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A Review: "An Efficient Method to Remove Camera Shake in Blurred Images"

N. B. Humbe[1], Prof. S. O. Rajankar[2]

PG Student [Digital System], Dept. of ETC, SCOE College of Engineering, Pune, India[1]

Assistant Professor, Dept. of ETC, SCOE College of Engineering, Pune, India[2]

Abstract: The paper presents an effective technique for tackling one of the most challenging problem of photographers viz. motion blur due to camera shake. The most common cause of a blur image is camera shake or a relative movement of a handheld camera and object in a given exposure time. The movement may be very small, but still creates blurry images. There exist different conventional techniques which are used for removal of motion blur to get clear and sharp image. Most of these methods use multiple images as a input taken through a burst mode, a feature available in all modern cameras, and combine them to get a more clean image. However there are certain limitations and disadvantages of using these conventional techniques. Removing a blur from a single image is a challenging problem. The proposed work is based on a technique that uses a single input image unlike other conventional techniques for removal of blur in images post capturing it. In the proposed technique a single blur image is divided into smaller images with an assumption that each sub image is uniformly blurred. with the implication of Fourier algorithm these sub images are used to estimate motion blur parameter -Blur Length and Radon transformation is used for determining values of Blur Angle. A local parametric blur model is prepared with the help of these estimated values of motion blur parameters, VIZ blur length and blur angle. These models are then deconvolved with blurry sub images. The resultant of this algorithm is a reconstructed, original, blur free image. The proposed technique is an effective solution to remove motion blur and serves the important requirement of clear images of various fields like medical, navigation, satellite imaging, driving assistance systems.

Keywords: Camera shake; Deconvolution; Single-image deblurring; Motion blur.

I. INTRODUCTION

Camera shake, wherein an unsteady camera causes blurry photographs, is a continuing problem for photographers worldwide [1]. The basic principle of capturing an image in a camera is the accumulation of photon in given exposure time. The very basic requirement of obtaining a blur free image is that there should not be any relative motion between camera and the object. Both should be very stable. While taking photos, tremor vibrations to the camera causes the random phenomenon, which gets introduced in an image, which is nothing but a camera shake. In most of the applications good and clear images is the important requirement. Hence, it is important to pay attention to blurring of image because of camera shake.

The proposed technique, unlike other conventional methods, present a robust algorithm that takes a single blur image as an input. On this blur image Fourier transform and Radon transform is applied to calculate blur parameters.

Further the image is divided into sub-images and deconvolution is performed to restore original image which is more clear and blur free. De-convolution is performed for image renovation in many applications such as medical imaging, astronomical speckle imaging, and remote sensing. Removal of camera shake can be done with help of different methods namely – Blind Image Restoration and Non Blind Image Restoration.

The section II gives literature review consists of different classical techniques to remove the blur based on different scenario. And the section III gives proposed method which is based on blind deconvolution. In which the least attenuated part is considered to build the latent image. Section IV gives result and discussion and Section V gives the conclusion about the previous methods and proposed method.

II. LITERATURE SURVEY

Removing camera shake blur is one of the most challenging problems in image processing. Although in the last decade some image renovation algorithms have emerged giving outstanding performance, their success is still very dependent on the scene.

Most image deblurring algorithms cast the problem as a deconvolution with either a known blurring kernel (non-blind) or an unknown blurring kernel (blind). See e.g., the review by Kundur and Hatzinakos , where a discussion of the most classical methods is presented.

III.BLUR REMOVAL TECHNIQUES

Mauricio Delbracio and Guillermo Saprio [4] proposed method for blur removal based on multi image deblurring. It assumes that generally each image in a burst is blurred differently. It uses less blurred image from each image and performs weighted average in the Fourier domain to reconstruct a sharper image.

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Method avoids one of most typical problem of many deconvolution algorithms i.e. ringing artifacts. Ashwini M. Deshpande [1] proposed a variant motion blur removal technique. When capturing device and object are in relative motion then it is difficult to capture blur free image. This problem is solved by dividing blurred image into uniformly blurred smaller sub images.

For estimating motion blur parameters each sub image is transform in to frequency domain. Fourier transformation and radon transformation is used to obtain values of blur length and blur angle. Local parametric blur modal is obtain by using this blur parameters. Original image is obtain using deconvolution of local parametric blur models with blurry sub images. Original filter is restored by using Wiener filtering. Sometimes this technique is not effective on partial blur and camera shaken images.

