EXP No : 08 Image Smoothing Using Mean Filter, Measure Quality of Image Using PSNR and SSIM , Sharpening Image Using Laplacian Filter

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AIM :

- Use “starry night” as the input image. Do color image smoothing using a mean filter, visualize it.
- Measure the quality of the output image using PSNR and SSIM.
- Perform color sharpening using Laplacian filter.
- Evaluate your output using visualization, PSNR, SSIM.

Code

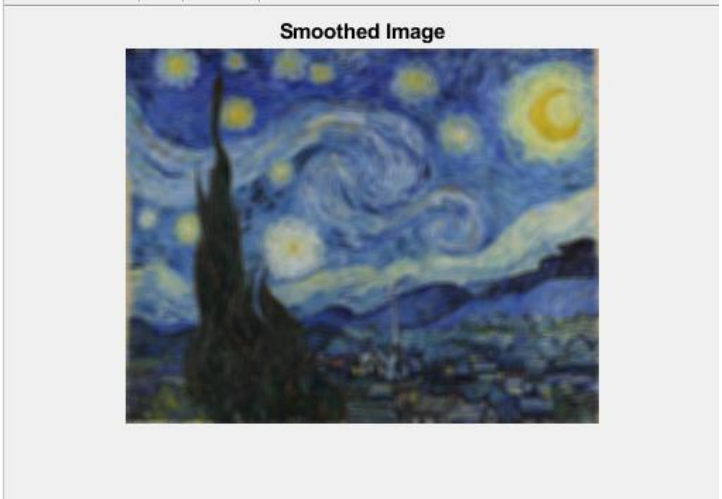
```
image ="C:\Users\dsplab\Downloads\exp8.jpeg";
img = imread(image);
% Display original image
figure(1);
imshow(img);
title('Original Image');
% Color image smoothing using mean filter
kernel_size = 5;
smoothed_img = imfilter(img, ones(kernel_size) /
kernel_size^2, 'replicate');
% Display smoothed image
figure(2);
imshow(smoothed_img);
title('Smoothed Image');
% Measure PSNR and SSIM for smoothed image
psnr_smoothed = psnr(smoothed_img, img);
ssim_smoothed = ssim(smoothed_img, img);
% Display PSNR and SSIM values
fprintf('PSNR of smoothed image: %.2f dB\n', psnr_smoothed);
fprintf('SSIM of smoothed image: %.2f\n', ssim_smoothed);
% Color sharpening using Laplacian filtering
laplacian_kernel = [-1 -1 -1; -1 8 -1; -1 -1 -1];
sharpened_img = img - imfilter(img, laplacian_kernel,
'replicate');
% Display sharpened image
figure(3);
imshow(sharpened_img);
title('Sharpened Image');
```

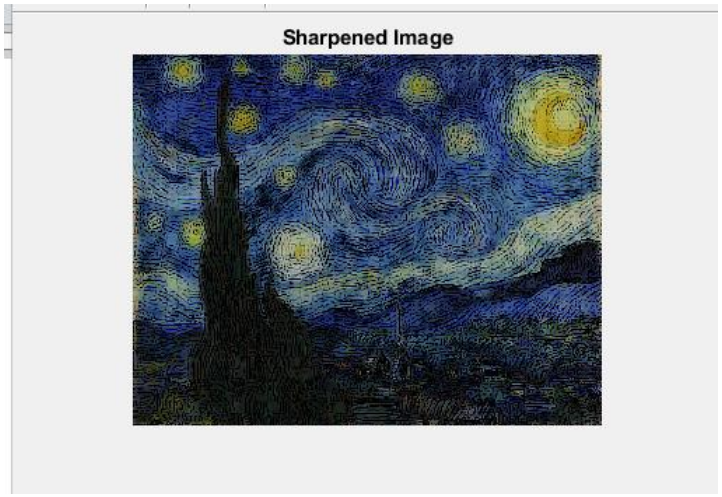
```
% Measure PSNR and SSIM for sharpened image
psnr_sharpened = psnr(sharpened_img, img);
ssim_sharpened = ssim(sharpened_img, img);
% Display PSNR and SSIM values
fprintf('PSNR of sharpened image: %.2f dB\n', psnr_sharpened);
fprintf('SSIM of sharpened image: %.2f\n', ssim_sharpened);
% Sharpening on smoothed image
sharpened_smoothed = smoothed_img - imfilter(smoothed_img,
laplacian_kernel, 'replicate');
% Display sharpened smoothed image
figure(4);
imshow(sharpened_smoothed);
title('Sharpened Smoothed Image');
% Measure PSNR and SSIM for sharpened smoothed image
psnr_sharpened_smoothed = psnr(sharpened_smoothed, img);
ssim_sharpened_smoothed = ssim(sharpened_smoothed, img);
% Display PSNR and SSIM values
fprintf('PSNR of sharpened smoothed image: %.2f dB\n',
psnr_sharpened_smoothed);
fprintf('SSIM of sharpened smoothed image: %.2f\n',
ssim_sharpened_smoothed);
% Smoothing on sharpened image
smoothed_sharpened = imfilter(sharpened_img, ones(kernel_size)
/ kernel_size^2, 'replicate');
% Display smoothed sharpened image
figure(5);
imshow(smoothed_sharpened);
title('Smoothed Sharpened Image');
% Measure PSNR and SSIM for smoothed sharpened image
psnr_smoothed_sharpened = psnr(smoothed_sharpened, img);
ssim_smoothed_sharpened = ssim(smoothed_sharpened, img);
% Display PSNR and SSIM values
fprintf('PSNR of smoothed sharpened image: %.2f dB\n',
psnr_smoothed_sharpened);
fprintf('SSIM of smoothed sharpened image: %.2f\n',
ssim_smoothed_sharpened);
```

