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A NOVEL METHOD FOR REMOVING GAUSSIAN BLUR FROM IMAGES

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Abstract: The aim of this paper is to develop a methodology in order to remove the blur from an image at a larger extent. One of the main problems in this research field is the quality of an images. So in this paper is propose an algorithm for improving the quality of an image by removing Gaussian blur, which is an image blur. The deblurring techniques are basically used to sharp an image using different methods & parameters. The deblurring techniques which is used in this research paper is basic derivative method and derivatives which are first series, second, third and fourth series respectively to recover a good quality image.

Keywords: Gaussian blur, Deblurring, Image Deblur, DIP, Gaussian Function, Derivative Method.

I. INTRODUCTION

In this paper we consider the Gaussian blur for improving the image which is blurred and noisy and the blur is removed by using some method. Image quality is the main task of image processing world. Image deblurring basically is to get the sharp image by removing its noise and blur from an image. Blurring may be due to many factors such as noise, dust, camera shake, object shake etc. Deblurring may be done by different methods such as sharpening the edges, filling the pixels which are blank and removing the noise. So the main thing in this paper is to obtain the deblurred image by using a degraded and blurry image. Gaussian blur is occurred when atmospheric condition causes image degradation this effect is called Gaussian effect. It is a type of filter that is used for normal distribution to calculating the transformation to apply to each and every pixel in an image. This type of filter shows a bell shaped curve for the image. This shows that blurring is maximum on the center and less on edges. Gaussian blur is mainly caused by Gaussian function. It blends some pixel inclemently. Deblurring basically done with using degradation method then by removing the blur from a noisy version to sharp version image. It is the work to remove the artifacts from an image to get the complete information of an image. Blurring mainly caused by different types of blur such as motion blur, out-of-focus blur, average blur and Gaussian blur. Firstly, we take an image and blur it using different types of filters such as Gaussian filter of 3*3 or 5*5 and then using derivative method the image becomes clearer as from its previous image. Blurring occurs due to many reasons in an image such as noise, lens problem, incorrect focusing with device, gaussian blur, motion blur, average blur etc. There are mainly two methods of deblurring image.

- Blind deconvolution
- Non-blind deconvolution

In blind deconvolution method the psf is estimated and then blur is removed and in non-blind deconvolution method the psf is unknown to viewer. The blind deconvolution method of deblurring is more complex and time consuming than the non-blind deconvolution. After applying different deblurring technique we get the recovered image which provides us the complete information of an image.

II. LITERATURE REVIEW

Deblurring is very crucial part of image processing and research world. There are different models are used for deblurring. A number of papers are published for blurring problems in which many methods are given for removing the blur or noise from digital image. Yuan Sun Quan and Shum [1] presented approach on image deblurring with the help of noisy image. Taking photos under dim light using a camera is difficult. If the camera is set to long click time the image is blurry or noisy due to camera shake or other reason. And the image is dark when it is taken with a short click time. Firstly, the estimation is done on blur kernel and secondly using both images the deconvolution is proposed to reduce the ringing effect in an image. Thirdly a gain controlled deconvolution is used for the remaining ringing artifacts.

Kalotra and Sagar [2] considered the algorithm based on blurred image restoration in the field of medical imaging. This paper focused on restore the high quality image from a degraded version image. It is mainly used for the medical images such as patient's X-ray image or other. It deals with the various diseases of patients which are facing problem of Gaussian and motion blur. For this two image restoration techniques are used which are LRA and BID techniques. As we know medical images are demand of these days. But these images are suffered from the Gaussian and noisy blur. Sharma and kumar [3] presented the research on effective blind deconvolution deblurring technique. In this paper the discussion is mainly on image restoration and psf. This technique will capitalize on the statistics on the blurry image and the sharp refined image. It is an iterative approach to converge the parameters. These image restoration methods are direct techniques and their result is a one step process. The main goal of this paper is to purpose a blind deconvolution algorithm for the image blur which changes the blurred image into a sharp version of image. Anandaraj.S, Deepa and prema [4] studied about deblurring of images using kernel estimation algorithm method. The aim of this paper is to deblurring with the help of noisy image. Recovering a high quality image from a noisy or blurred image is a tough task. Deblurring from a single image is a challenging problem and the kernel estimation and

