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PERFORMANCE ENHANCEMENT OF BLUR DETECTION FOR MOBILE IMAGE USING DEFOCUSED BLUR BASED PSF TECHNIQUE

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ABSTRACT

With the prevalence of mobile phones, the no. of digital images increases quickly. Now everyone has mobile phones and use everywhere for taking pictures as whenever needed. Which increase the demand for image quality assessment in terms of blur. Detection of blur in digital image, which is mainly first step for de-blurring process, it has becoming popular area of research now a days. and has engage many attentions from researchers. In this paper we enhance the blurred image and also enhance the image taken in dark region by using a yet elegant method combining defocused blur and point spread function method. In addition we achieve an effective mobile application for blur detection and report its performance on several mobile devices.

Keyword:-blur detection, de-blurring method, point spread function, uniform vision method, filtering, local blur , global blur.

I. INTRODUCTION

With the increasing use of mobile phones, most of people using mobile phones. They also uses the mobile camera for taking pictures of important documents when needed or taking photos in their everyday life for capturing precious moments of their life. Sometimes due to the lack of expertise or due to some other reasons some of these pictures are of poor quality. One of the key factors that accelerate quality degradation is blur

To assist mobile users restore those pictures or simply delete them, automatic blur detection is highly needed. That is to determine whether a given image is blurred or not and also to determine at what extent given image is blurred.

In addition to the use as a part of de-blurring process, automatic detection and classification of the blurred areas from digital image are more useful in order to recognize the image information and also useful for calculating image quality for further enhancement processes.

Fig: Block diagram to relate blur detection, blur classification, and image restoration.

Researches related to blurring process in digital image can be categorized into three ways such as blur detection, blur classification, and image restoration. Here we describe these ways as a series of cosequence processes as shown in fig 1.the first step is blur detection in this way we identify the area of blur in the given image, then followed by the blur

classifictaion, in this way we categorizedthe blurred regions and classified corresponding to their nature. At the wnd image restoration take palce, in this way we processed the blurred image by de-blurring operation, in order to maintain a good quality image.

II. BLUR PHENOMENA

Images are build to record or show useful inforamtion. In many cases the record image represents a blurred or partially blurred version. Therefor blur related topics have be investigated extensively now a days.

Blurring is a form of bandwidth reduction of a given image caused by an imperfect image formation process. The objective of blur detection is to support the users to automatically detect the blurresd pictures and classify them into some categories to making the users further decisions.

III. MOTION BLUR

Motion blur is the visible streaking of swiftly moving objects in a still image or a sequence of images such as a movie or animation. Motion blur occurs in photography when either objects or camera moves during the shutter interval.

IV. CAMERA MOTION BLUR

In this image is fully blurred due to the camera vibration . generally the camera motion blur without camera rotation shown in fig.(a) should be regarded as spatially invariant blur.

V. OBJECT MOTION BLUR

The blur is caused by the relative motion between the moving objects or camera position. The moving object is blurred only and background is still clear shown in fig.(b) should be regarded as spatially variant blur.

In this paper we focus on detecting blur area an enhance that by using defocused blur method and also we focus on the image taken in the dark region which is not shown by applying our proposed method we enhance this dark region image at the extent to becoming visible.

(a) (b)

Fig. Two types of motion blur

VI. RELATED WORK

Methods for blur detection and classification were conventionally developed for scene imges with some application to mobile camera captured images. Desired reactivity of blur detection in scene image for self operating processing is not as relevent as in the case of mobile taken images.where each pixel has to be processed through a recognition system perfectly. Given below some related researches done by the researchers on blur detection .

