IMAGE RESTORATION

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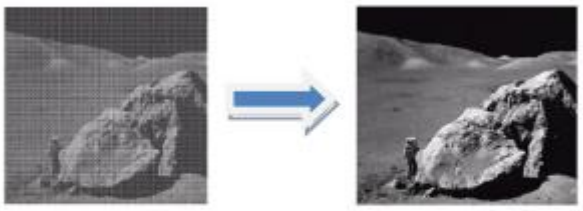
ABSTRACT: — Image restoration is known as recovery of images. Generally with operation such as noise and transmission of images make it corrupted and it is difficult to recover. Image restoration problem represents one of the primary research focuses in the field of digital image processing. Blurring is hard to avoid in any image acquisition systems, which is caused not just by only one source, but by many, such as atmospheric turbulence, an out of-focus optical system and aberrations in the imaging system, and so on. In this project, we are working on some image restoration techniques to improve the quality of the images. We use different filtering techniques such as weiner and median filtering to restore the original image from different noise environment

KEYWORDS: Gaussian Noise, weiner- deconv filter, median filter, PSNR,MSE.

INTRODUCTION:

- Image restoration is the process of recovering an image that has been degraded by using a priori knowledge of the degradation phenomenon.
- Restoration techniques involve modeling of the degradation function and applying the inverse process to recover the original image.
- This process is processed in two domains: spatial domain and frequency domain
- To retrieve the meaningful information from the degraded images, image restoration techniques were used.



(a) (b)

Figure 1(a) Degraded image (b) Restored image

- Reconstruction of the image can be performed using 2 types of model (i) Degradation Model (ii) Restoration Model.

ADVANTAGES:

- In case of health, image restoration is very useful for diagonising the diseases.
- This method does not require prior knowledge for the removal of noise and blur.

APPLICATIONS:

- Restoration of Compressed Images

- Blind Image Restoration
- Biomedical
- Area of astronomical
- In order to improve the video resolution, the motion blur estimation can be performed in the real time video image processing applications.

LITERATURE SURVEY:

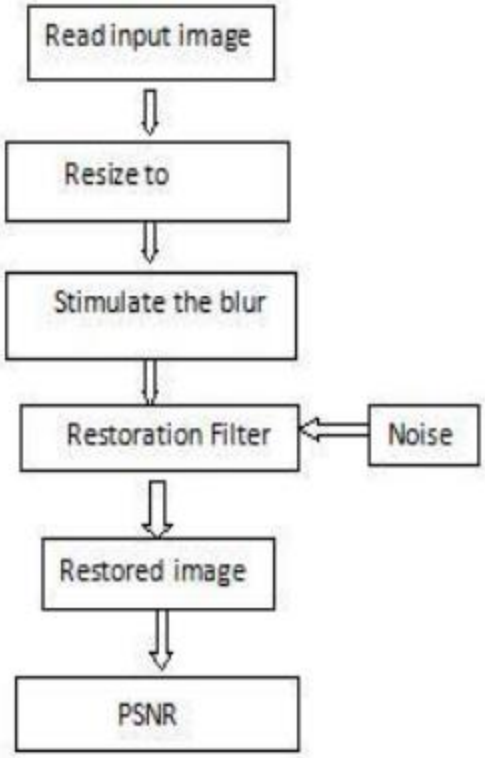
The technique of image processing has made its way into every aspect of society. Its applications encompass a wide variety of specialized disciplines including medical imaging, machine vision, remote sensing and astronomy. Personal images captured by various digital cameras can easily be manipulated by a variety of dedicated image processing algorithms. Image restoration can be described as an important part of image processing technique. Image restoration has proved to be an active field of research in the present days. The basic objective is to enhance the quality of an image by removing defects and make it look pleasing.

The proposed method is based on two steps. Firstly it segments both the input and blurred image and cluster those segments based on PSNR values. Secondly it retrieves segments having low PSNR values. image restoration techniques has been implemented by using Various Parameters like Contour plots, Histogram equalization, MSE, PSNR, max difference, avg difference, normalized cross correlation, normalized absolute error, structure content as performance is measured. The proposed method works for locally instead of globally to better elimination of random impulse noise in the image. The fuzzy detection and reduction method is not better for color image restoration.

