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Compare results of restoration of Motion Blurred Images using Non Blind Techniques

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Abstract: ***Image deblurring and restoration has been of great importance nowadays. Image recognition becomes difficult when it comes to blurred and poorly illuminated images and it is here image restoration come to picture. In this paper, we will examine various existing techniques are compared with the proposed PDE techniques and are shown that results are of better quality than these techniques. The comparison is done on the basis of the calculated PSNR for different techniques and for various noises.***
The aim or objective of this thesis "Comparative Analysis of Various Techniques for Non-Blind Restoration of Images" is designed to compute approximation of true images when a blurred image and some information about blurring is given.

I. IMPORTANCE OF POINT SPREAD FUNCTION (PSF)

The quality of the deblurred image is mainly determined by knowledge of the PSF. the fundamental task of deblurring is to deconvolve the blurred image with the PSF that exactly describes the distortion

A. Non-Blind Deblurring

In this technique we have prior knowledge of PSF. It is just reverse process of blurring process.
In this section we introduce the different techniques of image deblurring.
The objective of this paper is:-
To compare the various deblurring techniques for the non-blind image deblurring. We are comparing various techniques like

1) Weiner Filter ,Median Filter
2) Horizontal deblurring algorithm
3) Vertical deblurring algorithm
4) combination of both algorithms

We are performing non blind deblurring for motion blurred images.
We have compared the results for various deblurring techniques on the PSNR values.

1) Weiner Filter: The method is founded on considering image and noise as random process and objective is to find an estimate of deblurred image of the uncorrupted image such that mean square error between them is minimized. The simplest approach is to restore the original image simple by dividing the transform of degraded image by degradation function.

$$F(u,v) = F(u,v) + N(u,v) / H(u,v)$$

a) Order Statistics Filters: These are the spatial filters whose response is based on the ordering of the pixels contained in the image area and compassed by the filter. The response of the filter at any point is determined by ranking result.

$$F_1(x,y) = median\{g(s,t)\} \qquad (4.2)\ F_1(x,y) = \max\{g(s,t)\}$$

$$(4.3)\ F_1(x,y) = mean\{g(s,t)\}$$

(4.4)

b) PDE Method: From the 1-D flux partial conservative equation
∂g/ ∂t= -v ∂g/dx

Also analytically the general solution of this equation is a wave propagating in the positive x-direction is g=f(x-vt) which models our image blurring process.

After discretization of this scheme by FTCS(Finite Time Centered Scheme) we get

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$$\left(\frac{g_j^{n+1}-g_j^n}{\Delta t}\right)=-v\left(\frac{g_{j+1}^n-g_{j-1}^n}{2\Delta x}\right)$$

$$It = It-(v\Delta t)\frac{\partial g}{\partial x}+\frac{(\Delta x)^2}{2}\frac{\partial^2 g}{\partial x^2}$$

2) The Horizontal Deblurring Algorithm: The Algorithm for this scheme is as follows:-

a) Read the original image of size mxn.

b) Introduce the motion blur in x direction to get g (x, y, t) or alternatively we can directly have the blurred image g (x, y, t).
It =g(x, y): Initial Image

c) Set dx=0. 1,dt = 0.1

d) for t=1:niterations

$$It = It-(v\Delta t)\frac{\partial g}{\partial x}+\frac{(\Delta x)^2}{2}\frac{\partial^2 g}{\partial x^2}$$

e) Display the image

3) The Vertical Deblurring Algorithm: The Algorithm for this scheme is as follows:-

a) Read the original image s of size mxn.

b) Introduce the motion blur in y direction to get s(y, x, t) or alternatively we can directly have the blurred image s(y, x, t).
Id =s(y, x): Initial Image

c) Set dy=0. 1,dt = 0.1

d) for t=1: n iterations

$$Id = id-(v\Delta t)\frac{\partial s}{\partial y}+\frac{(\Delta y)^2}{2}\frac{\partial^2 s}{\partial y^2}$$

e) Display the image

4) The Combined Deblurring Algorithm: The Algorithm for this scheme is as follows:-

a) Initial Image I = K(x,y)

b) Set dx=0.1,dt=0.1, no_iterations=50, v_x =1
For t=1: no_iterations

$$I = I-(v_x\Delta t)\frac{\partial k}{\partial x}+\frac{(\Delta x)^2}{2}\frac{\partial^2 k}{\partial x^2}$$

c) R=I
Set dy=0.1,dt=0.1, num_iterations=50, v_y =1

$$R = R-(v_y\Delta t)\frac{\partial I}{\partial y}+\frac{(\Delta y)^2}{2}\frac{\partial^2 I}{\partial y^2}$$

d) Get R and display as final deblurred Image.