image deconvolution is under constrained. The proposed method of super resolution shows better results. From this there is low error in root mean square and higher signal to noise ratio. Saini and Himral [5] focuses on mainly image restoration concept for getting true image from the noisy and uncorrupted image. In it there is use of Blind Deconvolution strategy for recover a sharp image using the image restoration technique. A true image provides the valuable information. Suryanarayana, Deekshatulu, Kishore and Kumar R. [6] In this paper a novel algorithm for Gaussian blur estimation and removal is proposed by using 3*3 sub-windows in which the test pixels appear. The standard deviation (STD) for all sub-windows are used to defined reference STD and minimum and maximum standard deviations. The average STD is then deliberated as the average of those STDs of all sub-windows whose STD falls within the range of [σmin, σmax]. This σavg is used for identifying and removing additive Gaussian blur. The performance is differentiate with that of the standard mean filter. The present scheme is outperforming than the standard mean filter. De and Masilamani [7] presented a new method concerned the NR-IQA (No-reference Image Quality assessment). In this paper the standard deviation of Gaussian filter kernel is used for different images. This concept is used for deblurring the images. When there is blur increases in image the frequency component is decreases. So it is an image quality measure for the image. Image Quality measure is obtained after center Fourier transform for detecting sharpness in an image. Gavilan, R. Arahal and Ierardi [8] presented their work on roll angle estimation. The estimation of plane angles is used to remove the blur in an image. Gradient algorithm is also used in this technique. These are basically vision enhanced methods for the aerial images. It is related to the automatic landing methods. Saleh Al-amri, Kalyankar and Khamitkar S.D. [9] studied the method of Restored Gaussian Blurred Images when there is no information of PSF is given. In this paper different type of deblurring methods are compared and different experiments are done on different type of techniques, such as Wiener Filter, Lucy-Richardson Algorithm Method, Blind Deconvolution Algorithm Method, Regularized Filter Deblurring Method etc. Singh and Sahu [10] purposed a method for deblurring images using transformation spread functions (TSFs). Quality measurement parameters are also calculated in this. HDR images are derived by PSFs. Deblurring is said to be a method used to sharp and clear the image. In this paper, the PSF is estimated for blurry image. Madghe and Kasturiwala [11] discussed the methodology of image enhancement for improving the quality of an image by using GLAS algorithm. The image enhancement is basically a process of obtaining the original image which is free from blur and noise. The two methods of image enhancement are: Spatial domain and Transform domain. These methodology increases the quality of an image. Image enhancement is the demand of today's world for improving the quality of image. Henawy, Amin, Ahmed, Adel [12] concerned about the blur kernel and the deblurred image both. They also introduced the blur type, noise model and different deblurring techniques. Image blur may be occurring due to many reasons such as camera shake, object movements etc. After that he obtained image degrades and we cannot see it clearly. According to this paper, all captured images are less or more blurry. And there are a lot of factors for degrading the quality of an image. Kamboj and Moudgil [13] worked on Hybrid Median Filter to remove the noise or blur from an image. They considered different filtering techniques for sharpening an image but the suitable technique purposed by them is hybrid median filter by which we can get the better result of a blurry image. By using different filter the value of PSNR is calculated and the hybrid filter gets the better result than median filter. Tyagi and Singh [14] have discussed about the detection of regionto be inpainting in an image and then fill the hole and scratches by reconstructing them to get fine image. There are two approaches used for image deblurring one is texture synthesis and inpainting to restore the image. For filling the pixel value two types of algorithm are used i.e. Boundary fill and Flood fill algorithm. Vankawala, Ganatra and Patel [15] proposed the surveys on different image deblurring techniques. This paper suggests about the reason of blurring on images. It may be camera shake, motion blur, out-of-focus blur etc. Image deblurring is also called image enhancement which is used to reduce the amount of blur in an image. The deblurring is mainly used to reduce the blur quantity and convert the degraded version of image into sharpen and clear version. This paper concerned the cause of burring in the image and it is very important to increase the effect of deblurring to get the good result.

