Experiment – 08 Date: 26/09/24

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**SMOOTHENING AND SHARPENING**

**Aim:**

To implement smoothening and sharpening of image starry night, along with smoothening after sharpened image and vice versa.

To evaluate the performance using PSNR and SSIM.

**Required software:** MATLAB

**Procedure**:

* Clear command window, previously opened figure by using clc, close all, clear all commands.
* Type respective code for each task.
* Run the code in MATLAB.

**CODE:**

%Experiment-8:

clc;

clear all;

close all;

img = imread('starrynight.jpg');

img = double(img);

avg\_kernel = ones(5, 5) / 25;

smoothed\_img = zeros(size(img));

for channel = 1:3

smoothed\_img(:,:,channel) = conv2(img(:,:,channel), avg\_kernel, 'same');

end

smoothed\_img = uint8(smoothed\_img);

subplot(2,2,1);

imshow(smoothed\_img);

title('Smoothed Image');

psnr\_smoothed = psnr(smoothed\_img, uint8(img));

ssim\_smoothed = ssim(smoothed\_img, uint8(img));

disp(['PSNR (smoothed): ', num2str(psnr\_smoothed)]);

disp(['SSIM (smoothed): ', num2str(ssim\_smoothed)]);

lap\_kernel = [0 -1 0; -1 5 -1; 0 -1 0];

sharpened\_img = zeros(size(img));

for channel = 1:3

sharpened\_img(:,:,channel) = conv2(img(:,:,channel), lap\_kernel, 'same');

end

sharpened\_img = uint8(sharpened\_img);

subplot(2,2,2);

imshow(sharpened\_img);

title('Sharpened Image');

psnr\_sharpened = psnr(sharpened\_img, uint8(img));

ssim\_sharpened = ssim(sharpened\_img, uint8(img));

disp(['PSNR (sharpened): ', num2str(psnr\_sharpened)]);

disp(['SSIM (sharpened): ', num2str(ssim\_sharpened)]);

sharpened\_after\_smoothing = zeros(size(smoothed\_img));

for channel = 1:3

sharpened\_after\_smoothing(:,:,channel) = conv2(smoothed\_img(:,:,channel), lap\_kernel, 'same');

end

sharpened\_after\_smoothing = uint8(sharpened\_after\_smoothing);

subplot(2,2,3);

imshow(sharpened\_after\_smoothing);

title('Sharpened After Smoothing');

psnr\_smooth\_sharpen = psnr(sharpened\_after\_smoothing, smoothed\_img);

ssim\_smooth\_sharpen = ssim(sharpened\_after\_smoothing, smoothed\_img);

disp(['PSNR (sharpened after smoothing): ', num2str(psnr\_smooth\_sharpen)]);

disp(['SSIM (sharpened after smoothing): ', num2str(ssim\_smooth\_sharpen)]);

smoothed\_after\_sharpening = zeros(size(sharpened\_img));

for channel = 1:3

smoothed\_after\_sharpening(:,:,channel) = conv2(sharpened\_img(:,:,channel), avg\_kernel, 'same');

end

smoothed\_after\_sharpening = uint8(smoothed\_after\_sharpening);

subplot(2,2,4);

imshow(smoothed\_after\_sharpening);

title('Smoothed After Sharpening');

psnr\_sharpen\_smooth = psnr(smoothed\_after\_sharpening, sharpened\_img);

ssim\_sharpen\_smooth = ssim(smoothed\_after\_sharpening, sharpened\_img);

disp(['PSNR (smoothed after sharpening): ', num2str(psnr\_sharpen\_smooth)]);

disp(['SSIM (smoothed after sharpening): ', num2str(ssim\_sharpen\_smooth)]);

**OUTPUT:**



**Result:**

Hence, smoothening and sharpening of image, smoothening of sharpened image and sharpening of smoothened image is done using MATLAB.