e)

II. RESULTS

Result Median Filter(Horizontal Blur)

PSNR Value=44.7412

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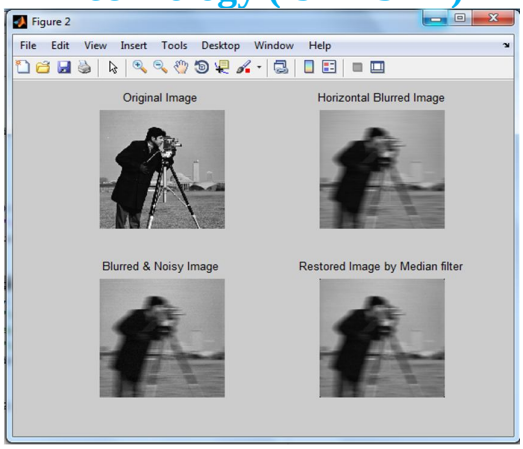
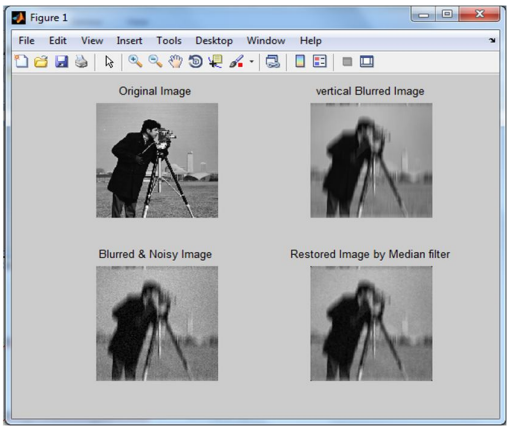


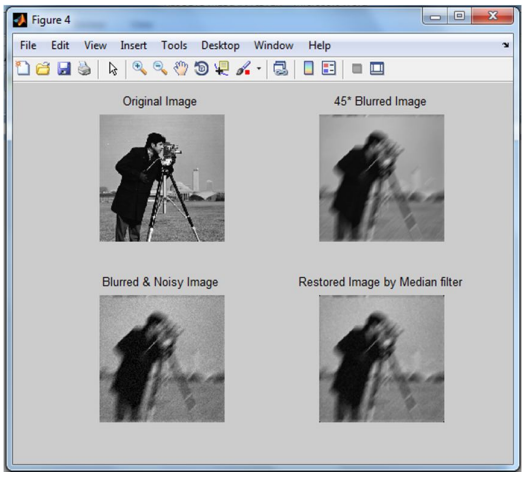
Results Median Filter (Vertical Blur)

PSNR value=26.6929



Results Median Filter (Combine Blur)

PSNR Value=18.2979



Results Weiner Filter (Horizontal Blur)

PSNR Value= 10.2344

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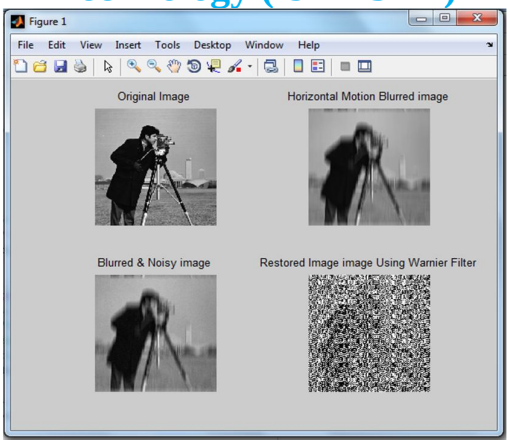
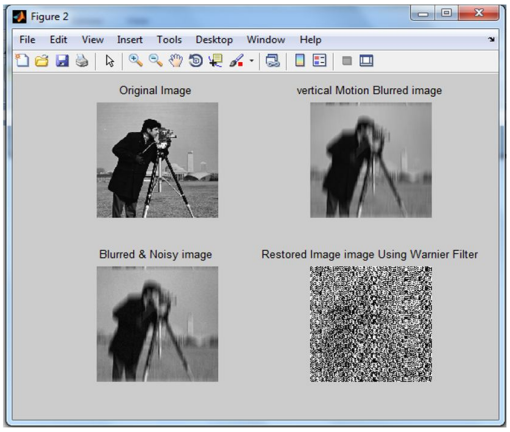


