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A NOVEL METHOD TO IMPROVE THE QUALITY OF IMAGE

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Abstract: Image processing is as an important field of research in which the image is converted into digital form and some basic operations are operated on it. In this paper we propose an algorithm for deblurring an image to get a sharp version from its noisy image. The aim of this paper is to develop a methodology in order to remove the blur from an image at a larger extent. The deblurring techniques which is used in this research paper is basic derivative method and derivatives which are first order, second, third and fourth order respectively to recover a good quality image. From this method the blurry factor becomes less and less and image gets sharp as from the previous image.
Keywords: derivative method, deblurring, image deblur.

I. INTRODUCTION

The Image deblurring is an important task in the research world. 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 average filter of 5*5 or 7*7 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, 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

Image deblurring is very crucial part of image processing world. There are different models are used for deblurring problem. A number of papers are published for blurring problems in which many methods are given for removing the blur or noise from an image. Sharma and kumar [1] 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. Yuan Sun Quan and Shum [2] 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. Anandaraj.S, Deepa and prema [3] 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. Kalotra and Sagar [4] 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. Meen Lee et al. [5] explained the research on deblurring of images based on the estimation of PSF parameters and the post processing. The two parameters of psf are length and angle of blur kernel. The deblurring performance is affected by the accuracy of estimation of the two parameters. This paper proposes the method of psf parameter estimation and reconstructing the image using post processing method. Vankawala, Ganatra and Patel [6] 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. Maheshwari [7] concluded the study of image restoration techniques. and research. But during transmission and acquisition the Image restoration is basically used for improving the blurry image by removing the different type of artifacts in it. This paper gives the basic idea about image restoration technique and the various deblurring techniques. Image restoration is an important field of image processing world and research. It is widely used in various applications such as medical imaging. Daniel Fan and Nagy [8] 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. Z. Reti [9] studied on the topic which is based on deblurring ages blurred using discrete Gaussian. As we know Gaussian blur is used for the degradation of an image. In this paper main aim is to deblur the imagime using discrete Gaussian. Hypergeometric series is used for the calculation for deblurring of images. A modified Gaussian blur is used for this purpose. The review of the research literature has given the parameters of the various techniques. This paper presents a derivative model to recover a sharp version of image from a degraded image version.

III. PROBLEM FORMULATION

In our present work, the objective of deblurring method is to develop a technique to remove the blur completely from an image. The main goal 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 environment and degraded using different types of filter such as average filter.

IV. ALGORITHM FOR DEBLURRING IMAGE

- Read an image: Input an image f(x, y) which is to be deplored.
- Simulate the blur in the image: Blur the image with an average filter using psf value.
- Calculate the first order, second order, third order and fourth order 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:

$(d\hat{}2\ f)/(dx\hat{}2) =$
$f(x+1,y) - 2f(x,y) +$
$f(x-1,y)$ ……..…… (3)

Keeping x fixed, approximation derivative eq. is:

$(d\hat{}2\ f)/(dy\hat{}2) = (x,y+1) - 2f(x,y) + f(x,y-1)$ …….. (4)

Adding these two equations (3) and (4):$-\nabla\hat{}2\ f(x,y) = (d\hat{}2\ f)/(dx\hat{}2) + (d\hat{}2\ f)/(dy\hat{}2)$

$\nabla\hat{}2\ f(x,y) = (x+1,y) + f(x-1,y) + f(x,y+1) + f(x,y-1) - 4f(x,y)$… (5)

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

$\nabla\hat{}3\ f(x,y) = f(x+1,y) + f(x-1,y) + f(x,y+1) + f(x,y-1) + f(x,y+2) + f(x+2,y) + f(x,y-2) + f(x-2,y) - 8f(x,y)$…… (6)

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

$\nabla\hat{}4\ f(x,y) = f(x+1,y) + f(x-1,y) + f(x,y+1) + f(x,y-1) + f(x,y+2) + f(x+2,y) + f(x,y-2) + f(x-2,y) + f(x,y+3) + f(x,y-3) + f(x-3,y) - 12f(x,y)$…… (7)

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

Increasing function can be calculated as:

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

Decreasing function can be calculated as:

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

If the second order derivation is equal to zero the approximation function will be same as it is.

$$Z(x,y) = f(x,y) \quad \text{..... (10)}$$

Output with a deblurred and sharp image with improved quality. Thus by using this calculated derivative algorithm we can get best approximation for deblurring.

V. RESULTS

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

*Deblurring image using 5*5 filters:*

(a) (b)

Figure a) Blurred image b) Recovered image with proposed algorithm

*Deblurring image using 3*3 filters:*

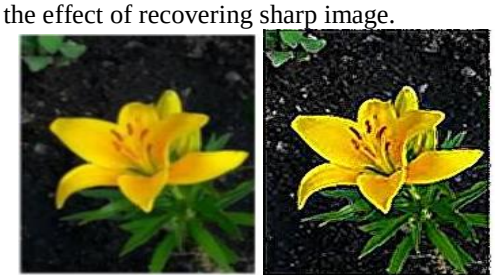
a) b)

Figure a) Blurred image b) Recovered image with proposed algorithm

Deblurring image using 7*7 filters:

Figure a) Blurred image b) Recovered image with proposed algorithm

Now for the colored image we represent different examples having the effect of recovering sharp image.

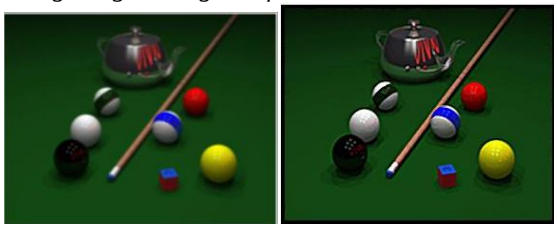


(a) (b)

Figure a) Blurred image b) Recovered image with proposed algorithm

Figure a) Blurred image b) Recovered image with proposed algorithm

*Deblurring images using 3*3 filters:*



(a) b)

Figure a) Blurred image b) Recovered image with proposed algorithm

(a) b)

Figure a) Blurred image b) Recovered image with proposed algorithm

Some other example below shown improved quality as blurry image:

a) b)

Figure a) Blurred image b) Recovered image with proposed algorithm

VI. CONCLUSION

The proposed algorithm not only deblurs the image 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 colored 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.

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