Digital Image Processing Lab

Experiment 8

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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.

Software Tool Used :

Matlab

Matlab Code:

```
 image ="exp8.jpg";

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 –

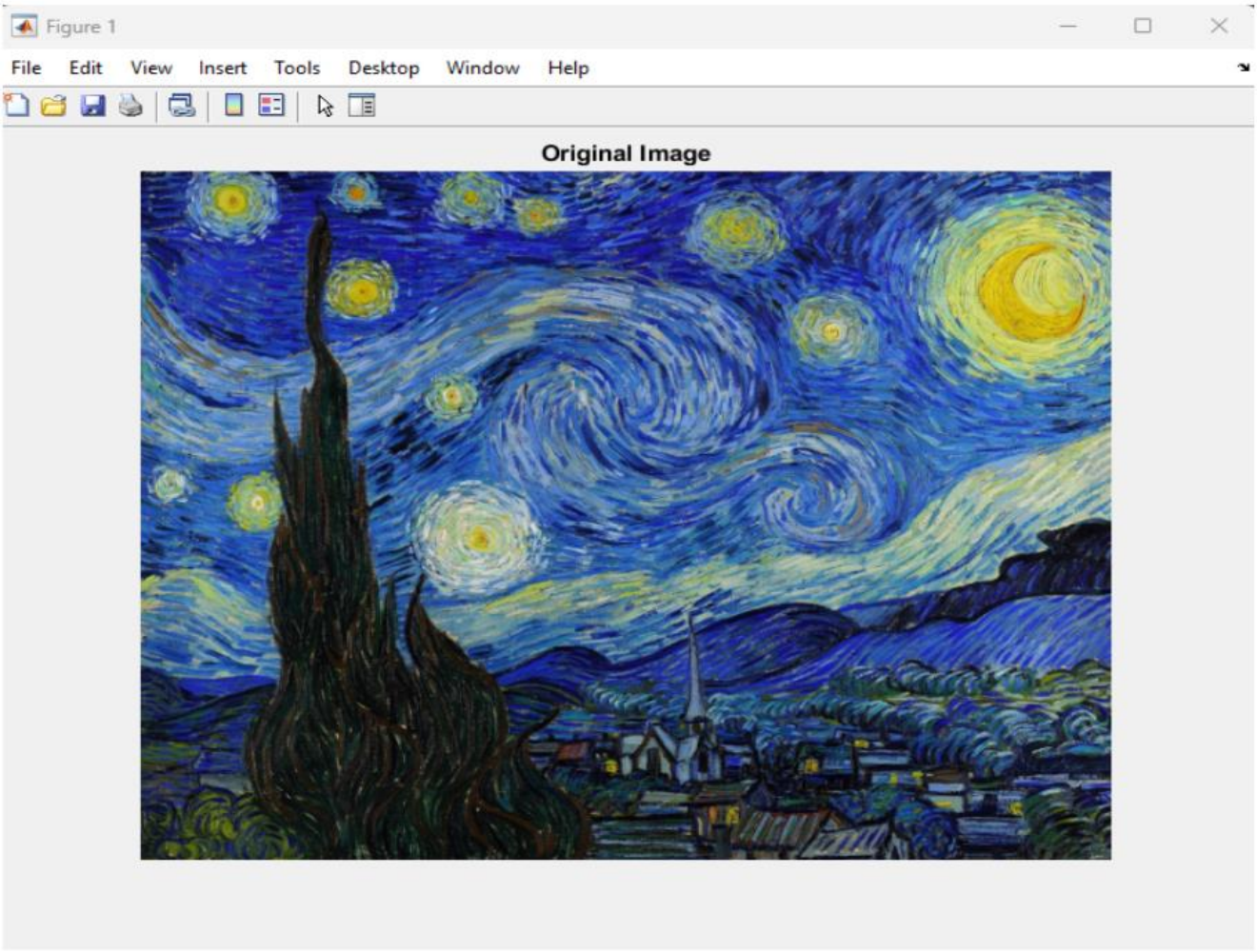
