A Review On Image Restoration And Its Various Blind Image Deblurring Algorithms

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Abstract- Many pictures suffer from image blurring due to various factors such as camera shake and poor focus. Blurring is usually caused by defocus or relative motion, which can be formulated by the convolution of the point-spread-function(PSF) and latent image. Restoration of image is necessary to raise the quality of deteriorated images. Blurred image restoration has multiple applications in area like astronomical imaging, medical imaging or remote sensing etc. This paper presents literature review of work to improve the restoration performance and restore the clear image from blur image with less MSE in fast few years. Their corresponding advantages and disadvantages and overviews on various image restoration and deblurring applications are also present.

Keywords- Blur, Image Restoration, Image degradation, Deblurring, PSF

1. INTRODUCTION

In daily life, many images such as photographs, pictures, books, video and so on, so the image and human life are indivisible. With the fast growth in modern digital technology, using digital image as digital information carrier has been the people's attention. The digital images are used in various area, such as medical, military and transportation, microscopy imaging and photography deblurring *etc.* The recorded image consisting a noise and blur version of original picture. The analysis of various pictures using techniques that can identify shades, colours and relationships that cannot be perceived by the human eye. The images in bitmapped graphics format and it is captured and scanned in with digital cameras. Restoration is field of image processing used for an reconstruct or recover a image from degraded image. Blur is one of example of image detoriation and many researches on the restoration of blur image has been proposed. In the case of restoration of degraded image if the blurring factor is unknown, It is essential to figure a PSF (Point-Spread-Function) and its ideal image along with an input image. A method of alternately repeating the PSF and ideal image estimation gives rise good results. However there are various problems such as occurrence of ringing due to an estimation error of the PSF and emphasis of noise. Therefore, further improvements in restoration performance are needed. The motion blur image restoration has been developing in the land of vitality.

Fig.1. Blurred Image Before Restoration [10]

Fig.2. Original Image Obtain After Restoration [10]

In this for restoration of blur image the various deblurring algorithms are used. Thus various methods are need to improve the restoration performance and restore the clear image from blur image with less MSE. In this various parameters are comapare which are PSNR, error ratio, SNR etc. Our proposed method reduces processing time by selecting an optimal patch for (PSF) estimation gives rise good results. Therefore, further improvements in restoration performance are needed.

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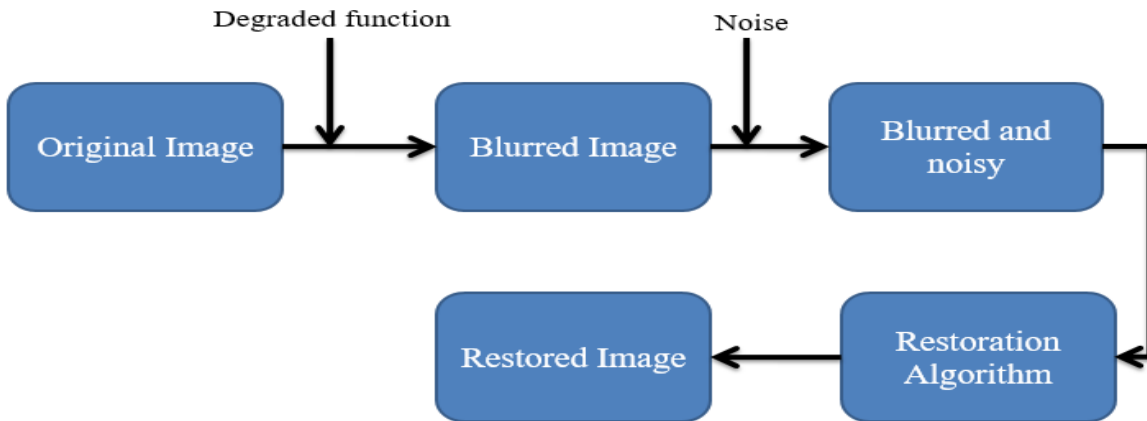*Available online at www.ijrat.org*

Fig.3. General Block Diagram For Image Restoration of Blurred Image [8]

2. SURVAY ON IMAGE RESTORATION AND DEBLURRING

There are different filtering techniques available to reduce blurring and noise, but it has its own disadvantages and then developed various deblurring algorithms

