DIGITAL IMAGE PROCESSING

EXPERIMENT – 8

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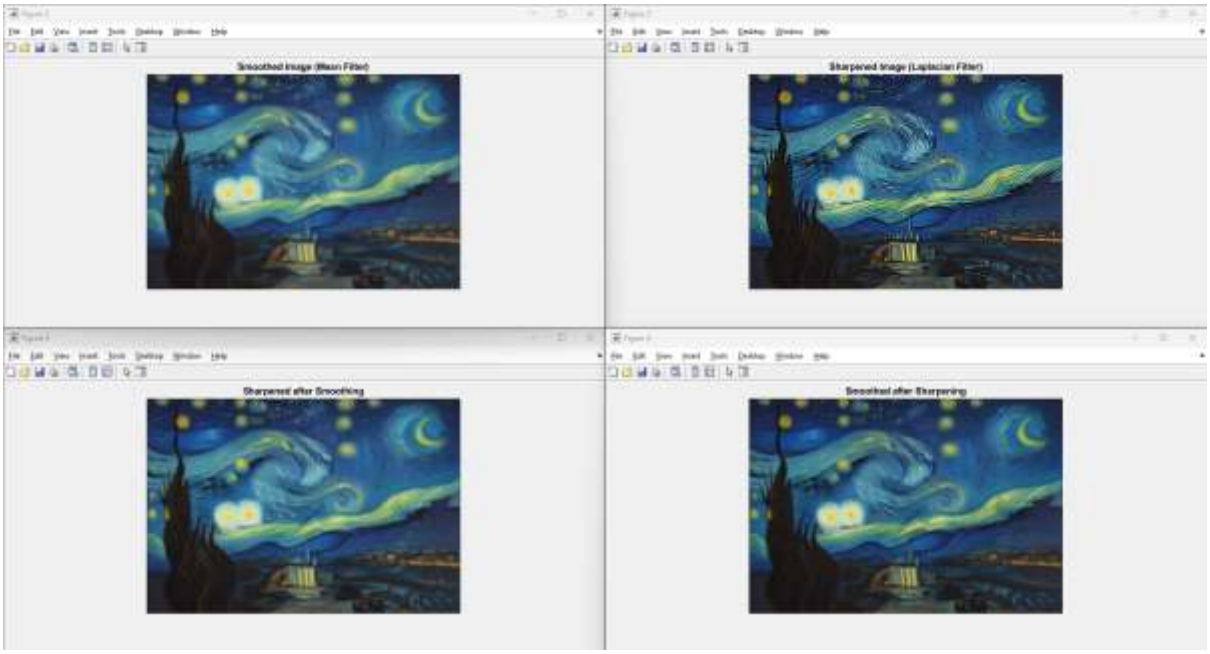
Use “staryy night” as input image- download from google. Do color image smoothing using mean filter, visualise it. Measure the quality of the output using PSNR and SSIM (one line command in matlab). Also, do color sharpening using Laplacian filtering. Evaluate your output using visualisation, PSNR, SSIM.

Finally apply sharpening on smoothed image, evaluate and do vice verse too.

```
% Read the color image (Starry Night)
img = imread("C:\Users\daplab\Downloads\starrynight.jpg");
% Display the original image
figure, imshow(img), title('Original Image');
%% 1. Color Image Smoothing using Mean Filter
mean_filter = fspecial('average', [5 5]);
smoothed_img = imfilter(img, mean_filter);
% Display the smoothed image
figure, imshow(smoothed_img), title('Smoothed Image (Mean Filter)');
% Evaluate using PSNR and SSIM
psnr_smoothed = psnr(smoothed_img, img);
ssim_smoothed = ssim(smoothed_img, img);
fprintf('Smoothing -> PSNR: %.4f, SSIM: %.4f\n', psnr_smoothed, ssim_smoothed);
%% 2. Color Image Sharpening using Laplacian Filter
laplacian_filter = fspecial('laplacian', 0.2);
sharpened_img = imfilter(img, laplacian_filter);
sharpened_img = img - sharpened_img; % Subtracting the laplacian image to sharpen
% Display the sharpened image
figure, imshow(sharpened_img), title('Sharpened Image (Laplacian Filter)');
% Evaluate using PSNR and SSIM
psnr_sharpened = psnr(sharpened_img, img);
ssim_sharpened = ssim(sharpened_img, img);
fprintf('Sharpening -> PSNR: %.4f, SSIM: %.4f\n', psnr_sharpened, ssim_sharpened);
%% 3. Apply Sharpening on Smoothed Image
sharpened_smoothed_img = imfilter(smoothed_img, laplacian_filter);
sharpened_smoothed_img = smoothed_img - sharpened_smoothed_img;
% Display the sharpened smoothed image
figure, imshow(sharpened_smoothed_img), title('Sharpened after Smoothing');
% Evaluate using PSNR and SSIM
psnr_sharpened_smoothed = psnr(sharpened_smoothed_img, img);
ssim_sharpened_smoothed = ssim(sharpened_smoothed_img, img);
fprintf('Sharpening after Smoothing -> PSNR: %.4f, SSIM: %.4f\n', psnr_sharpened_smoothed, ssim_sharpened_smoothed);
%% 4. Apply Smoothing on Sharpened Image
smoothed_sharpened_img = imfilter(sharpened_img, mean_filter);
% Display the smoothed sharpened image
figure, imshow(smoothed_sharpened_img), title('Smoothed after Sharpening');
% Evaluate using PSNR and SSIM
psnr_smoothed_sharpened = psnr(smoothed_sharpened_img, img);
ssim_smoothed_sharpened = ssim(smoothed_sharpened_img, img);
fprintf('Smoothing after Sharpening -> PSNR: %.4f, SSIM: %.4f\n', psnr_smoothed_sharpened, ssim_smoothed_sharpened);
```

Outputs:


Original Image


Smoothed Image (Mean Filter)
Sharpened Image (Laplacian Filter)
Sharpened after Smoothing
Smoothed after Sharpening