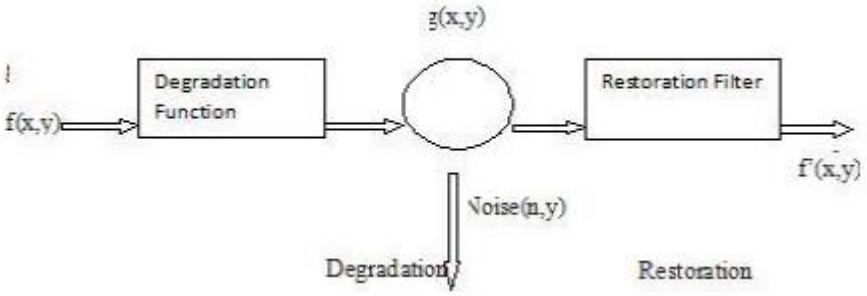
EXISTING METHOD:

As the name denotes the median filter is measurements approach. During this methodology we discover the median of the picture element the replace the picture element by median of the grey levels in their neighborhood of that pixels . The median filter is engaged to get rid of the salt and pepper noise. It's capability with significantly less blurring than liner smoothing filters of the similar size. In alternative words we will say that Median filtering could be a wide used and extremely necessary techniques of filtering and best renowned for its glorious noise reduction ability from the photographs. By the filtering it keeps the perimeters whereas removing the noise. This makes the image to not blur as alternative smoothing ways.

FLOW CHART:



BLOCK DIAGRAM:



Flowchart explanation:

The main idea of the median filter is to run through the signal entry by entry, replacing each entry with the median of neighboring entries. The noisy image is filtered using median filter that is this is done in 2 D using 3-by-3 neighborhood and finally find the matrix i.e PSNR ,MSE,SNR.

OBJECTIVE:

To improve a given image in some predefined sense, how matlab models degrads the restoration solution.

PROBLEM STATEMENT:

A major trend in modern day image restoration has been the use of data to improve quality . The goal of this project was to explore methods to increase the accuracy of pixel to bring the "precision" in spatial data collection of Image to a whole different level.

PROPOSED METHOD:

A. METHOD:

An improvement upon normal deconvolution is to apply a **Wiener filter** before deconvolution to reduce the additive noise. The Wiener filter utilizes knowledge of the characteristics of the additive noise and the signal being recovered to reduce the impact of noise on deconvolution. This process is known as **Wiener deconvolution**. Wiener deconvolution can be used effectively when the frequency characteristics of the image and additive noise are known, to at least some degree. The Wiener deconvolution method has widespread use in image deconvolution applications, as the frequency spectrum of most visual images is fairly well behaved and may be estimated easily

B. SOLUTION:

In any noise removal schemes, attention is given to remove noise from images in addition to keeping as much original properties as possible. However, since both the objectives are contradicting in nature, it is not possible for any scheme to fulfil both the objectives. It has been observed through the simulation of the existing schemes that they also fail in providing satisfactory results under high noise conditions. Since noise is not uniformly distributed across the image, it is desirable to replace the corrupted ones through a suitable filter. create a point-spread function, PSF, by using the fspecial function and specifying linear motion across 21 pixels at an angle of 11 degrees. Then, convolve the point-spread function with the image by using imfilter.

C. MATHEMATICAL ANALYSIS:

1)PEAK TO SIGNAL RATIO:

Peak signal-to-noise ratio (PSNR) is the ratio between the maximum possible power of an image and the power of corrupting noise that affects the quality of its representation. To estimate the PSNR of an image, it is necessary to compare that image to an ideal clean image with the maximum possible power.

$$PSNR = 10\log_{10}\left(\frac{(L-1)^2}{MSE}\right) = 20\log_{10}\left(\frac{L-1}{RMSE}\right)$$

2)MEAN SQUARE ERROR:

MSE is the most common estimator of image quality measurement metric. It is a full reference metric and the values closer to zero are the better.

$$\text{MSE} = \frac{1}{MN}\sum_{n=0}^{M}\sum_{m=1}^{N}\left[\hat{g}\,(n,m) - g\,(n,m)\right]^2$$

3)SIGNAL TO NOISE RATIO:

SNR or signal-to-noise ratio is the ratio between the desired information or the power of a signal and the undesired signal .

$$S/N = 20\log_{10}(P_s/P_n)$$

SOFTWARES AND LIBRARIES USED:

Software: MATLAB VERSION

PRACTICAL OR SIMULATION SETUP:

- MATLAB CODE FOR PROPOSED METHOD:

```
clc;
close all;
clear all;
I = imread('cameraman.tif');
subplot(4,1,1);
```

