

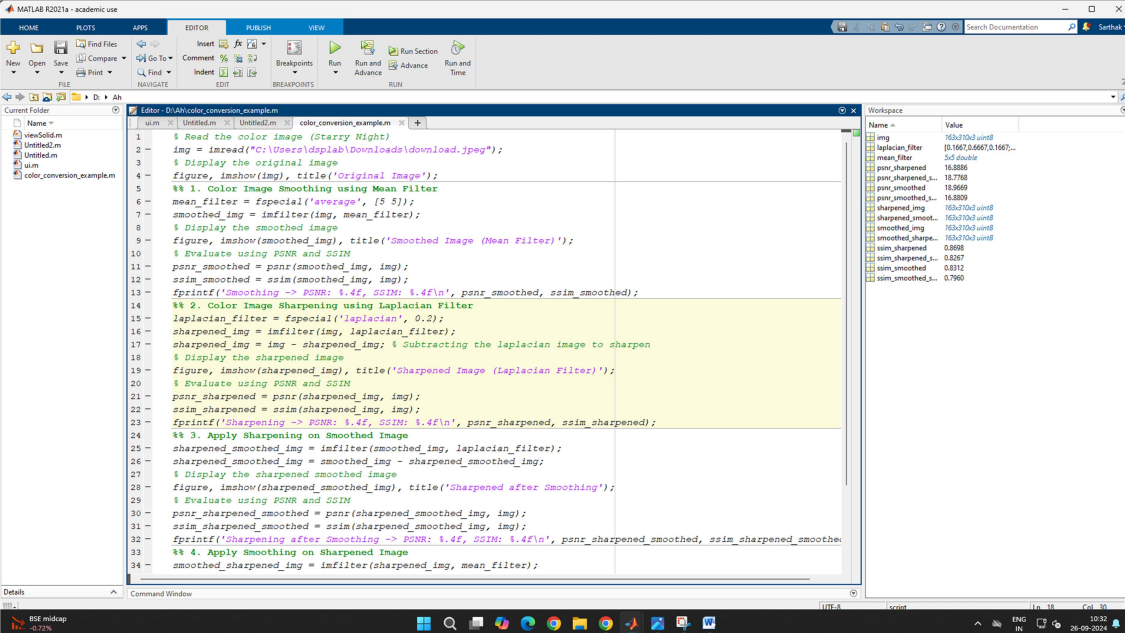
EXPERIMENT 8

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21BEC1507

Question:

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



The image shows the MATLAB R2021a - academic use interface. The main window displays a script titled 'color_conversion_example.m'. The script performs the following steps:

- Read the color image 'stray_night.jpg'.
- Display the original image.
- Apply a mean filter to smooth the image.
- Display the smoothed image.
- Evaluate the PSNR and SSIM of the smoothed image.
- Apply a Laplacian filter to sharpen the image.
- Display the sharpened image.
- Evaluate the PSNR and SSIM of the sharpened image.
- Apply sharpening to the smoothed image.
- Display the sharpened smoothed image.
- Evaluate the PSNR and SSIM of the sharpened smoothed image.
- Apply a mean filter to the sharpened smoothed image.
- Display the final sharpened smoothed image.

The script includes comments and uses the 'fspecial' function for the mean and Laplacian filters. The PSNR and SSIM values are printed at the end of each major step.

```
1 % Read the color image (stray_night)
2 img = imread('C:\Users\dplab\Downloads\download.jpeg');
3 % Display the original image
4 figure, imshow(img), title('Original Image');
5 % 1. Color Image Smoothing using Mean Filter
6 mean_filter = fspecial('average', [5 5]);
7 smoothed_img = imfilter(img, mean_filter);
8 % Display the smoothed image
9 figure, imshow(smoothed_img), title('Smoothed Image (Mean Filter)');
10 % Evaluate using PSNR and SSIM
11 psnr_smoothed = psnr(smoothed_img, img);
12 ssim_smoothed = ssim(smoothed_img, img);
13 fprintf('Smoothing -> PSNR: %.4f, SSIM: %.4f\n', psnr_smoothed, ssim_smoothed);
14 % 2. Color Image Sharpening using Laplacian Filter
15 laplacian_filter = fspecial('laplacian', 0.2);
16 sharpened_img = imfilter(img, laplacian_filter);
17 sharpened_img = img + sharpened_img; % Subtracting the laplacian image to sharpen
18 % Display the sharpened image
19 figure, imshow(sharpened_img), title('Sharpened Image (Laplacian Filter)');
20 % Evaluate using PSNR and SSIM
21 psnr_sharpened = psnr(sharpened_img, img);
22 ssim_sharpened = ssim(sharpened_img, img);
23 fprintf('Sharpening -> PSNR: %.4f, SSIM: %.4f\n', psnr_sharpened, ssim_sharpened);
24 % 3. Apply sharpening on Smoothed Image
25 sharpened_smoothed_img = imfilter(smoothed_img, laplacian_filter);
26 sharpened_smoothed_img = smoothed_img + sharpened_smoothed_img;
27 % Display the sharpened smoothed image
28 figure, imshow(sharpened_smoothed_img), title('Sharpened after Smoothing');
29 % Evaluate using PSNR and SSIM
30 psnr_sharpened_smoothed = psnr(sharpened_smoothed_img, img);
31 ssim_sharpened_smoothed = ssim(sharpened_smoothed_img, img);
32 fprintf('Sharpening after Smoothing -> PSNR: %.4f, SSIM: %.4f\n', psnr_sharpened_smoothed, ssim_sharpened_smoothed);
33 % 4. Apply Smoothing on Sharpened Image
34 smoothed_sharpened_img = imfilter(sharpened_img, mean_filter);
```

The Workspace window on the right shows the following variables:

Name	Value
img	163x103x3 uint8
laplacian_filter	[0.1667 0.6667 0.1667...
mean_filter	5x5 double
psnr_sharpened	16.8886
psnr_sharpened_s...	18.7768
psnr_smoothed	18.9659
psnr_smoothed_s...	16.8886
sharpened_img	163x103x3 uint8
sharpened_smooth...	163x103x3 uint8
smoothed_img	163x103x3 uint8
smoothed_smooth...	163x103x3 uint8
ssim_sharpened	0.8688
ssim_sharpened_s...	0.8367
ssim_smoothed	0.8312
ssim_smoothed_s...	0.7960

```

% Read the color image (Starry Night)
img = imread("C:\Users\dsplab\Downloads\download.jpeg");
% 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);

```

