Etienne Pham Do 40130483

COMP 478 Assignment 3

1.

2.

a)

Let Radon(f(x,y)) = g(ρ,θ), and f and g be f(x,y) and g(x,y)

b)

**Programming**

1.

import numpy as np

import cv2

#loading the images

Ia = cv2.imread('house.tif', 0)

Ib = cv2.imread('jet.tiff', 0)

#applying the fourier transforms and center the transforms

Fa = cv2.dft(np.float32(Ia), flags = cv2.DFT\_COMPLEX\_OUTPUT)

dft\_shift\_a = np.fft.fftshift(Fa)

Fb = cv2.dft(np.float32(Ib), flags = cv2.DFT\_COMPLEX\_OUTPUT)

dft\_shift\_b = np.fft.fftshift(Fb)

#getting the magnitudes and phases

magA, phaseA = cv2.cartToPolar(dft\_shift\_a[:,:,0], dft\_shift\_a[:,:,1])

magB, phaseB = cv2.cartToPolar(dft\_shift\_b[:,:,0], dft\_shift\_b[:,:,1])

#applying the switch in phases and merge the values in new frequency arrays

realA, imagA = cv2.polarToCart(magA, phaseB)

realB, imagB = cv2.polarToCart(magB, phaseA)

mergedCartA = cv2.merge([realA, imagA])

mergedCartB = cv2.merge([realB, imagB])

#undoing the shift

mergedCartA\_ishift = np.fft.ifftshift(mergedCartA)

mergedCartB\_ishift = np.fft.ifftshift(mergedCartB)

#inverse fourier transform

newA = cv2.idft(mergedCartA\_ishift)

newB = cv2.idft(mergedCartB\_ishift)

newA = cv2.magnitude(newA[:,:,0], newA[:,:,1])

newB = cv2.magnitude(newB[:,:,0], newB[:,:,1])

#converting back to 8 bit images from 32 bit

newA = cv2.normalize(newA, None, alpha=0, beta=255, norm\_type=cv2.NORM\_MINMAX, dtype=cv2.CV\_8U)

newB = cv2.normalize(newB, None, alpha=0, beta=255, norm\_type=cv2.NORM\_MINMAX, dtype=cv2.CV\_8U)

#showing the results

cv2.imshow('original', Ia)

cv2.imshow('newA', newA)

cv2.imshow('newB', newB)

cv2.waitKey(0)

cv2.destroyAllWindows()

I­2 should have a reconstruction closer to the original image IA since it has the phase of FA, which has information about the shape features of IA.

A picture containing text, outdoor

Description automatically generated