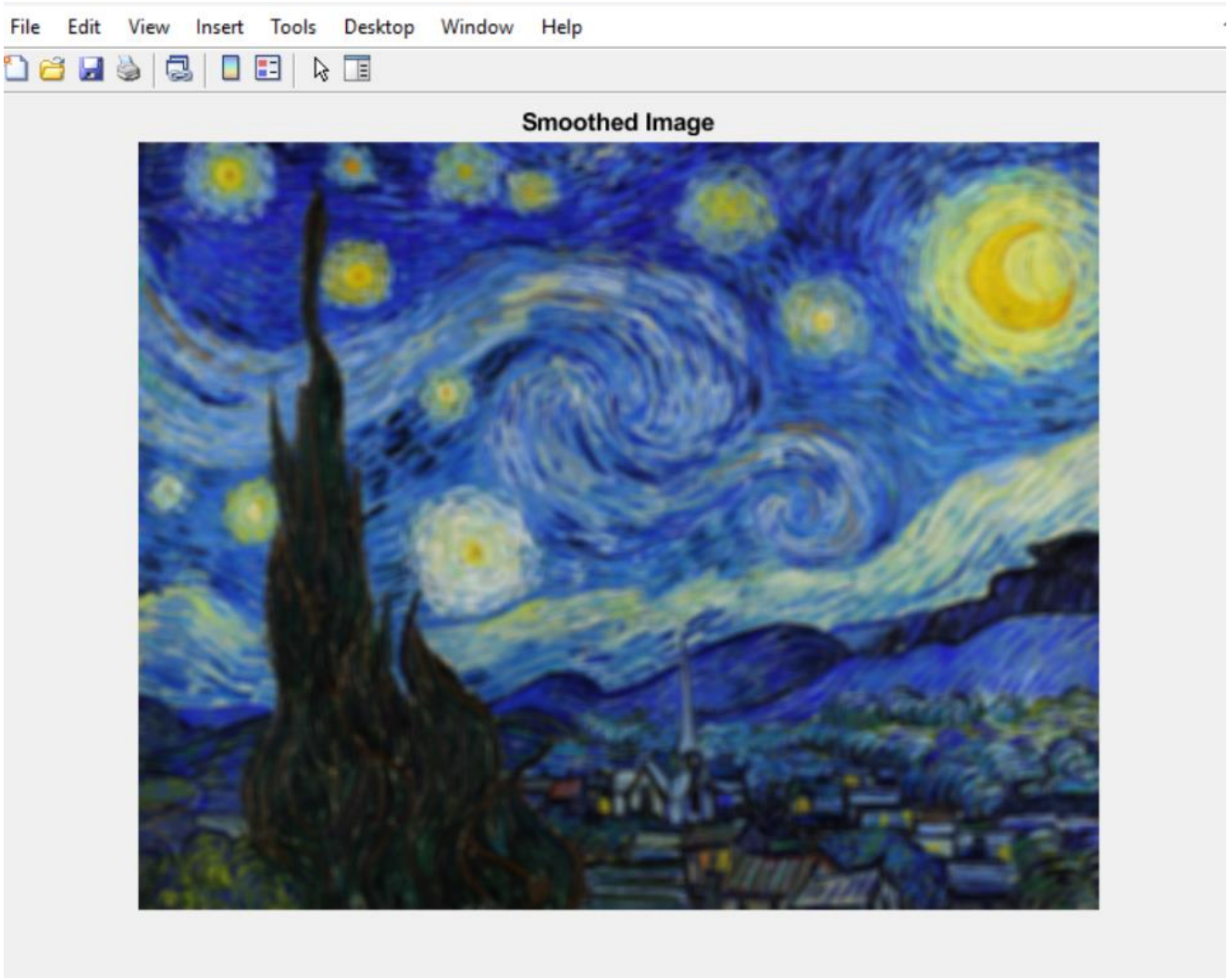


Figure 1
File Edit View Insert Tools Desktop Window Help
Original Image

File Edit View Insert Tools Desktop Window Help



