Project #2

DIGITAL IMAGE PROCESSING

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Requirement:

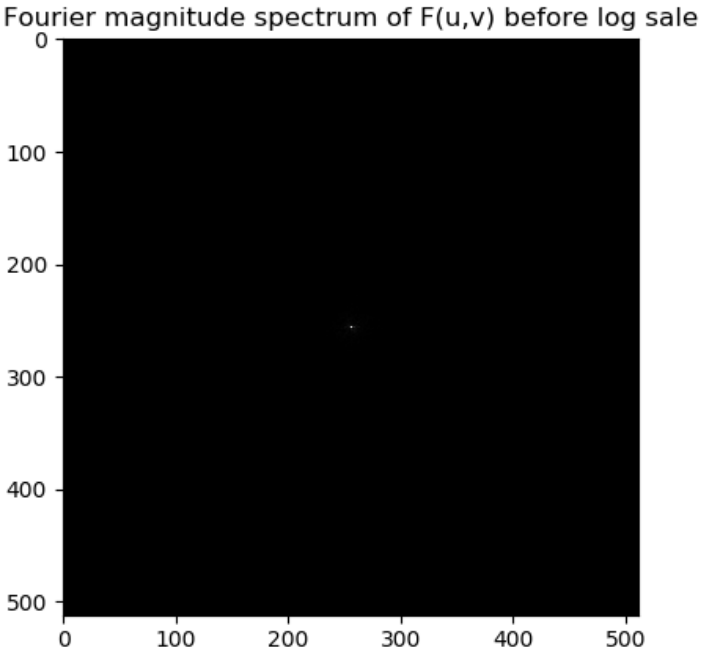
- For the bird image below, compute the 512x512 DFT and determine the frequencies (u,v) of the largest 25 DFT magnitudes.
- Your report should contain:
- Source codes
- Figures of Fourier magnitude (using log scale) and phase spectrum (after centering)
- Table of top 25 DFT frequencies (u,v)

Original image

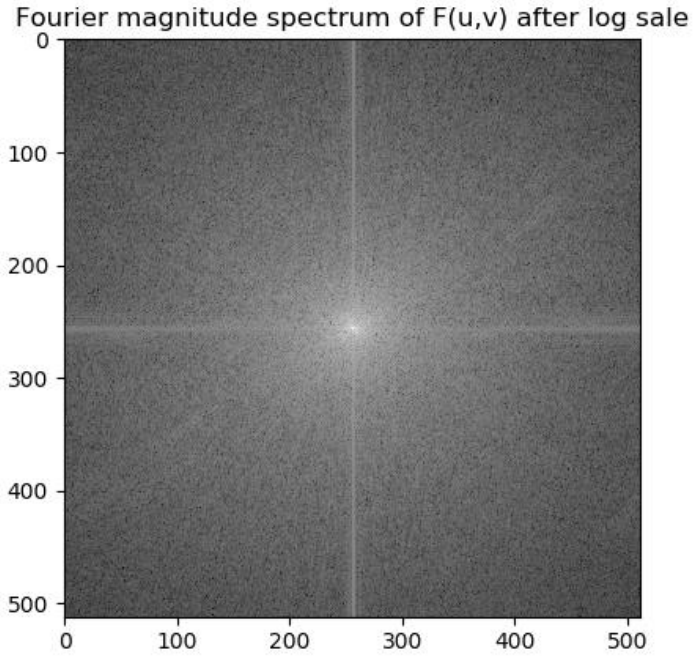
I will do this task by following step by step:

Step1: Centering picture by multiplying input image (f(x,y) by $(-1)^{x+y}$

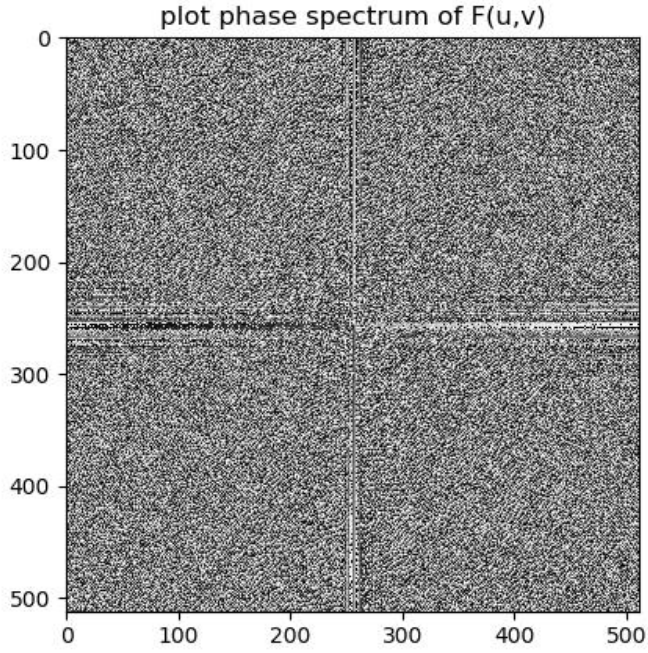
Step2: compute the 512x512 DFT



Step3: Using log scale function: **log(1+|F(u,v|)**



Step4: plot phase spectrum after centering



Step5: determine the frequencies (u,v) of the largest 25 DFT magnitudes

u	v	|F(u,v)|
256	256	17.14661
256	258	15.31143
256	254	15.31143
256	257	15.21525
256	255	15.21525
257	256	15.0907
255	256	15.0907
259	257	14.50039
253	255	14.50039
256	262	14.26044
256	250	14.26044
257	259	14.21716
255	253	14.21716
258	257	14.20633
254	255	14.20633
258	256	14.19427
254	256	14.19427
256	261	14.1615
256	251	14.1615
258	259	14.14579
254	253	14.14579
257	258	14.13817
255	254	14.13817
258	258	14.1075
254	254	14.1075

- **Source Code (use python)**

```
#2020/04/22
#National Chiao Tung University
#Digital Image Processing
#Mini project NO.2
#Created by Le Van Hung (0860831)
# import library
from numpy import asarray
from numpy import savetxt
from PIL import Image
```

```python
import numpy as np
import matplotlib.pyplot as plt

# import image
image = Image.open('Bird 1.tif')
image.show()

# convert image to array version
f = np.array(image,dtype='float')
# ff = np.zeros((512,512))
#define value
N = f.shape[0]
for x in range(N):
    for y in range(N):
        # ff[x,y] = f[x,y]*pow(-1,(x+y))
        f[x,y] = f[x,y]*pow(-1,(x+y))

plt.imshow(f,cmap='gray')
plt.title("input image after multiplying by (-1)^(x+y)")
plt.show()
# DFT
F = np.fft.fft2(f)

# multi fp with (-1)^(x+y)

# plot magnitude spectral before after using log function
F_abs = np.abs(F)
F_log = np.log(1+F_abs)
plt.imshow(F_abs,cmap='gray')
plt.title("Fourier magnitude spectrum of F(u,v) before log sale")
plt.show()

plt.imshow(F_log,cmap='gray')
plt.title("Fourier magnitude spectrum of F(u,v) after log sale")
plt.show()

#plot phase spectral of F
phase = np.angle(F)
plt.imshow(phase,cmap='gray')
plt.title("plot phase spectrum of F(u,v)")
plt.show()


# sort 25 top of frequence [25 max abs()]
def find_max(array):
    len_array = array.shape[0]
```

```
    max = 0;
    row = 0;
    col = 0;
    for u in range(len_array):
        for v in range(len_array):
            if(array[u,v] >=max):
                max = array[u,v]
                row = u
                col = v
    return [row,col,max]
A_sort = []
F_log_temp = 1*F_log
for i in range(25):
    temp = find_max(F_log_temp)
    F_log_temp[temp[0],temp[1]] = 0
    A_sort.append(temp)

A_sort = np.reshape(A_sort,(25,3))
```