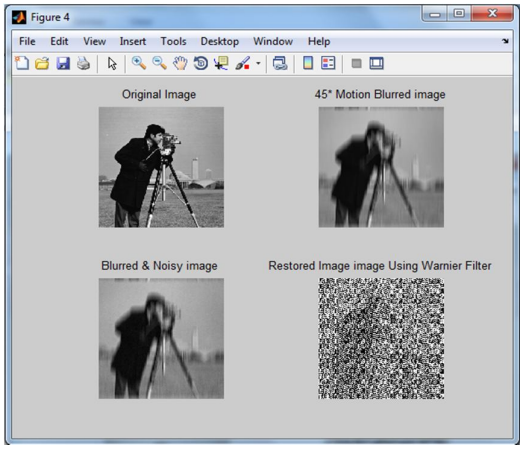
Results Weiner Filter (Vertical Blur)

PSNR Value = 11.1457



Results Weiner Filter (Combine Blur)

PSNR Value = 8.3513



Results PDE(Horizontal Blur)

PSNR Value = 37.8898

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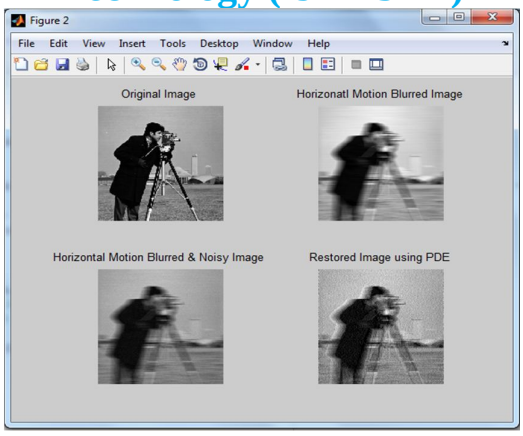
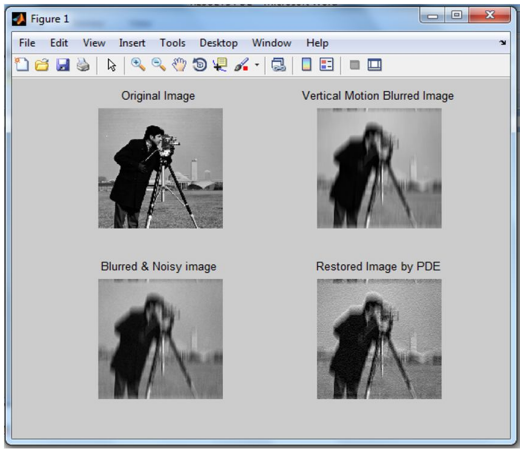


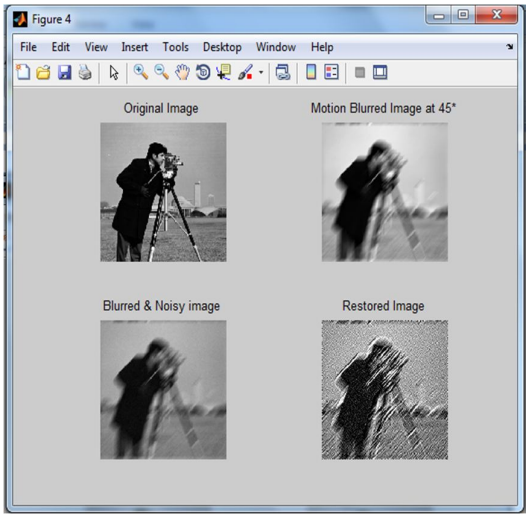
Results PDE(Vertical Blur)

PSNR Value = 38.3336



Results PDE(Combine Blur)

PSNR Value = 13.2344



III. CONCLUSION

In this research various methods for noise reduction have been analyzed. In the analysis, various well-known measuring metrics have been used. The results show that by using the PDE noise reduction is much better compared to other methods. The PDE technique is much efficient than these for the motion blurring. The vertical deblurring shows the better results than horizontal and combined deblurring in PDE.

