Lab 02

Submitted By:

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Section: 02

Course Code: CSE438(Image Processing)

Submitted To:

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Problem No:1

Code:

```
inputImg = imread('tree.jpg');
refImg = imread("tree_reference.png");


if size(refImg, 3) == 3
    refImg = rgb2gray(refImg);
end

inputHist = imhist(inputImg);
refHist = imhist(refImg);

inputCDF = cumsum(inputHist) / numel(inputImg);
refCDF = cumsum(refHist) / numel(refImg);

transFunc = interp1(refCDF, 0:255, inputCDF, 'linear');

outputImg = uint8(transFunc(double(inputImg) + 1));

subplot(1,2,1); imshow(inputImg); title('Input Image');
subplot(1,2,2); imshow(outputImg); title('Output Image');
```
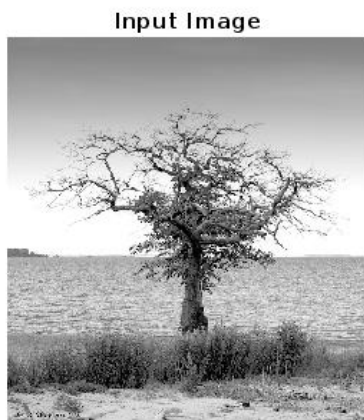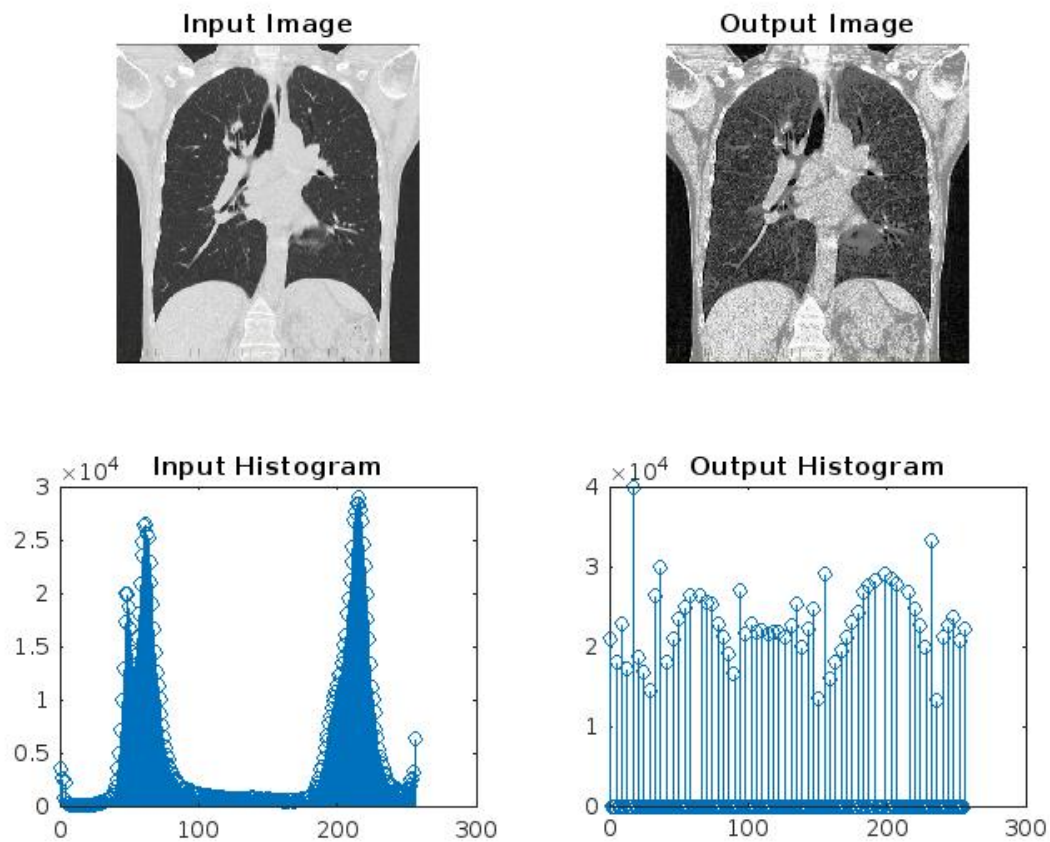
Output:

Problem No: 2
Code:

```matlab
inputImg = imread('CT.jpg')

outputImg = histeq(inputImg);

subplot(2,2,1); imshow(inputImg); title('Input Image');
subplot(2,2,2); imshow(outputImg); title('Output Image');

inputHist = imhist(inputImg);
outputHist = imhist(outputImg);
subplot(2,2,3); stem(inputHist); title('Input Histogram');
subplot(2,2,4); stem(outputHist); title('Output Histogram');
```

Output:

Problem No: 3

Code:

```
inputImg = imread('MRI.jpg');

noisyImg = imnoise(inputImg, 'salt & pepper', 0.05);

minFilteredImg = ordfilt2(noisyImg, 1, true(3,3));

maxFilteredImg = ordfilt2(noisyImg, 9, true(3,3));

subplot(2,2,1); imshow(inputImg); title('Input Image');
subplot(2,2,2); imshow(noisyImg); title('Noisy Image');
subplot(2,2,3); imshow(minFilteredImg); title('Min Filtered Image');
subplot(2,2,4); imshow(maxFilteredImg); title('Max Filtered Image');
```
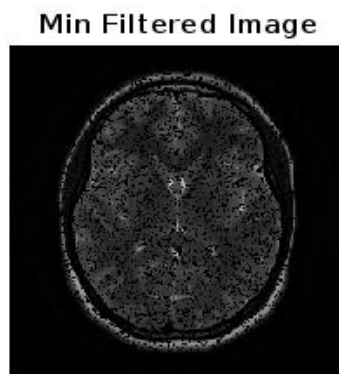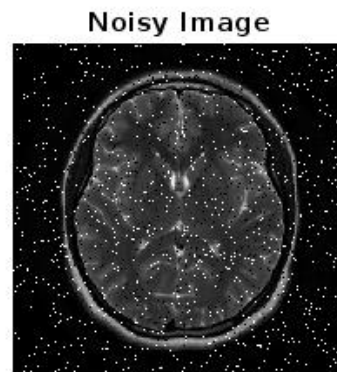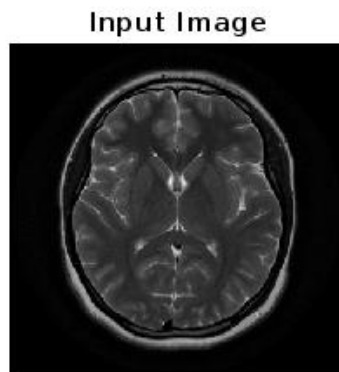
Output:

Problem No: 4

Code:

```
inputImg = imread('MRI.jpg');


noisyImg = imnoise(inputImg, 'gaussian', 0, 0.01);

minFilteredImg = ordfilt2(noisyImg, 1, true(3,3));

maxFilteredImg = ordfilt2(noisyImg, 9, true(3,3));

subplot(2,2,1); imshow(inputImg); title('Input Image');
subplot(2,2,2); imshow(noisyImg); title('Noisy Image');
subplot(2,2,3); imshow(minFilteredImg); title('Min Filtered Image');
subplot(2,2,4); imshow(maxFilteredImg); title('Max Filtered Image');
```
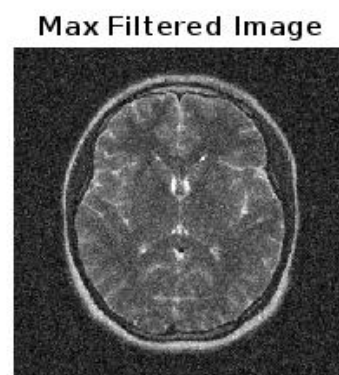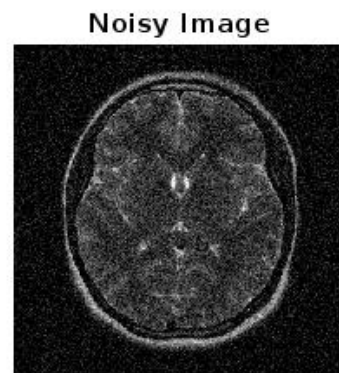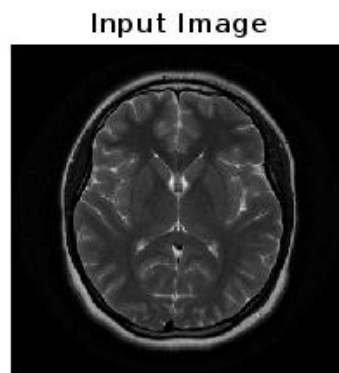
Output:

Problem No: 5

Code:

```matlab
inputImg = imread('MRI_2.jpg');


if size(inputImg, 3) == 3
    inputImg = rgb2gray(inputImg);
end

noisyImg = imnoise(inputImg, 'gaussian', 0, 0.01);

boxFilteredImg = imboxfilt(noisyImg, 3);

averageFilteredImg = imfilter(noisyImg, fspecial('average', 3));

medianFilteredImg = medfilt2(noisyImg, [3, 3]);

figure;
subplot(2, 4, 1); imshow(inputImg); title('Input Image');
subplot(2, 4, 2); imshow(noisyImg); title('Noisy Image');
subplot(2, 4, 3); imshow(boxFilteredImg); title('Box Filtered Image');
subplot(2, 4, 4); imshow(averageFilteredImg); title('Average Filtered Image');
subplot(2, 4, 5); imshow(medianFilteredImg); title('Median Filtered Image');

boxPSNR = psnr(inputImg, boxFilteredImg);
averagePSNR = psnr(inputImg, averageFilteredImg);
medianPSNR = psnr(inputImg, medianFilteredImg);

disp(['Box Filtered PSNR: ' num2str(boxPSNR) ' dB']);
disp(['Average Filtered PSNR: ' num2str(averagePSNR) ' dB']);
disp(['Median Filtered PSNR: ' num2str(medianPSNR) ' dB']);

figure;
bar([boxPSNR, averagePSNR, medianPSNR]);
title('PSNR Comparison');
ylabel('PSNR (dB)');
xticklabels({'Box Filtered','Average Filtered','Median Filtered'});
```

Output:

Input Image   Noisy Image   Box Filtered Image Average Filtered Image
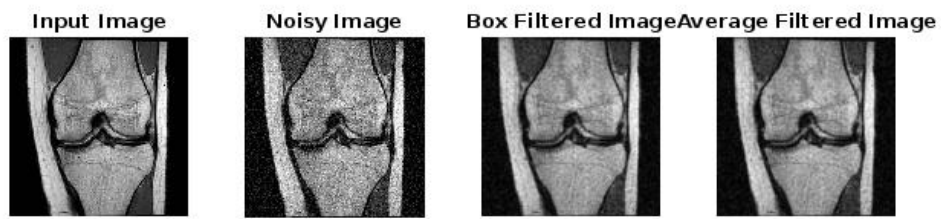
Median Filtered Image

