ISSN 2349-7815

International Journal of Recent Research in Electrical and Electronics Engineering (IJRREEE)
Vol. 3, Issue 2, pp: (19-23), Month: April 2016 - June 2016, Available at: www.paperpublications.org

A Review over Different Blur Detection Techniques in Image Processing

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Abstract: **In last few years there is lot of development and attentions in area of blur detection techniques. The Blur detection techniques are very helpful in real life application and are used in image segmentation, image restoration and image enhancement. Blur detection techniques are used to remove the blur from a blurred region of an image which is due to defocus of a camera or motion of an object. In this literature review we represent some techniques of blur detection such as Blind image de-convolution, Low depth of field, Edge sharpness analysis, and Low directional high frequency energy. After studying all these techniques we have found that there are lot of future work is required for the development of perfect and effective blur detection technique.**

Keywords**: Blur detection, Point Spread function (PSF), Blind image deconvolution, low directional high frequency energy.**

I. INTRODUCTION

Images are used to store or display information, which are very useful. But in many scenarios the quality of an image is spoiled due to blur. To remove the blur and to increase the quality of an image is an important task for blur detection. Various researchers work on blur detection and determine the regions that are blurred. S.K.Nayar [1] proposed methods that accomplish the basic adjustment between spatial resolution and temporal resolution to design a camera which is used to calculate the motion information during image capturing and this is used to obtain the Point spread function (PSF).This blur function i.e. PSF is used for deblurring process of an Image. Automatic detection and classification technique is very important for blurred digital images that contains blur due to motion and out of focus of the camera. This technique automatically detects the regions of image that are blurred and determine the blur type without either image deblurring or blur kernel estimation [8]. It includes in various application such as depth recovery and image segmentation. Yi Zhang et al. [2] proposed a double discrete wavelet transform (DDWT) this is very useful for blur detection, that determines the clear image and blur kernel simultaneously but it is very time consuming process. Jiajia Zhao et al. [3] proposed a technique to detect the motion blur i.e. based on lowest directional high frequency energy, it will improve the correctness of image with less cost.

In section I we present an introduction about blur detection. We present the different techniques of blur detection to improve the blurred images quality and to remove the blur from an image in section II. Finally we conclude our paper in section III.

II. DIFFERENT TECHNIQUES OF BLUR DETECTION

In Today's world blurred images quality is improved by various blur detection techniques, which is useful in crime solving or restoration of important information. Various researches have been done in this field. Some of the main techniques are as follows:-

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1.) Blind image de-convolution.

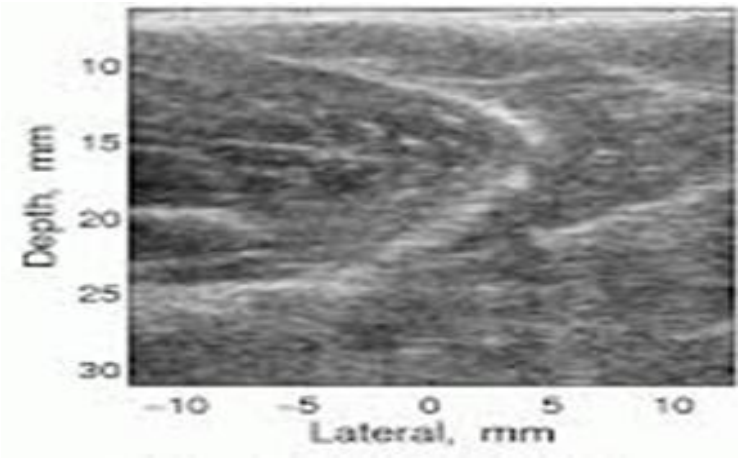
2.) Low depth of field.

3.) Edge sharpness analysis.

4.) Low directional high frequency energy.

A.) Blind image de-convolution method:

Rechardson (1972), Gull (1998) have been developed a de-convolution method which is very useful for astronomical images where the captured information is different from the natural scenes. The process of deblurring an image where the blur kernel is not known is called Blind image de-convolution. The main advantage of this technique is we don't require the knowledge of PSF and noise to deblur an image where as in other technique it is necessary that we should have previous information about blurring parameters. S.T. Roweis [5] proposed a method for blind image de-convolution and the main goal of this is to produce the sharp or clear image without the previous knowledge of blurring function (PSF). Sharp image is estimated by input image and the blur function is estimated by de-convolution algorithm. The images having motion blurred objects can't be deblurred by this technique because there is no similar motion between objects and background [6].This problem is overcome by J.Tumblin et al. [14].There is a Problem of deblurring a single image with blind image deconvolution having some motion objects, in these cases only a single part of image is deblurred because the entire image consist of blur in different angles and motion. For such images we don't find a single PSF for the entire image [7].