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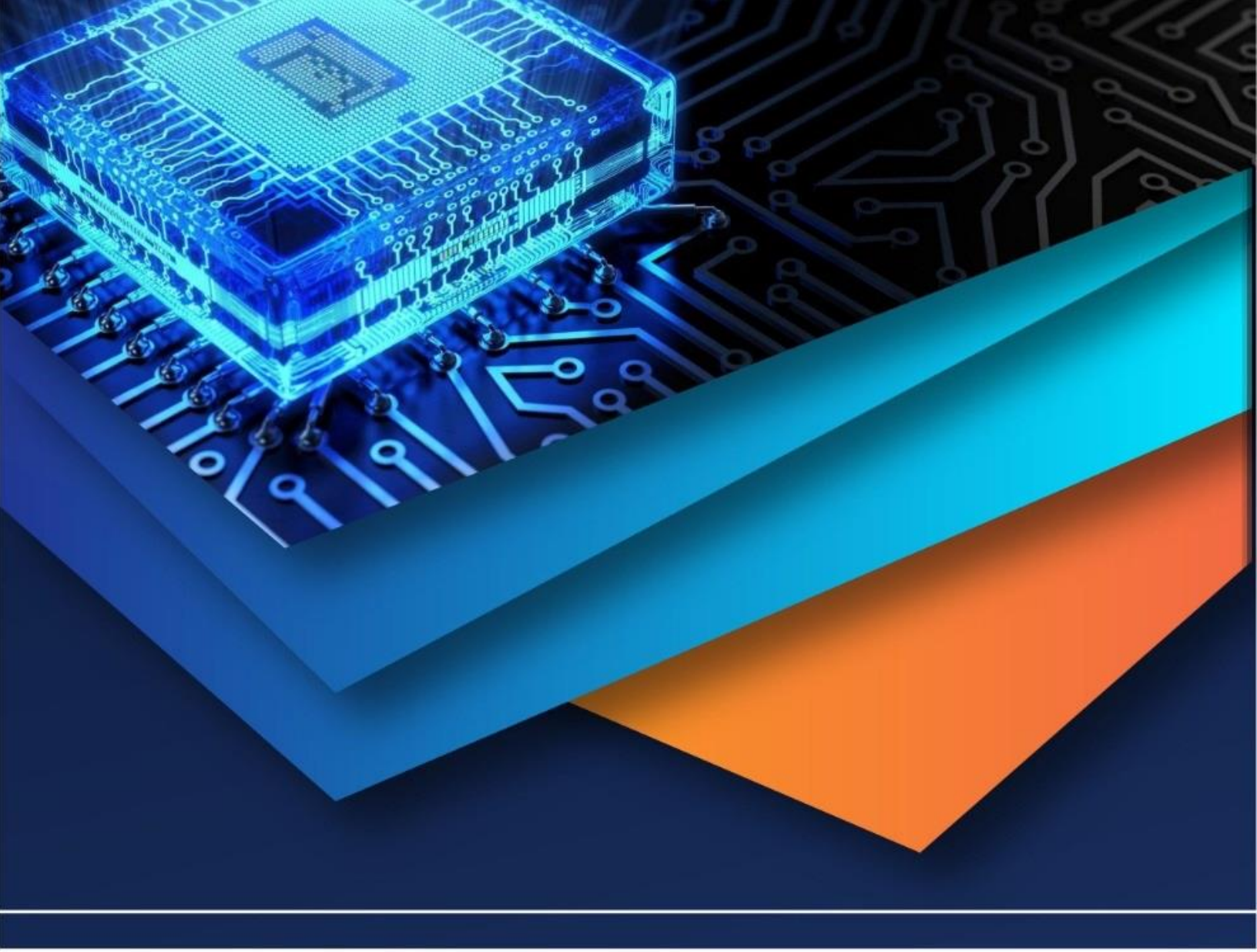

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