PSNR Comparison
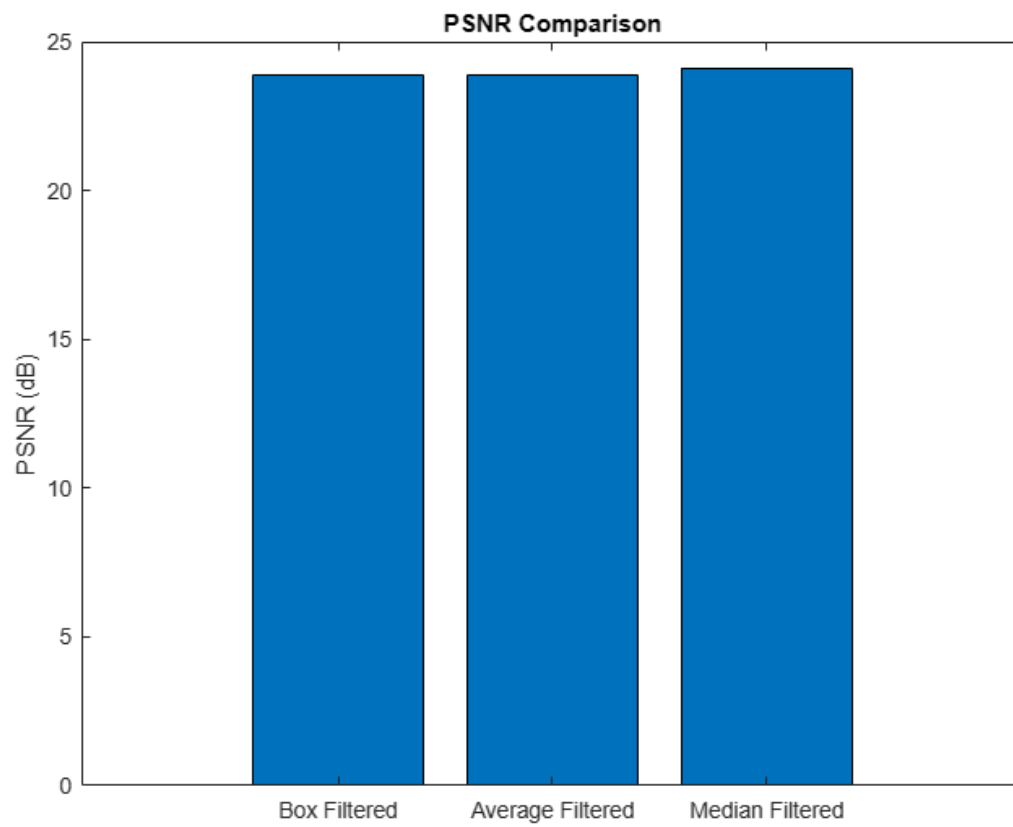
Problem No: 6

Code:

```
input_img = imread('contrast.png');

output_img = histeq(input_img);

figure;
subplot(1, 2, 1);
imshow(input_img);
title('Input Image');
subplot(1, 2, 2);
imshow(output_img);
title('Output Image');

figure;
subplot(2, 1, 1);
imhist(input_img);
title('Input Image Histogram');
subplot(2, 1, 2);
imhist(output_img);
title('Output Image Histogram');
```

Output:

Problem No: 7

Code:

```
input_img = imread('Brightness.png');

brightness_adj = 120;
output_img = imadjust(input_img, [], [], brightness_adj/255);

figure;
subplot(1, 2, 1);
imshow(input_img);
title('Input Image');
subplot(1, 2, 2);
imshow(output_img);
title('Output Image');
```
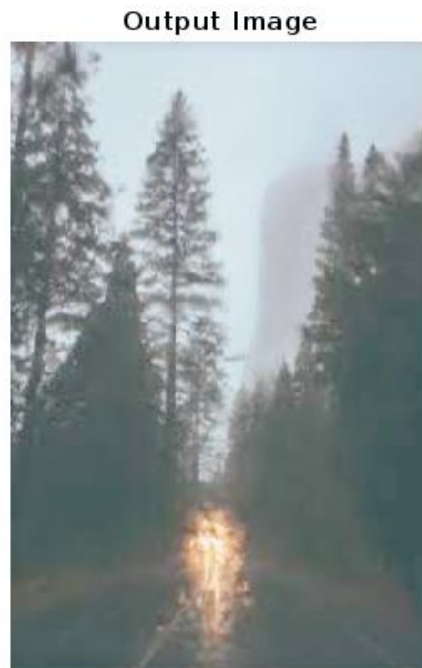
Output:

Problem No: 8

Code:

```
input_img = imread('coins.png');

output_img = uint8(floor(double(input_img)/32) * 32);

figure;
subplot(1, 2, 1);
imshow(input_img);
title('Input Image');
subplot(1, 2, 2);
imshow(output_img);
title('Output Image');
```

Output:

Problem No: 9

Code:

```matlab
input_img = imread('Galaxy.png');

% show the input image
figure;
imshow(input_img);
title('Input Image');

% show the matrix form of the image
disp('Image matrix:');
disp(input_img);

% display pixel information by hovering cursor over image
imtool(input_img);

% find the value of pixel (10,78)
pixel_value = input_img(10,78);
fprintf('Pixel value at (10,78): %d\n', pixel_value);

% show the size of the image
img_size = size(input_img);
fprintf('Image size: %d x %d\n', img_size(1), img_size(2));

% show all image information
imfinfo('input_image.jpg')
```

Output:

```
Pixel value at (10,78): 45
Image size: 433 x 425
```

Input Image

Image Tool 1 - input_img   — ✕

File   Tools

Pixel info: (217, 224) [246 250 255]

Problem No:10

Code:

```
rgb_img = imread('rgb_image.png');

gray_img = imread('grayscale__image.png');

indexed_img = imread('indexed__image.png');

subplot(1,3,1);
imshow(rgb_img);
title('RGB Image');
subplot(1,3,2);
imshow(gray_img);
title('Grayscale Image');
subplot(1,3,3);
imshow(indexed_img);
title('Indexed Image');

gray_rgb_img = rgb2gray(rgb_img);

gray_indexed_img = ind2gray(indexed_img, gray(256));

binary_img = imbinarize(gray_img);


inverted_binary_img = imcomplement(binary_img);

figure;
imhist(gray_img);
title('Histogram of Grayscale Image');

inverted_rgb_img = imcomplement(rgb_img);

blurred_rgb_img = imgaussfilt(rgb_img, 5);
```

Output:

☑ 411×407×3 logical

(:,:,1) =

Columns 1 through 50

```
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```

Histogram of Grayscale Image