1) Tong.et.al proposed edge detection estimation technique. In this method a strategy in which used the abality of Harr wavelet transform in different types of edges and retreive sharpness from the blurred class and describes whether an image is blurred or non-blurred and also examine that a blurred image is how much blurred.
2) Ben-Ezra et.al proposed hybrid image system method. In this method hybrid image system is used this is used as a secondary detector to calculate the motion in the image. Now combine the blurred image or the gained motion information, a psf is calculated that represent the location of camera when integration is running. Here psf can be used with a single parameter and used Guassian fucntion to calculate the single parameter psf from a single calculation of a degraded image.
3) Pedro et.al proposed the graph-based representation method. In this method algorithm used a graph- based representation of the image and applied to the image portioning. Let G=(V,E) be an undirected graph containing vertices vi ∈ V to be portioned and edges(vi , vj) ∈ E related to pair of neighboring vertices. One partition P is a segment of V if only each element in graph G'=(V,E') where E' ⊆ E. let P0 be the starting partition where every vertex Vi is in its own element and the process combine the vertices repeatedly. After M steps, Pm is the result that partition V into r elements p=(c1……cr).
4) L.G and stockman proposed the Guassian blur detection method. Guassian blur is detect blurring image used by Guassian function. This method is used mostly in the graphics software. Generally to decrease image noise and decrease details.the optical effect of this method is a plane blur resembling that of observing the image through a transparent screen. Guassian planning is also used as a pre-processing stage in computer vision technique for improving the image structure at different scales.
5) John.F,Canny proposed canny edge detection method. It uses a multistage process to find out a wide range of edges in the images. This is a process to extract important structure data from different vision. Elements and impressive decrease the amount of data to be processed. This technique is applied in various computer vision systems. This technique is adaptable to diifferent environments. Its framework allow it to be tailored to recognition of edges of different attribute depending on the particular requirements of a given execution.
6) Rooms proposed wavelet-base approach. This is a technique to calculate the blur of an image by looking at the sharpness of the sharpest edges in the image. The lipchitz exponents was calculated for the sharpest edges and a relation between the variance of a Guassian point spread function and the magnitude to be dependent on the blur image and not on the image contents.
7) Mallat and Hwang mathematically prove that signals carry information via irregular structures and singularities. In particular author show that the local maxima of the wavelet transform detect the locations of irregularities. For ex. 2D wavelet transform maxima indicate the locations of edges in images. The forier analysis which has been conventionally used in physics and mathematics to investigate irregularities was not always suitable to detecting the spatial distribution of such irregularities.

8) Zhang and Bergholm defined Guassian different signature for multi-scale-blur calculation and edge type classification in point observation. This signature function same to the first-order derivative of Guassian, in order to calculate the degree of difuseness introduced by out-of-focus objects and classify edges into diffuse or sharp. This classification was useful for point understanding provides a calculation of depth and can be used qualitatively for detecting coccliding and occluded edge contours and petitioning purposes.

VII. METHODS

There are several methods or approaches are used in the blur detection process or to enhance the blurred image some of the approaches are explained are as follows:

A. Defocussed Blur Detection:- In this method generally, blurring system is formed as follows:-

$G(I , j) = f(I,j)* h(I,j) + n(I,j)\ldots 1$

Here g(I,j), f(I,j), h(I,j) and n(I,j) all are the perceived image, the point spread function of the blurring image , and additional noise appropriately from the given equation (1) we should calculate the point spread function to reassemble the initial observed image. The algorithm to find h(I,j) is known as blur identification. Defocus blur process is initially due to the effect on the mobile camera gap which results in spreading a point light to cross a circle. Here the point spread function of defocus system can be shown by the mathematical approach.

$H(I,j)=\{1/ \pi R^2 \ \sqrt{i^2+j^2}<R , \ 0 \text{ otherwise}$

Here R is the defocus blur radius. This is only one parameter here which is not known. When this R is known, the point spread function can be examined hence the defocus blur identification is to find unknown value of R.

B. PSF Method:- here we start a discussion on point spread function calculation and find important sample characteristics. Generally , the point spread function can be calculated by imaging a point-like test example with known shape and hence known ideal image x. the point spread function can be calculated then in Fourier domain

F(y)(w)/F(x)(y)

Here y is the observed image. This process needs that [f(x)(w)] is not zero at all points; impulse signals are absolute for this reason from their related non-zero flat frequency spectrum fig.

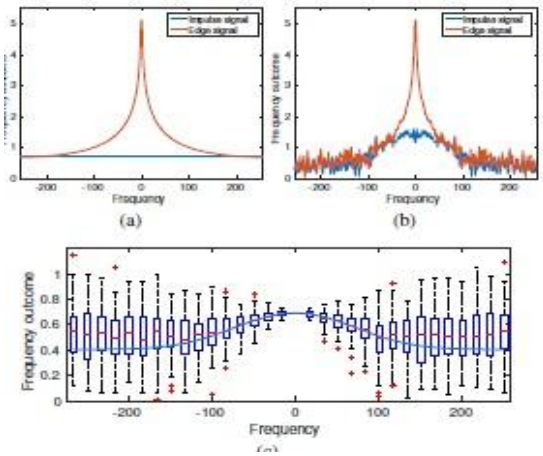


Fig. frequency spectrum of (a) a one dimensional impulse and crisp edge signal and (b) noisy blurred impulse (c)true psf frequency spectrum.

For ex:- fluorescent beads are normally used in microscopy for this reason. Whenever examples like these are few common in EM hence we obtained SEM imags with two expected intensities which permit us to make a proper calculation of the hidden image which consist of sharp edges switching between two intensities. These have complete non-zero spectrum. Note down generally y also have an extra noise signal influncing the point spread function calculation as noise may build small frequency responses for y that will be greately amplified in the cleaving with a small frequency response of x and yeild noisy point spread function calclulation see fig.