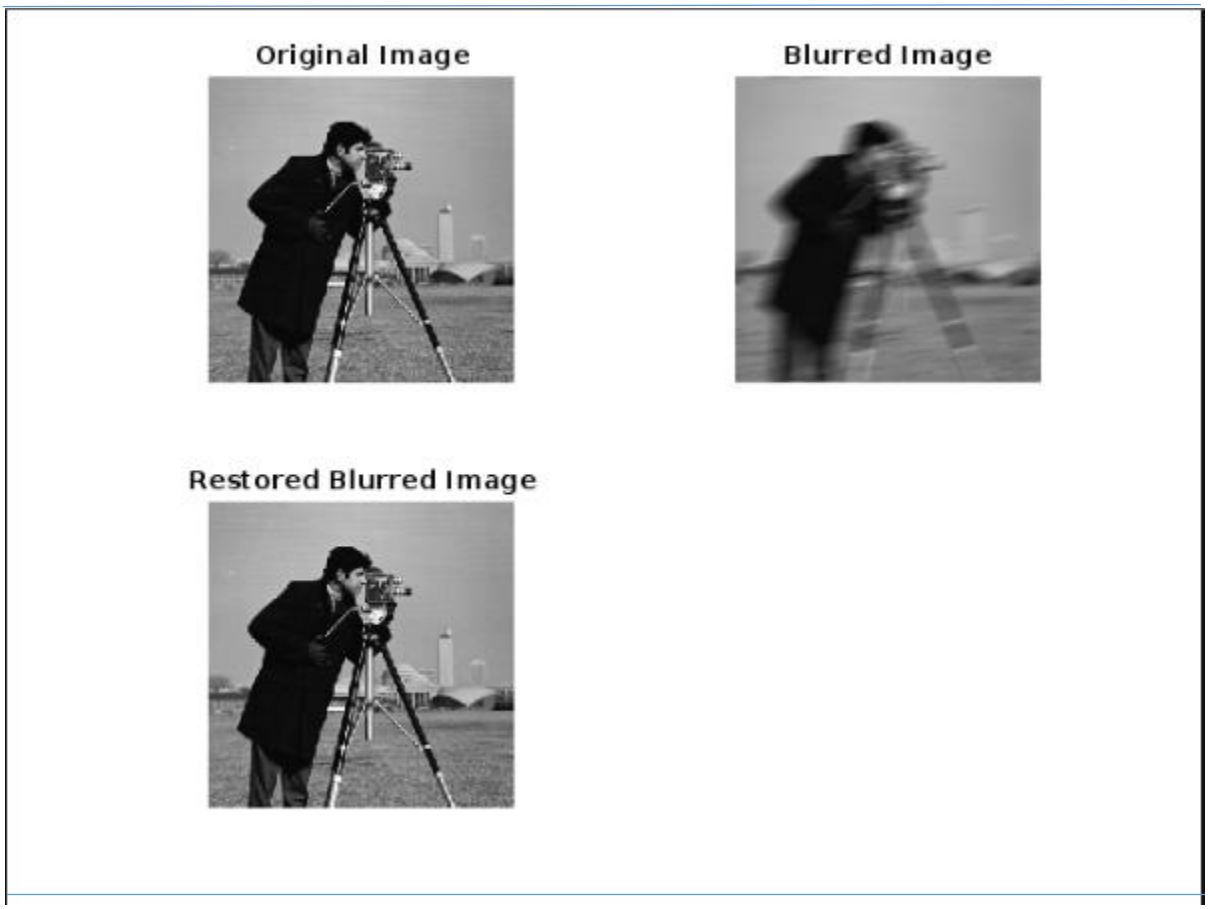
```
imshow(I)
title('Original Image')
PSF = fspecial('motion',21,11);
Idouble = im2double(I);
blurred = imfilter(Idouble,PSF,'conv','circular');
subplot(4,1,2);
imshow(blurred)
title('Blurred Image')
I_noise = imnoise(I, 'gaussian', 0.09);
img=I;
img=double(img(:));
ima=max(img(:));
imi=min(img(:));
mse=std(img(:));
snr=20*log10((ima-imi)./mse)
% Measure Peak SNR
[peaksnr, snr] = psnr(I_noise, I);
fprintf('\n The Peak-SNR value is %0.4f', peaksnr);
fprintf('\n The SNR value is %0.4f \n', snr);
fprintf('\n The MSE value is %0.4f \n', mse);
wnr1 = deconvwnr(blurred,PSF);
subplot(4,1,3);
imshow(wnr1)
title('Restored Blurred Image')
```