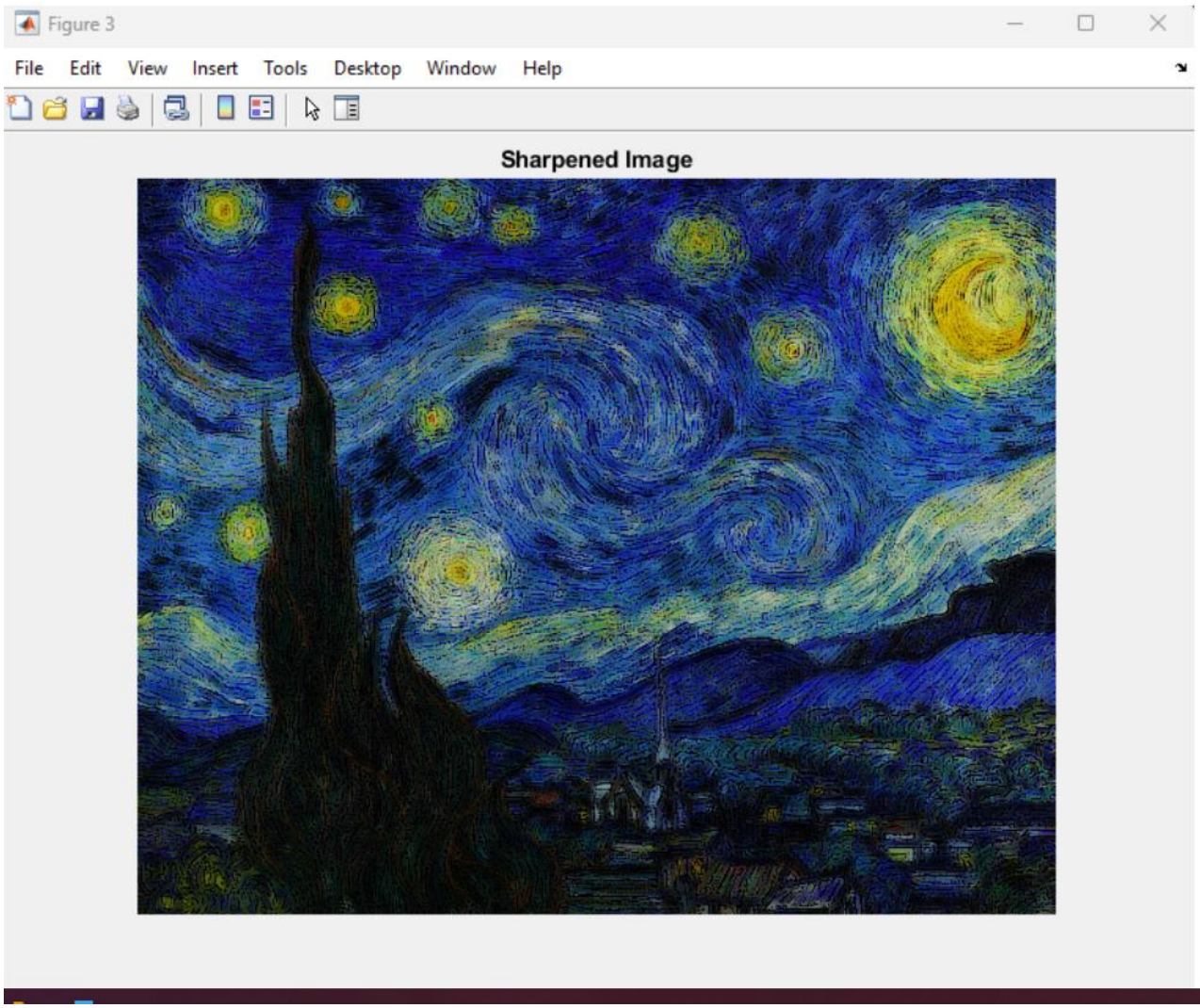


Figure 3
File Edit View Insert Tools Desktop Window Help
Sharpened Image

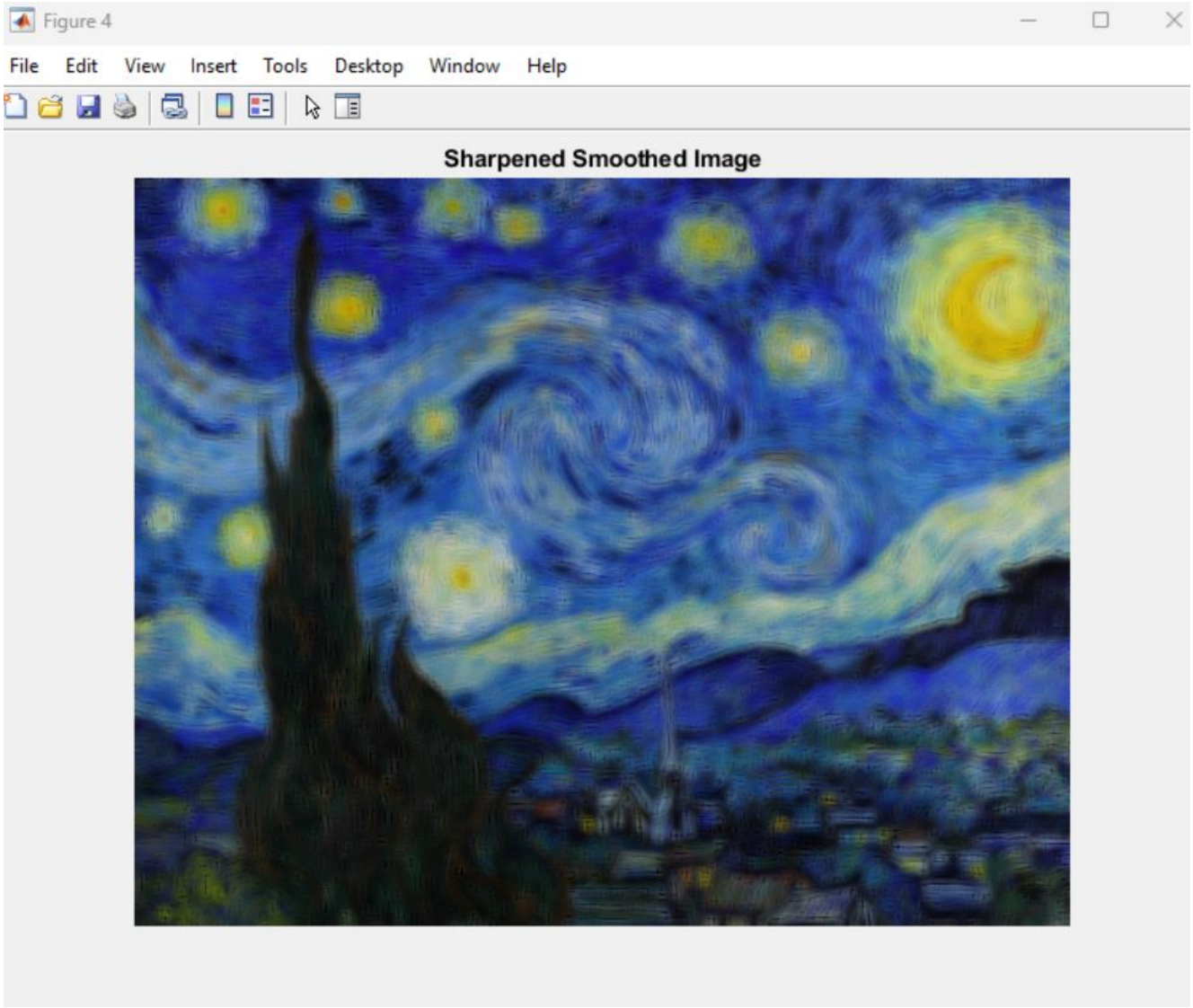
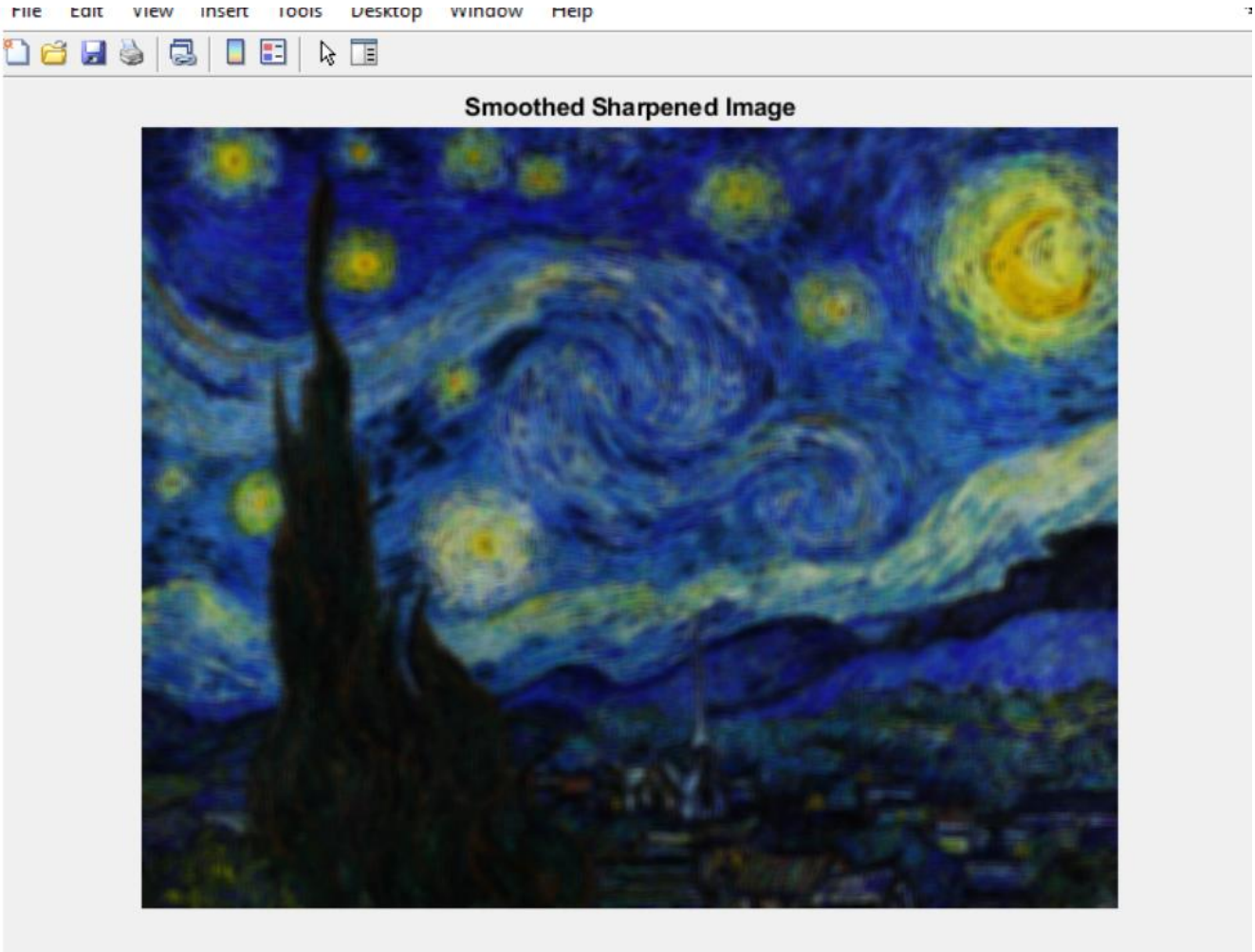


Figure 4
File Edit View Insert Tools Desktop Window Help
Sharpened Smoothed Image



Result:

Hence we have performed the objectives and observed the outputs.