To review, the acquired image y should contain as little noise as possible and underlying hidden image x should have a significant non-zero frequency response for any frequency in order to confirm the more exact point spread function calculation.

C. Lucy Richardson Method:- it is an iterative method for recovering a hidden image that has been blurred because of a known point spread function. When an image is examined on a detector such as photographic film. It is typically slightly blurred, containing an ideal point source not especial as a point but being spread out which is known as point spread function. Non-point sources are completely the sum of different unique point sources and pixels in an observed image can be shown in terms of the psf and the hidden image as

$$Di = \{ Pij, uj \}$$

Here pij is the point spread function , uj is the pixel value at location j in the hidden image and di is the observed image. The idea is to calculate the uj

$$Uj(t+1) = uj(t) \sum_{i} di/ci\ pij$$

Where

$$Ci = \sum_{j} pij\ uj(t)$$

D. Filters:- there are three types of filters uses in our work which are briefly explained as follows:

Box filtering:- it is a linear filtering technique which is equivalent to Guassian convolution. We traverse the connection between a box filter and explicit schemes for linear diffusion.

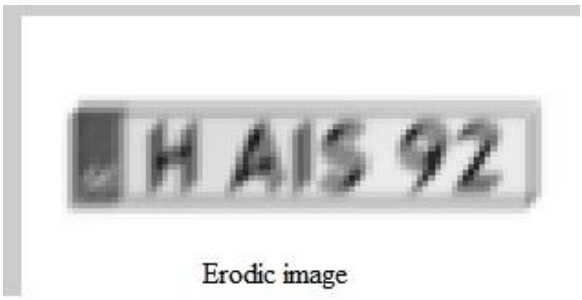
Let f = (fi)I belong to N be a descrete 1-D signal given on a grid. Here we will define the box filter with length

Box filtering

(2n+1) n, n belongs to N, as well as second order derivative by Square filtering:- in this type of filtering process edges play an important role in our recognition of images as well as in the investigation of images. As such it is necessary to be able to smooth images without distributing the sharpness and if possible the pixels of edges. A filter that achieve this goal is termed an edge-preserving filter. Althoug this filter can be obtained for a variety of different window shapes.

square filtered image

Erodic filtering:-this filtering process is used for fetching the text by using the binary regions of the image and remove the outer boundary of RGB threshold as shown in the fig.

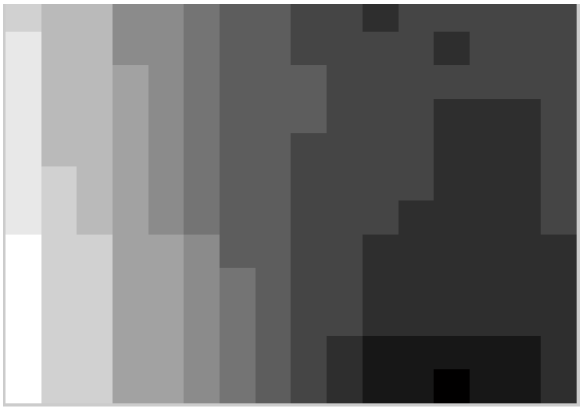


Erodic image

E. Circular Shift Method:- To merge the key points description of defocused and psf method as we discussed earlier in brief.

F. Experimental Results:- Here we describe the all results of our research in details:

First of all we describe the results of enhancing the blurred image with the help of our reseach approach.



psf map 2-d

This is the psf map 2-d curve there are two types of psf described as follows:

Local psf:- in this we taking the similar point sharp.

Global psf:-in this we cover the all objects distance with sharpened rotational angle.

- **Data Set 1:-** we describe all the results of our research in terms of data set. In data set 1 we describe the blurred and deblurred images with the help of patches