- **MATLAB CODE FOR EXISTING METHOD:**

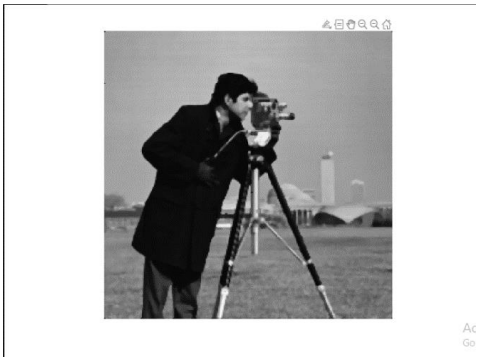
```
clc;
close all;
clear all;
I = imread('cameraman.tif');
imshow(I)
J = imnoise(I,'salt & pepper',0.02);
figure, imshow(J)
I_noise = imnoise(I, 'gaussian', 0.09);
img=I;
img=double(img(:));
ima=max(img(:));
imi=min(img(:));
mse=std(img(:));
snr=20*log10((ima-imi)./mse)
% Measure Peak SNR
[peaksnr, snr] = psnr(I_noise, I);
fprintf('\n The Peak-SNR value is %0.4f', peaksnr);
fprintf('\n The SNR value is %0.4f \n', snr);
fprintf('\n The MSE value is %0.4f \n', mse);
K = filter2(fspecial('average',3),J)/255;
figure, imshow(K)
L = medfilt2(J,[3 3]);
figure, imshow(K)
figure, imshow(L)
```

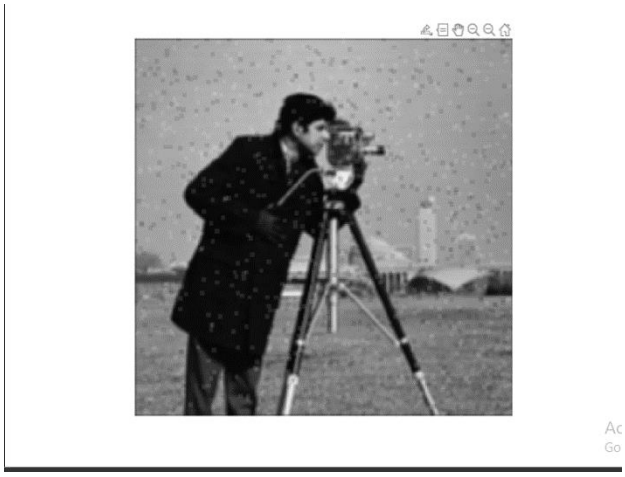
RESULTS AND DISCUSSIONS:

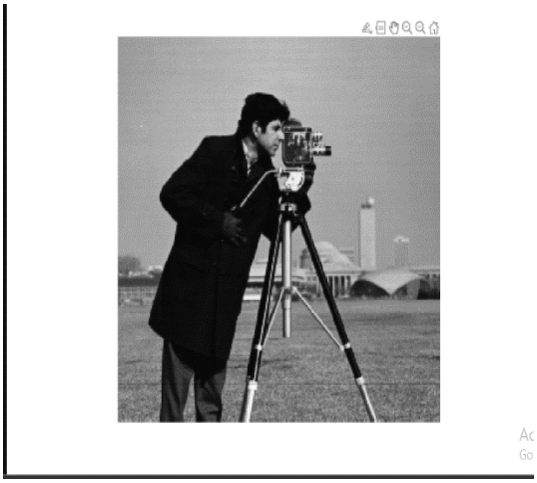
- RESULTS FOR PROPOSED METHOD:



- RESULTS FOR EXISTING METHOD:







S.NO	TECHNIQUE	PSNR	SNR	MSE
1.	WEINER - DECONV	17.5564	11.974	62.3417
2.	MEDIAN - FILTER	17.4857	11.9033	62.2417

CONCLUSION:

There are many techniques. After conducting literature survey on various image techniques proposed by different researchers. Restoration or Deblurring blur from images is a difficult problem to resolve. It is concluded from above techniques that wiener filter give better results as compare to other techniques. For further advancement we try to apply network on these techniques. These Results are concluded on the basis of MSE and PSNR parameters.

FUTURE SCOPE:

- Image restoration seems to reconstruct or recover a degraded image. The information loss due to image acquisition and transmission is restored under some constraints which are suitable for natural images and medical images.
- The lost information is recovered or restored with the prior information about natural images and medical images that leads to achieve more visual realism.
- This study presents adaptive filtering, median filtering, mean filter for image restoration to enhance the quality of an image. In this study input image is first converted to the grayscale image and then noise is inserted in it.
- Further, brightness and contrast is added to the noisy image and the restoration of image is done using adaptive filtering, median filtering.
- Python tool is used to perform filtering and simulation results show results using three different type of filtering.
- In future, soft computing along with artificial intelligence techniques may be used to further enhance the quality of an image

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