Satoshi Motohashi [1] worked on gradient reliability map(R-map). In this paper [1], a novel algorithm based on two-step blind deconvolution is done. In this paper, during latent image restoration step, total variation regularization is applied to reduce texture components and noise; and shock filter is applied to emphasize the edges. This process is used to improve the PSF estimation performance. The gradient reliability map is then applied to decrease the edges, which are severely affected in the PSF estimation. This method is utilized to achieved the best performance for average PSNR, average error ratio, and success rate in the objective evaluation. For further research, we intend to improve maximum error ratio, which was decreased because there were a few restored failure images using this method. Fu-Wen Yang [2] proposed a algorithm on the blind deblurring method. In this blind deblurring method needing to predict a blur kernel in our own way. The color distribution of edges is more distinct in clear image than in a blurred image. The filter is proposed to make edges in a blurred image clearer for use as reference image. The blur kernel is estimated from the reference image. The blurred image is then deconvolved with the estimated blur kernel to introduced latent image. Marapareddy. R [3] worked on Wiener filtering for blur image restoration which is degreded due to complex surrounding environment. Here first find out atmospheric turbulence degradation model. After that inverse filtering and minimum mean square error i.e., for restore the blurring image the wiener filtering is applied. Here the value of PSNR seems to be lower than the one of the image we feel more comfortable with wiener filter.

Shuyin Tao [4] formulate the deconvolution problem by combining negative logarithmic poisson likelihood with total variation (TV) regularization, and describe a fast algorithm which is based on the method of Lagrange multiplier to solve it. The restored image is achieved by alternately solving two sub-problems. One is simple convex problem which has a closed from solution and the other is TV regularized deconvolution problem having Gaussian noise model. This technique shows that the algorithm runs very fast and achieve restored image of high accuracy.

Satoshi Hirano [5] worked on the blind method restoration that rapidly restored blurred image using local patches. In this algorithm, a portion of blurred image is utilized for the PSF(Point Spread Function) calculation. In addition, a new technique proposed for a automatic PSF size estimation algorithm which is used for an generation of autocorrelation map. This is used for finding an edge map from Laplacian filter and the sobel filter and takes an optimal edge map for PSF estimations. It also selects patch based on strength of edge.

Rinku kalotra [6] worked on the two popular restoration techniques viz. LRA and BID are used and analysed in the restoration of X-ray images. Restoration of blurred image is essential as such image suffer from distortion like noise and blur. X-ray image play a important role in considering with the detection of several disease in a patients and they face the problem of motion blur and Gaussian noise. Therefore their restoration is must which can be done with image restoration technique. Here the

performance of BID technique while recovering X-ray image is better than the LRA technique. Here technique needs a lot of improvement.

Punam patil [9] worked on the blind deconvolution algorithm with canny edge detector. In this method the original image is blurred by applying Gaussian filter. In the blurred image edges the canny edge method is used for detection of ringing effect and then it can be removed before restoration process. For restoration of blurred image blind deconvolution algorithm is applied. Blind deconvolution algorithm is used in effect when no information of distortion is known. This algorithm is utilized to restores the PSF and image at the same time.

Masanao Sawada [7] worked on novel blind image restoration algorithm which is depends on the total variation(TV) regularization and the shock filter. It consist of alternative iteration of the point spread function calculation and deconvolution. With this they obtain the cleared image from blurred image without increasing noise. Processing time of this technique is less than 80%.

3. COMPARISON

There are lots of improvements up to latest dated in field of deblurring and restoration of image. As move towards the next techniques there are some advantages over the previous one and also some drawbacks of the previous method are tried to remove in the next upcoming method. The following table shows the comparison of the existing deblurring and restoration of images.