Fig. Single patch

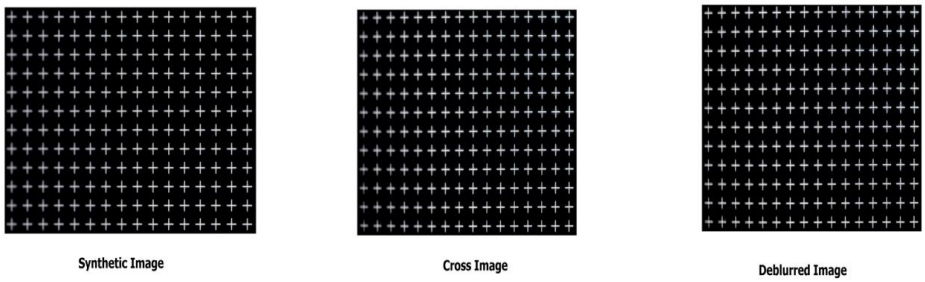


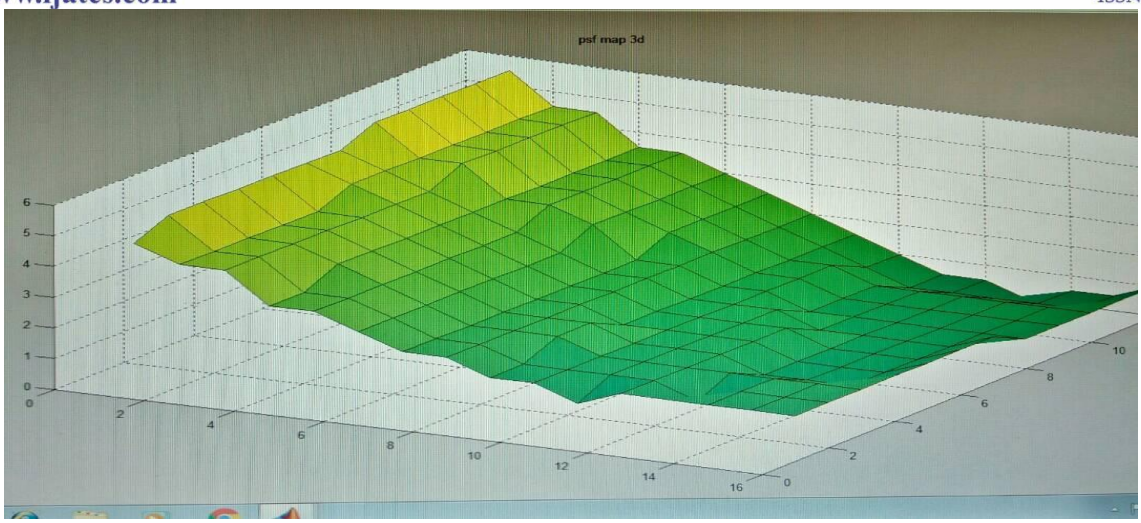
Fig. comparison of blurred and deblurred image

Here we show the comparison of the blurred image in first pic we take the synthetic image in this we observe the pattern that is blurred and in the second image we observe that the image will be enhance that the existing input image and in the last image we obsererved the deblurred image.

- **Data Set 2:-**In this compare the result of texhe text data set and enhance the text data set from blurred image to the deblurred image after applying the various filtering methods such as box filtering, square filtering, erodic filtering.and also we use the here to improve the input image by applying the defocused blur image method and restore the enhance image.

comparison of text data set image

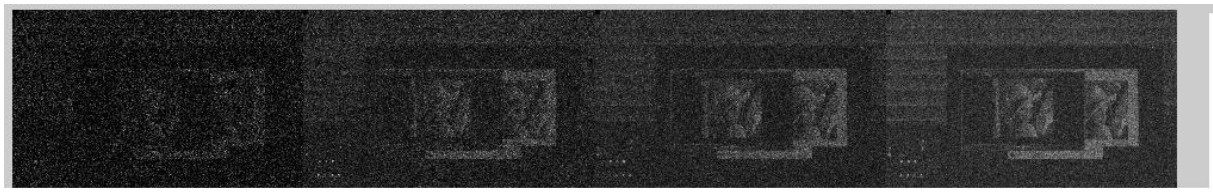
This the comparison image of the text data set and enhance the text data by applying various filters.



This is the psf map in 3-d . it becomes the restoration error for the different generalised image at t= ½, ¼,sec.

Data Set 3:- In this data set we take the dark region image and enhance that image by applying the various methods.

initial image taken in dark region



sequence of enhance the dark region image

First fig is shown the initial image which is taken in the dark region. After applying the poisson noise verification. In the poisson noise blur due to the camera motion and sensor noise which explain in min. exposure time. After that we applying the guassian noise method for unifield description of both long and short exposure image. Which describe very acquisition paradigm including blur observation. After applying the richardson lucy deconvolution method which will not display any specific reason due to space limitation overall behaviour of this technique which surface independent of the original image and the captured image using smoother pointer set.

IV. CONCLUSION AND FUTURE WORK

blur detection for mobile captured image is of intrest for several mobile applications.in this research we enhance the existing text input image and also we enhance the image taken in the dark region.in future we can enhance the approach for natural scene image based text blur detection using advanced image processing technique.

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