**RA2211003011298**

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**D2 Section**

**Impathon Documentation**

Aim: -

To demonstrate how to perform Discrete Fourier Transform (DFT) analysis on an image using MATLAB and to perform separability and periodicity on the following image.

A peacock with a feathered tail

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Algorithm:-

1. Read the image and changing it to gray scale image

2. Compute 2D DFT of the image

3. Display the magnitude spectrum of the DFT

4. Compute 1D DFT along rows and columns separately

5. Compare the 2D DFT with the product of 1D DFTs

6. If the difference is negligible, conclude separability

7. Check if the 2D DFT is periodic

8. Display the results of separability and periodicity analyses

Architecture Diagram: -

A diagram of a computer process

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Code: -

A screenshot of a computer

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image = imread("C:\Impathon\Peacock.jpg");

image\_gray = rgb2gray(image);

% Calculating the 2D dft

dft\_image = fft2(double(image\_gray));

% For displaying the magnitude spectrum

magnitude\_spectrum = abs(fftshift(dft\_image));

figure;

subplot(1, 2, 1);

imshow(image);

title('Original Image');

subplot(1, 2, 2);

imshow(log(1 + magnitude\_spectrum), []);

title('Magnitude Spectrum (log scale)');

% To study the seprability

dft\_rows = fft(image\_gray, [], 2); % along the row

dft\_cols = fft(dft\_rows, [], 1); %along the column

% For finding the seprability error

separability\_error = max(max(abs(dft\_image - dft\_cols)));

if separability\_error < 1e-10

disp('The 2D DFT is separable.');

else

disp('The 2D DFT is not separable.');

end

% To study the periodicity

periodicity\_error = max(max(abs(dft\_image - dft\_image(1, 1))));

if periodicity\_error < 1e-10

disp('The 2D DFT is periodic.');

else

disp('The 2D DFT is not periodic.');

end

Output: -

A screenshot of a computer

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A screenshot of a computer

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