFT and IDFT functions are implemented using the numpy library for numerical operations. The DFT is computed using the Fast Fourier Transform (FFT) algorithm provided by numpy. The IDFT involves computing the FFT of the DFT coefficients.

4 Results

The implementation is tested on two input images. The DFT is applied to both images, and the magnitude spectra are displayed. Then, the IDFT is used to reconstruct the images with swapped phases .
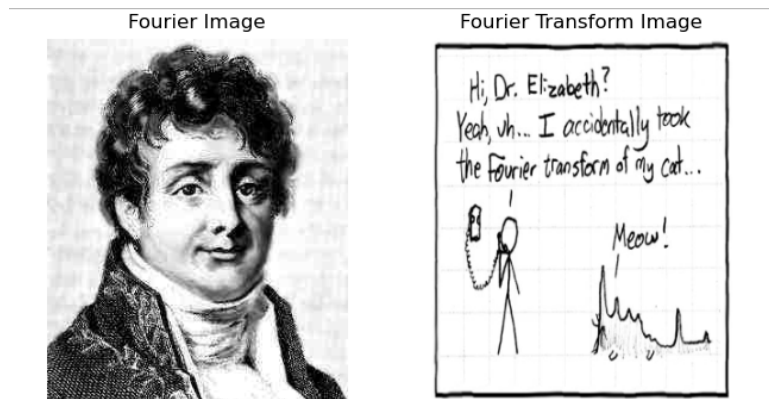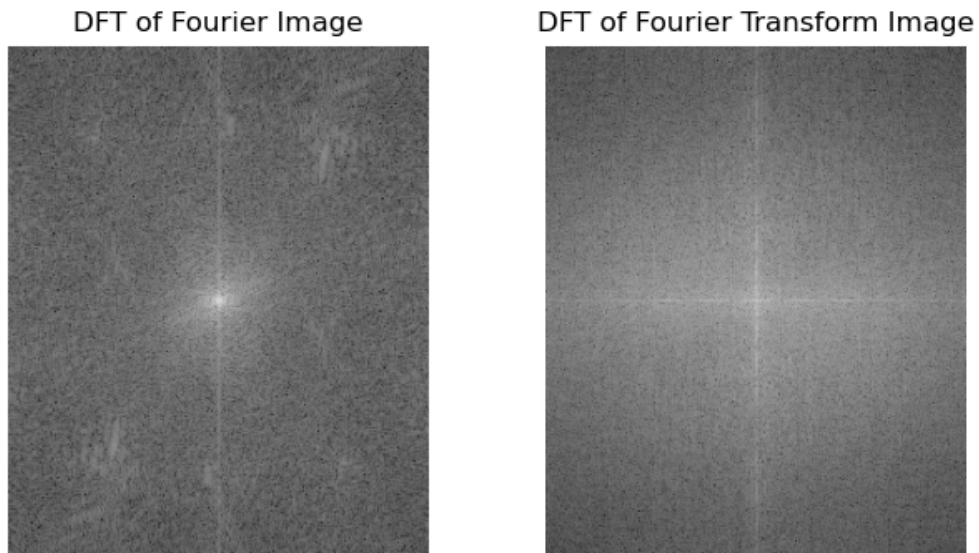

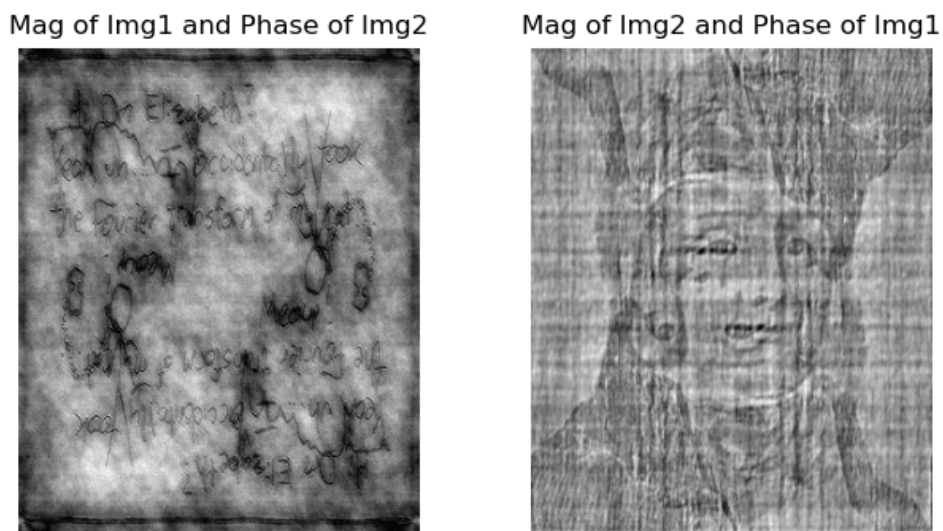Figure 1: Given Image

Figure 2: Fourier Transforms

Figure 3: Swapped phases results

5 Conclusions drawn

The implementation of the DFT and IDFT functions successfully computes the frequency domain representations of input images and reconstructs the images from the spectra as required by the question. It shows that Phase of the image has more information about the image than magnitude as said in class.This was proved elegantly in the assignment.