

231501037

EXP NO: 05

DATE: 01-08-2025

Fourier transform for filtering the image

Aim: Use of Fourier transform for filtering the image.

Algorithm:

1. Convert image to grayscale and float type.
2. Apply DFT using `np.fft.fft2()` and shift using `np.fft.fftshift()`.
3. Create a mask for low/high pass filtering in frequency domain.
4. Apply mask and perform inverse FFT using `np.fft.ifft2()`.
5. Take magnitude and display filtered image.
6. Compare with original.

Code:

```
import cv2

import numpy as np

import matplotlib.pyplot as plt

# Read image

img = cv2.imread('/content/drive/MyDrive/input.jpg', 0)

# Check if the image was loaded successfully

if img is None:

    print("Error: Could not load image. Please check the file path and ensure the image exists.")

else:

    # Fourier Transform

    f = np.fft.fft2(img)

    fshift = np.fft.fftshift(f)
```

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```
magnitude_spectrum = 20*np.log(np.abs(fshift))

# --- Low-pass filter ---
rows, cols = img.shape
crow, ccol = rows//2, cols//2
mask_lp = np.zeros((rows, cols), np.uint8)
r = 50 # radius for LPF
cv2.circle(mask_lp, (ccol, crow), r, 1, -1)

fshift_lp = fshift * mask_lp
img_lp = np.fft.ifft2(np.fft.ifftshift(fshift_lp))
img_lp = np.abs(img_lp)

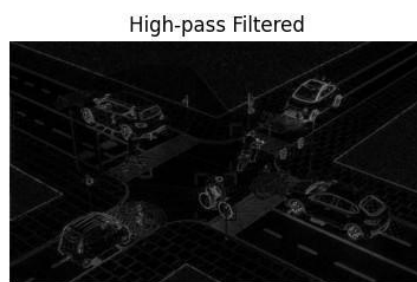
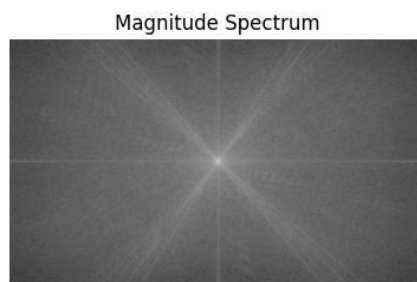
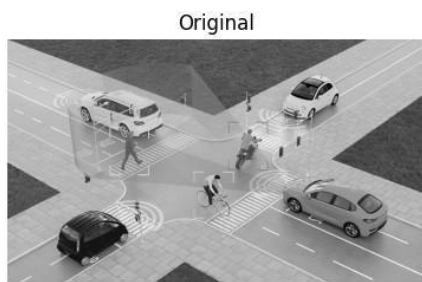
# --- High-pass filter ---
mask_hp = 1 - mask_lp
fshift_hp = fshift * mask_hp
img_hp = np.fft.ifft2(np.fft.ifftshift(fshift_hp))
img_hp = np.abs(img_hp)

# Display results
plt.figure(figsize=(10,8))
plt.subplot(2,2,1), plt.imshow(img, cmap='gray')
plt.title("Original"), plt.axis('off')
plt.subplot(2,2,2), plt.imshow(magnitude_spectrum, cmap='gray')
plt.title("Magnitude Spectrum"), plt.axis('off')
plt.subplot(2,2,3), plt.imshow(img_lp, cmap='gray')
plt.title("Low-pass Filtered"), plt.axis('off')
plt.subplot(2,2,4), plt.imshow(img_hp, cmap='gray')
```

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```
plt.title("High-pass Filtered"), plt.axis('off')  
plt.show()
```

Output:



Result: Thus, Fourier transform for filtering the image was implemented successfully.