Digital Image Processing Lab
Experiment 7

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Aim : To enhance the contrast of low light image. Evaluate the effectiveness of implementation by applying it to a variety of images with different lighting and Homomorphic filtered image.

Software Tool Used :

Matlab

Matlab Code:

```
clc;

close all

clear all

% Set parameters

d = 10; % Cutoff frequency for the Gaussian filter

d2 = d^2; % Square of the cutoff frequency

% Read and preprocess the image

f1 = double(rgb2gray(imread("DP.jpg"))); % Convert image to grayscale and double
precision

f = f1 + 100; % Brighten the image

% Logarithmic transformation

l = log(1 + f); % Apply log transformation for dynamic range compression

% Fourier transform of the log-transformed image

z = fft2(l); % Compute the 2D Fourier transform of the image
```

```
% Get image size

[m, n] = size(f); % Dimensions of the image

% Initialize filter variables

b = zeros(m, n); % Distance matrix (for Euclidean distance)

h = zeros(m, n); % Gaussian filter matrix

% Create the Gaussian filter in frequency domain

for i = 1:m

for j = 1:n

% Compute the Euclidean distance from the center

b(i, j) = sqrt((i - m / 2)^2 + (j - n / 2)^2);

% Gaussian low-pass filter equation

h(i, j) = exp(-b(i, j)^2 / (2 * d2));

end

end

% Gamma values for homomorphic filtering

L = 0.5; % Gamma low value

H = 1.5; % Gamma high value

% Create the homomorphic filter

filter = L + (H - L) * h;

% Apply the filter in the frequency domain

s = z .* filter;

% Perform inverse Fourier transform
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g = abs(ifft2(s)); % Inverse FFT to get the filtered image back

% Inverse the logarithmic transformation

e = exp(g) - 1;

% Display results

figure;

subplot(1, 3, 1); % Display the original image

imshow(f1, []);

title("Original Image");

subplot(1, 3, 2); % Display the homomorphic filtered image
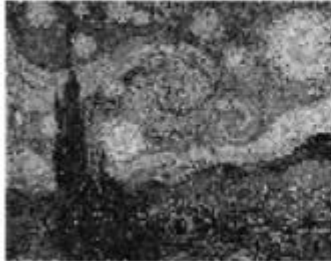
imshow(e, []);

title('Homomorphic Filtered Image');

Output –

Original Image   Homomorphic Filtered Image

Original Image   Homomorphic Filtered Image

Original Image Homomorphic Filtered Image

Original Image Homomorphic Filtered Image

Result:

Hence we have performed the objectives and observed the outputs.