Daniel Fan and Nagy [16] explained the paper on Synthetic boundary conditions for image deblurring. In this paper the new boundary condition is used when reconstructing a new observed image from the blurred and noisy image. This approach uses the information from the new image that boundary conditions continue on edges and texture across boundary. In this paper an efficient algorithm is used for implementing the new boundary condition.

III. PROBLEM FORMULATION

In this present work, the objective of deblurring method is to develop a technique to remove the Gaussian Blur completely from an image. The main purpose of this proposed work is to get a sharp version of image using the degraded version of image. Firstly, an original image is taken in MATLAB (Matrix Laboratory) environment and degraded using different types of filter such as Gaussian filter.

IV. ALGORITHM FOR REMOVING BLUR FROM IMAGES

- Read an image: Input an image f (x, y) which is to be denounce.
- Imitate the blur in the image: Blur an image with a Gaussian filter using psf value 3*3 or 5*5.
- Evaluate the first series, second series, third series and fourth series derivatives respectively. Taking these values always absolute.
- Restore the blurred image: This step involves restore the blurred image using different approximated derivative equations.

For 2-D images the approximation derivative equations as:

Firstly, using y fixed, approximation derivative equation is:

$$\frac{d^2f}{dx^2} = f(X+1,Y) - 2f(X,Y) + f(X-1,Y) \quad \ldots\ldots (3)$$

Keeping x fixed, approximation derivative equation is:

$$\frac{d^2f}{dy^2} = (X,Y+1) - 2f(X,Y) + f(X,Y-1) \quad \ldots\ldots (4)$$

Adding these two equations (3) and (4):

$$\nabla^2 f(x,y) = \frac{d^2f}{dx^2} + \frac{d^2f}{dy^2}$$

$$\nabla^2 f(x,y) = (X+1,Y) + f(X-1,Y) + f(X,Y+1) + f(X,Y-1) - 4f(X,Y) \quad \ldots\ldots (5)$$

Similarly, for 3-D images the approximation derivative equation can be calculated by:

$$\nabla^3 f(x,y) = f(X+1,Y) + f(X-1,Y) + f(X,Y+1) + f(X,Y-1) + f(X,Y+2) + f(X+2,Y) + f(X,Y-2) + f(X-2,Y) - 8f(X,Y) \quad \ldots\ldots (6)$$

For 4-D images the approximation derivative equation can be calculated by:

$$\nabla^4 f(x,y) = f(X+1,Y) + f(X-1,Y) + f(X,Y+1) + f(X,Y-1) + f(X,Y+2) + f(X+2,Y) + f(X,Y-2) + f(X-2,Y) + f(X,Y+3) + f(X+3,Y) + f(X,Y-3) + f(X-3,Y) - 12f(X,Y) \quad \ldots\ldots (7)$$

5. If second series derivatives less than zero, the calculated approximation derivative function are increasing otherwise it is decreasing.

Increasing function can be calculated as:

$$Z(x,y) = f(x,y) + \nabla\frac{f(x,y)}{2} + \nabla^2\frac{f(x,y)}{3} + \nabla^3\frac{f(x,y)}{4} + \nabla^4\frac{f(x,y)}{5} \quad \ldots\ldots (8)$$

Decreasing function can be calculated as:

$$Z(x,y) = f(x,y) - \nabla\frac{f(x,y)}{2} + \nabla^2\frac{f(x,y)}{3} + \nabla^3\frac{f(x,y)}{4} + \nabla^4\frac{f(x,y)}{5} \quad \ldots\ldots (9)$$

6. If the second series derivation is equal to zero, the approximation function will be same as it is. Z(x,y)=f(x,y). …….. (10)

7. Output with a deblurred and sharp image with improved quality.

Thus by using this calculated derivation algorithm, we can get the best approximation for Gaussian blur.