(a) Blurred and noisy

(b) decovolution

Fig. 1: Images of blind image deconvolution (a) blurred and noisy (b) deconvolution

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B.) Low depth of field method:

Low DOF method for blurring Detection is very useful for considerate the depth information within 2-D Pictures. Object of Interest (OOI) technique is used in Low Dof, which is express during work of C.Kim [11] and G.wiederhold et al. [13], OOI is a photographic technique. In Low Depth of field method segmentation of images is done by two ways edge based and region based. The results which are describes by Low DOF offers various application such as, Video Object Extraction, Image Indexing, Image Enhancement, Fusion of multiple Images. Another algorithm i.e. unsupervised multi resolution image segmentation for Low Depth of field images, which is based on wavelet coefficients of high frequency [13].

(a)

(b)

Fig. 2: Images of Low DOF

C.) Edge Sharpness Analysis method:

Edge sharpness analysis is an important technique for blur detection. When the image is clear then the edges that it contains are step edges and when the image becomes blurred then the step edges become ramp edges. A measure of the sharpness or blurriness of edges in an image can be useful for a number of applications in image processing, such as checking the focus of a camera lens, identify shadow of an image having edges less sharp then object edges. S.Chen et al. [9] works on edge sharpness analysis to determine the blurred edges of an image. This method doesn't require the information about the light source or the parameters like shapes and positions of the object. To find the blur kernel from a blurred image through the parameters such as quantile-quantile plot, probability plot and probability plot correlation coefficient plots. To find the shape parameters that produce the maximum probability plot correlation coefficient (PPCC) define the best functional form for blur kernel. Edge profile method can be combined with the more corrected blur function (PSF) or blind de-convolution method. This method works on various future researches. For example to produce a correct and adaptable blur function through other blur function and combinations of functions [10]. Zhang and Bergholm [4] defined Gaussian Difference Signature for layered blur evaluation and for the classification of edge type analysis of an image. This signature function is used to measure the diffused or sharp edges as well as the degree of

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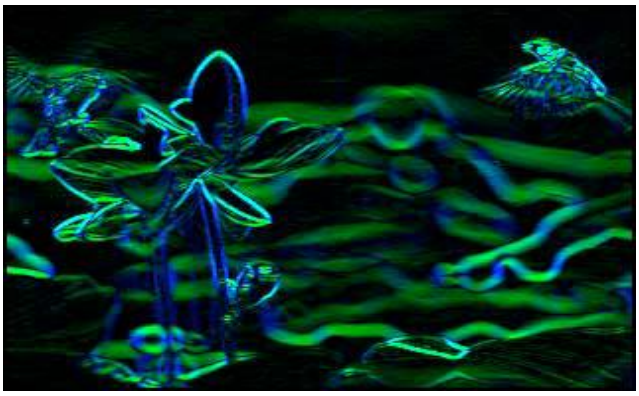
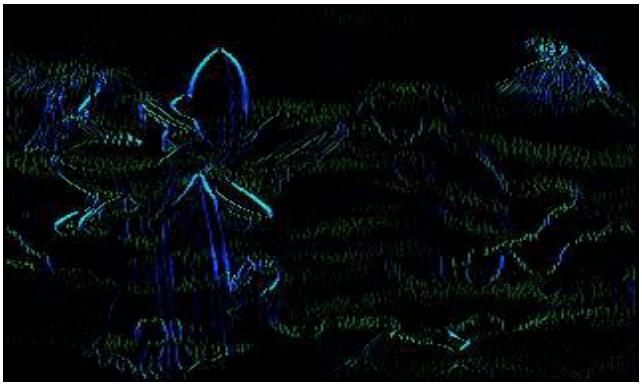
diffuseness produced by out of focus objects. This function is same as the first order derivative of Gaussian. The Function is used in applications such as scene understanding, segmentation applications and measurement of depth.

(a)



(b)



(c)

Fig. 3: An example of blur measurement using Edge sharpness analysis (a)Input Image (b)edge magnitude image; Blue-Vertical edge, Green Horizontal edge (c) Sharp edge Image.

D.) Low directional high frequency energy:

The Lowest directional high frequency energy method is used to measure the motion blur. Lowest directional high frequency energy method of motion blur detection has less expenditure on computer resources without the use of PSF estimation. This technique find the blurred motion region by evaluating the high frequency energy and calculate the direction of the motion of an image which make it more correct then the other methods. A solution derived in this method based on the concept of high frequency energy decreased incomparably along the direction of the motion in blurred image. Energy is considerate as sum of squared derivative of image [3].

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III. CONCLUSION

Blur Detection is a technique to remove the blur from a blurred region of an image which is due to defocus of a camera or motion of an object. In this paper we will study the various method for blur detection such as blind image de-convolution, Low DOF, Edge sharpness analysis, Low directional high frequency energy. In Blind Image de-convolution we don't, require the prior knowledge of PSF and noise parameters which are the main advantage of this technique over other techniques. In Edge sharpness method we detect the blur in an image through the intensity of an image profile. This method is has low computational cost but not effective on complex images over other methods. All these methods of blur detection are used for various applications such as: Video Object Extraction, Image Indexing and Enhancement, Fusion of multiple Images, Scene understanding and segmentation applications and measurement of depth.

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