TABLE I. COMPARISON OF THE EXISTING RESTORATION AND DEBLURRING ALGORITHMS

REF NO.	RESEARCHERS	METHODOLOGY USED	RESULT
1.	Satoshi Motohashi, Takahiro Nagata, Tomio Goto	A gradient reliability map(R-map) is used to enables edge selection appropriate for PSF and latent image.	Processing time of this method is 123 times more faster than the other methods
2.	Fu-Wen Yang, Hua Chuang	A algorithm on the blind deblurring method needing to calculate blur kernel.	It is utilized to make edges in a blurred image clearer for use as a reference image
3.	Marapareddy. R	An Wiener filtering is used for blur image restoration and it is degraded due to complex surrounding environment.	The value of PSNR seems to be lower with Wiener filter
4.	Shuyin Tao, Wende dong	The method is used to formulate the deconvolution problem by combining it with negative logarithmic poisson by total variation regularization, and describe a fast algorithm which is depends on the method of Lagrange multiplier.	This method shows that allgorithm runs faster and achieved restored image of high accuracy
5.	Satoshi Hirano, Masaru Sakurai	The local patches are used to restores the blur image.	Processing time of this method is less than 80% than the other method
6.	Rinku Kalotra, Sh. Anil Sagar	In this the two restoration techniques are used BID and LRA are applied and analysed in the restoration of X-ray images.	The ringing effects present at the edges of the restored image by the process of deconvolution needs improvement
7.	Masanao Sawada, Tomio Goto	A blind image restoration method depends on the shock filter and total variation(TV) regularization.	This method creates exact de-blurred image and processing time is lower than other methods

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9.	Punam Patil, R.B. Wagh	The blind deconvolution algorithm with canny edge detector.	It is used when we don't known about the information of distortion is known. It restores PSF and image at same time

4. CONCLUSION

The various methods and techniques used for the restoration of blurred image using image deblurring algorithm for bettering image quality were described in this paper. Advantage of using image deblurring algorithm is to de-blur the degraded image on prior knowledge of PSF and noise for better restoration process. The outcomes of the experiment show that we have achieved the best performance for average PSNR, average error ratio, and success rate in the objective evaluation. The various methods and techniques described in this paper have shown better results in terms of accuracy. But there is need to improve the maximum error ratio, which was decreased because there were a few restored failure images.

REFERENCES

[1] S. Motohashi, T. Nagata, T. Goto, Reo Aoki, Haifeng Chen. "A Study on Blind Image Restoration of Blurred Images using R-map". IEEE International Workshop on advanced image technology(IWAIT), 2018.

[2] Fu-Wen Yang, Hwei Jen Lin, and Hua Chuang. "Image Deblurring". IEEE Smart World, Ubiquitous Intelligence & Computing, Advanced & Trusted Computed, Scalable Computing & Communications, Cloud & Big Data Computing, Internet of People and Smart City Innovation, 2017.

[3] Marapareddy. R. "Restoration of blurred images using wiener filtering". International Journal Of Electrical, Electronics and Data Communication, 2017.

[4] S. Tao, W. dong, Q. Wang, Z. Tang. "Fast Non-blind Deconvolution Method for Blurred Image Corrupted by Poisson Noise". IEEE International conference on Progress in Information and Computing(PIC), 2017.

[5] S. Hirano, M. Sakurai, T. Goto, H. Sensshiki. "Fast Blind Restoration of Blurred Images Based on Local Patches". IEEE International Conference on Electronics, Information, and Communications (ICEIC), 2016.

[6] Rinku Kalotra, Sh. Anil Sagar. "A Novel Algorithm for Blurred Image Restoration in the field of Medical Imaging". International Jornal of Advanced Research in Computer and Communication Engineering, 2014.

[7] K. Ohkoshi, M. Sawada, T. Goto, S. Hirano, and M. Sakurai. "Blind Image Restoration Based on Total Variation Regularization and Shock Filter for Blurred Images". IEEE International conferene on Consumer Electronics, pp. 219-220, 2014.

[8] H. Riyaz Fathima, Mr. K. Madhan Kumar. "Evaluation of Blind image Restoration". International Journal of Advanced Research in Computer Engineering & Technology (IJARCET), pages: 4210-4215, 2014.

[9] P. Patil, R .B. Wagh. "Implementation of Restoration Of Blurred Image Using Blind Deconvolution Algorithm". International Conference on Wireless and Optical Communications Networks (WOCN), 2013.

[10] P. Jaypriya, Dr. R. M. Chezhian. "A Study on Image Restoration and its Various Blind Image Deconvolution Algorithms". International Journal of Computer Science and Mobile Computing, Page: 273-278, 2013.