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Experiment 5: Median, Averaging and Sharpening filter

Aim: To perform median filter, to filter the salt and pepper noise, to apply averaging filter to remove high frequency components and to apply sharpening filter to get boundaries of the image

Apparatus: PC/Laptop, MATLAB Software and few Images

Theory:

Salt and Pepper noise: Salt and pepper noise is a form of noise, sometimes seen on images. It is also known as impulse noise. This noise can be caused by sharp and sudden disturbances in the image signal. An effective noise reduction method for this type of noise is a median filter or a morphological filter.

Median filter: The median filter considers each pixel in the image in turn and looks at its nearby neighbors to decide whether or not it is representative of its surroundings. Instead of simply replacing the pixel value with the mean of neighbouring pixel values, it replaces it with the median of those values. The median is calculated by first sorting all the pixel value with the mean of neighbouring into numerical order and then replacing the pixel being considered with the middle value

Averaging filter: Average (or mean) filtering is a method of 'smoothing' images by reducing the amount of intensity variation between neighbouring pixels. The average filter works by moving through the image pixel by pixel, replacing each value with the average value of neighbou

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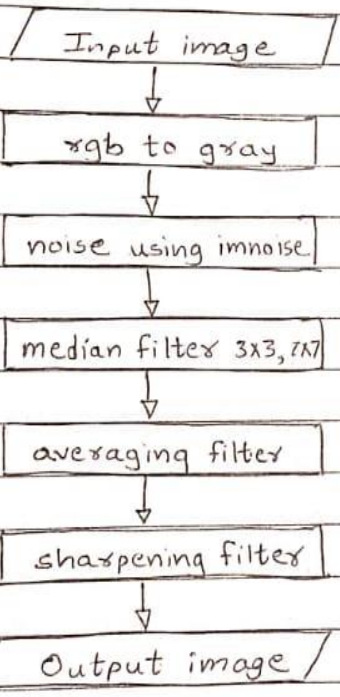
pixels, including itself

Sharpening filter: Sharpening filters are used to enhance the edges of objects and adjust the contrast and the shade characteristics. In combination with threshold they can be used as edge detectors. Sharpening or highpass filters let high frequencies pass and reduce the lower frequencies and are extremely sensitive to shot noise.

Flowchart and algorithm:



First, input the image into a variable; further convert it into a gray image using the inbuilt function. We can input noise with the inbuilt function in matlab. Further define the masks and logic for finding median and apply to the gray noise image. Similarly apply the logic for averaging and sharpening filter and plot them using matlab's subplot function.

Coding and Output:

```
% Vighnesh Vikas Salgaonkar | B-21 | EXPERIMENT:5
clear all
close all
clc
I = rgb2gray(imread('IPMV1.jpg'));
ISP = imnoise(I,'salt & pepper', 0.05);
medf = @(x) median(x(:));
med_IM1 = nlfilter(ISP, [3 3], medf);
med_IM2 = nlfilter(ISP, [7 7], medf);
figure
subplot(331);
imshow(I);
title('OG Image')
subplot(332);
imshow(ISP);
title('Pepper and Salt Noise added');
subplot(333);
imshow(med_IM1);
title('Filtered OP 3x3');
subplot(334);
imshow(med_IM2);
title('Filtered OP 7x7')
```

```
gaussmask = fspecial('gaussian', 3);
filtimg = imfilter(I, gaussmask);
subplot(335);
imshow(filtimg, []);
title('Output of gaussian filter 3*3');
[row, col] = size(I);
for i=4:1:row-3
    for j=4:1:col-3
        x= I(i-3:i+3,j-3:j+3);
        C= x(:)';
        C=sort(C);
        ave = sum(C)/49;
        I(i,j)= ave;
    end
end
title('Filtered OP 3x3');
subplot(336);
imshow(I);
h = [-1 -1 -1; -1 9 -1; -1 -1 -1];
hpt3 = conv2(double(I), double(h));
subplot(337);
imshow(hpt3/100);
title('Sharpening - User Defined Mask');
```

OG Image

Pepper and Salt Noise added

Filtered OP 3x3

Filtered OP 7x7

Filtered OP 3x3

Sharpening - User Defined Mask

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Conclusion: Thus, I conclude that, I have studied, understood and performed the practical based on median, averaging and sharpening filter.