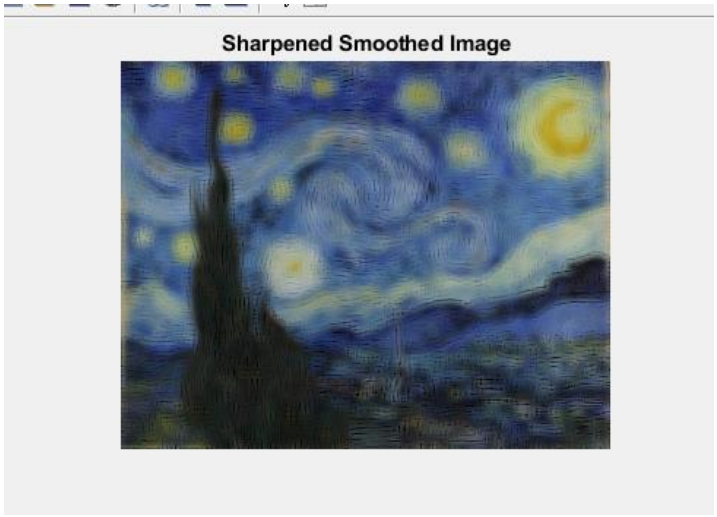
Output

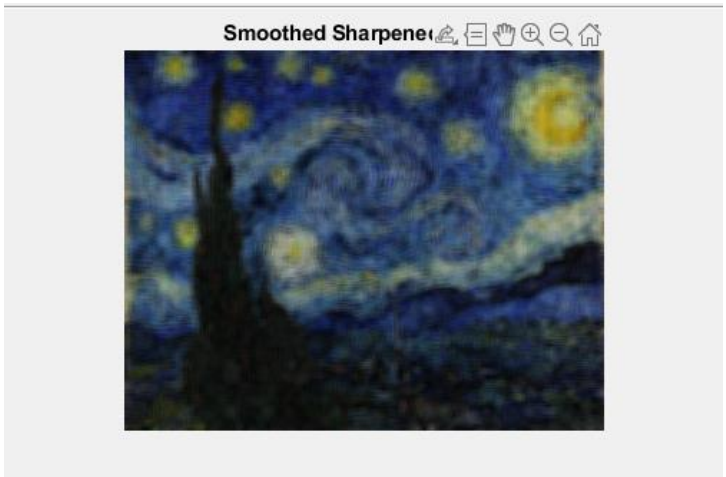
```
>> expno8
PSNR of smoothed image: 22.84 dB
SSIM of smoothed image: 0.69
PSNR of sharpened image: 12.85 dB
SSIM of sharpened image: 0.07
PSNR of sharpened smoothed image: 21.38 dB
SSIM of sharpened smoothed image: 0.64
PSNR of smoothed sharpened image: 15.82 dB
SSIM of smoothed sharpened image: 0.54
```

Output Figure ;




Sharpened Image


Sharpened Smoothed Image


Smoothed Sharpene