V. RESULTS

In this section we demonstrate the different examples by using the proposed derivative algorithm. Firstly, we represent the gray scale images and then coloured image results by removing gaussian blur from them. We take a blurred image and then making sharp it by using our proposed algorithm. In examples, we can see there is improvement in the image.

Deblurring image using 3*3 filters:

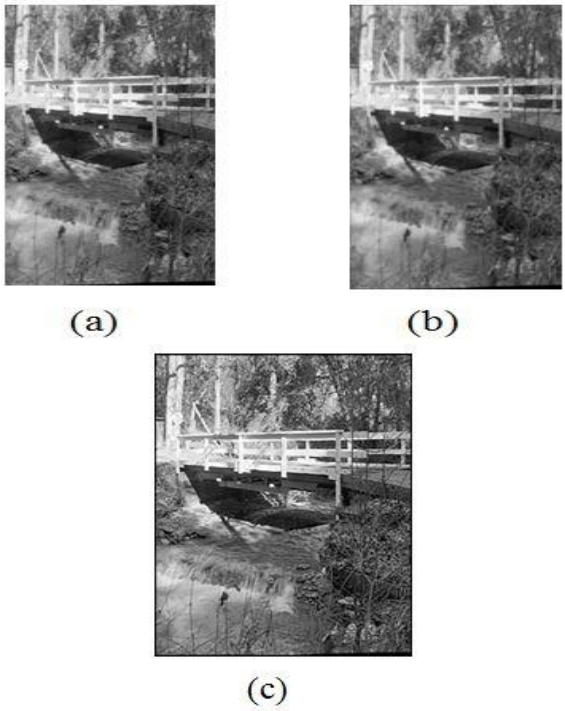

Figure a) Original image b) Blurred image c) Restored image

Deblurring image using 5*5 filters:

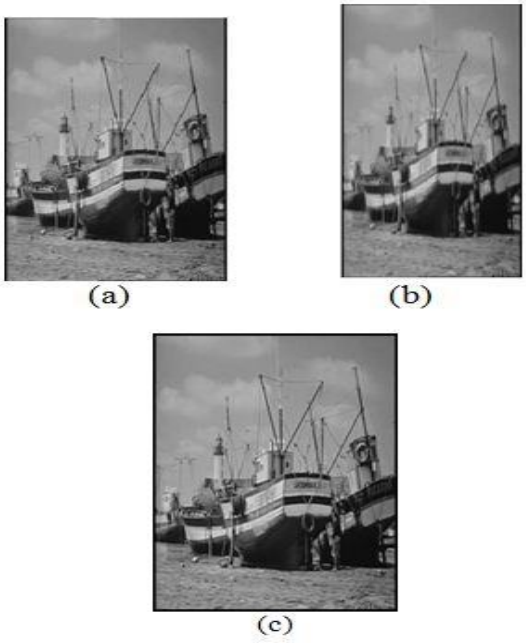

Figure a) Original image b) Blurred image c) Restored image

Deblurring image using 7*7 filters:

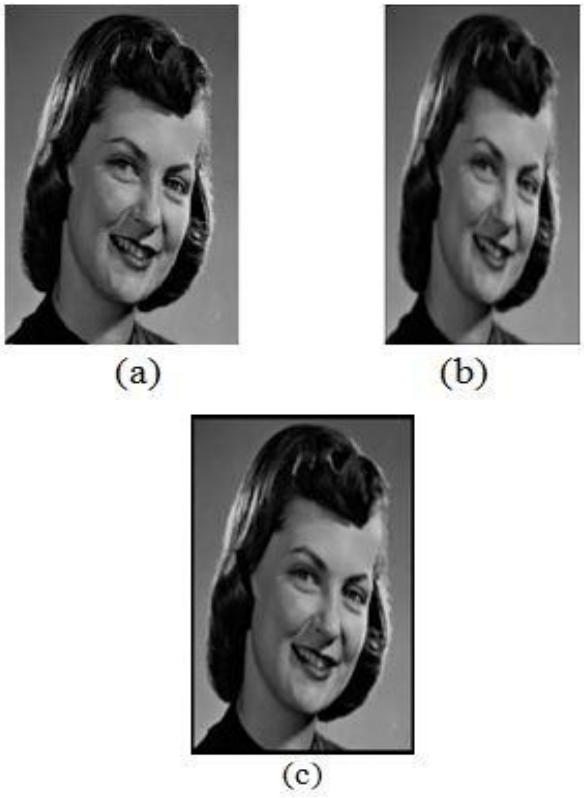

Figure a) Original image b) Blurred image c) Restored image

Now for the coloured images we represent different examples having the effect of restored sharp images:

Deblurring on coloured image using 3*3 filters:

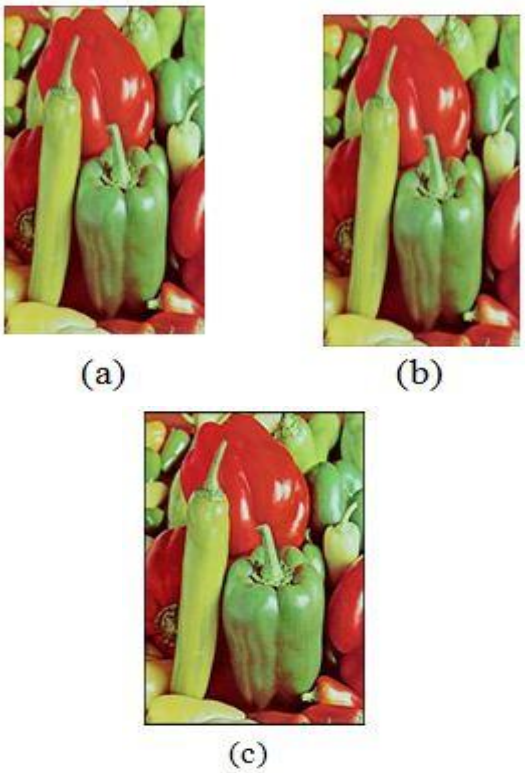

Figure a) Original image b) Blurred image c) Restored image

Deblurring on coloured image using 5*5 filters:

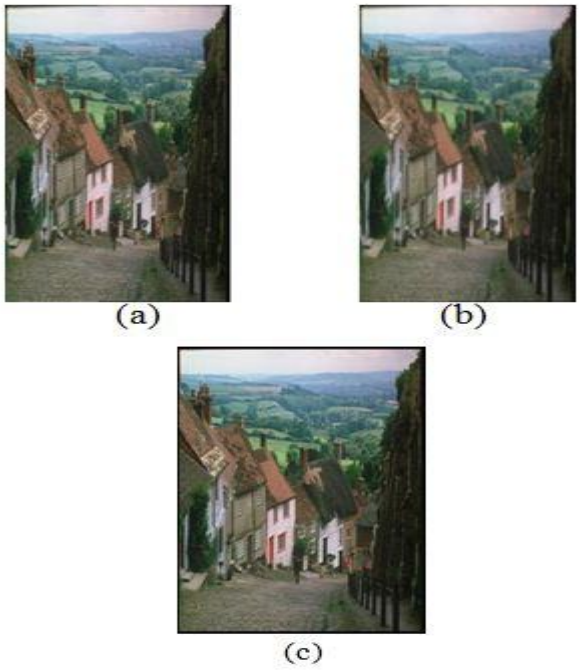

Figure a) Original image b) Blurred image c) Restored image

Deblurring on coloured image using 7*7 filters:

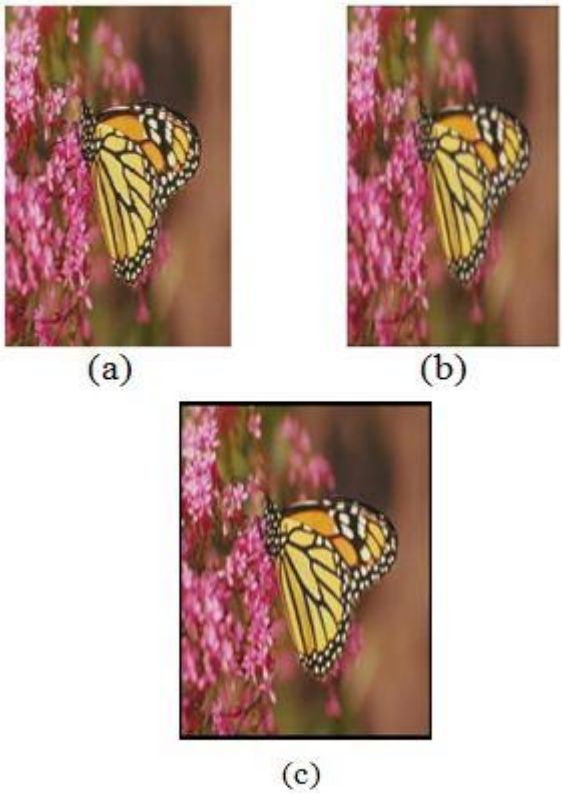

Figure a) Original image b) Blurred image c) Restored image

Some other example below shown improved quality of blurred image:

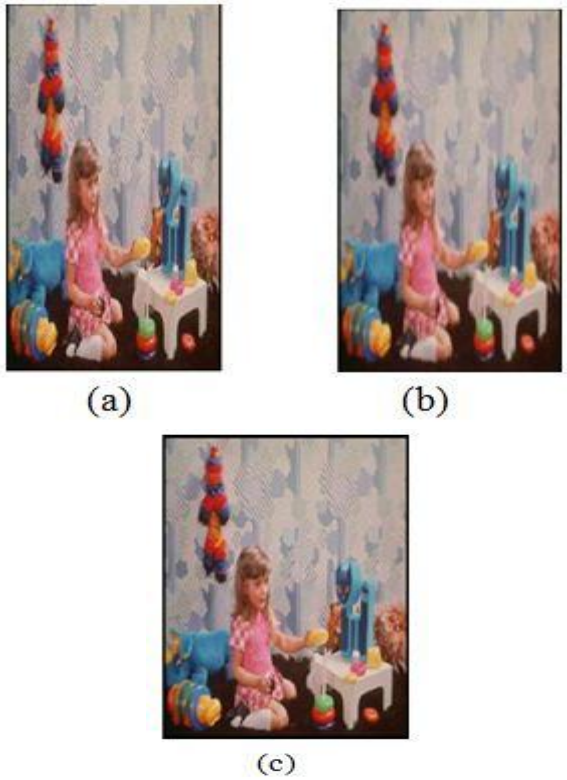

Figure a) Original image b) Blurred image c) Restored image

VI. CONCLUSION

In this proposed algorithm not only deblur the images with a high quality but also preserve the same information present in the objects of image. And we apply this algorithm on different images and compare all the results with each other. The results for the coloured images are also shown by this derivative method. From the different results produced on the different images we can see that our algorithm works efficiently and effectively in a good manner. Many of parameters are used to improve the quality of an image. So the proposed algorithm is about the image quality. Deblurring uses different parameters such as degraded model, restoration techniques, different algorithms and other techniques.

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