HaisenLi, Yanning Zhang, Jinqiu Sun, Dong Gong [2] proposed Robust algorithm this algorithm is used to obtain sharp image by combining blurred and noise image. Motion blur images are occurred when taken under dim light condition. Some information in noisy image may be lost due to motion blur so this technique uses two noisy image pair for restoration of clear image. It is basically a de-noising processes. Restoration result can be optimized by joint denoising model and deblurring model and also it can be optimized by estimating blur kernel and sharp image in alternate way so optimized result will not be sensitive to the denoised result. This method is better as compared image deblurring methods.

Rob Fergus, Barun Singh, Aaron Hertzmann, Sam T. Roweis, William T. Freeman [3] proposed a technique to remove camera shake based on Kernel estimation. The proposed technique helps to remove unknown camera shake which is a form of blind image deconvolution. Method assumes the blurr is generated by convolution of blur kernel with latent image plus noise. The method involves two main steps.

In first step blur kernel is estimated from an input image, In second step this estimated kernel is used to apply standard deconvolution algorithm to obtain blur free latent image. The most common disadvantage of this method is occurrence of ringing artifacts which may get removed by application of advanced statistical methods to non-blind deconvolution of problem.

Sung Hee park and Mark Levoy [5] proposed a non blind image deconvolution technique which is based on multi image approach. Based on exposure time performance of two different approaches viz. align and average and multi image deconvolution is compared. In this paper Multi image deconvolution with gyroscope based camera motion estimation is proposed. The finding of study is that the gyro based multi image deconvolution is more effective than align and average method, it also improves image quality in very low light. Moving objects are unable to deblurred using this method, is the main limitation of proposed method.

IV. PROPOSED BLUR REMOVAL METHOD

Camera shake originated from hand vibrations is a random phenomenon which shows that the motion of the camera in an individual image from the burst is independent of the movement in another one [2].
Proposed method is based on the concept that it takes single blur image as an input and by applying fourier transform and then radon transform before deconvolution it improves the input image by removing unwanted peaks in image.
An overview of the proposed system is presented in Figure 1. Proposed system introduces an idea to removing blur in image due to camera shake. The proposed system:

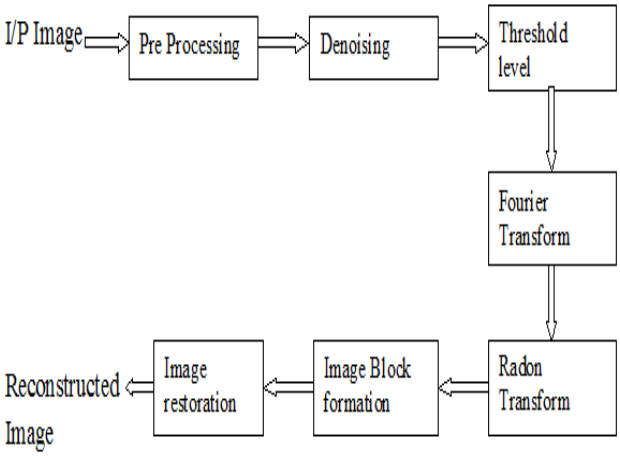

Fig. 1 Overview of the proposed method

The proposed system consists of the following steps:
1. Input image:
Input image is taken from database of blur images. the database is created using different type of and size of blurred images. which is to be de-blurred using fourier transform algorithm.

2. Pre-processing of an image:
Different types of images are available in data base. But in algorithm we need only one size of image. So we have to resize the input image in size 256*256.

3.De-noising of an image:
It's necessary to have quality images without any noise to get accurate result. So it de-noise the input image for removing unwanted peaks in image. Traditionally, linear models have been used. To de-noise the image we can use median filter. Median filter does the work of smoothening of image.

4. Threshold level calculation:
To know how much blur attain in image we using Threshold level calculation. It will decided block formation of blurred image which is used for the process of deconvolution. This blurriness will find by calculating MSE and PSNR value from this value we will be decided up to how much extent it we can decrease the block level size of a target image.

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5. Fourier transformation:
Fourier transformation is used to convert spatial domain in to frequency domain to eliminate & estimate blur component in an image.

6. Radon transformation:
Radon transformation is used for blur kernel estimation. In blur kernel estimation it is used to estimate blur parameters of an image. Radon transform is integral which include integration of function over straight lines. Radon investigated radon transform and gave formula for inverse transform. It is used in many applications such as tomography in which inverse radon transform is used to reconstruct original density which is known as image reconstruction.

7. Image Block formation:
Formation of blocks which is decided by calculating PSNR value. This PSNR value calculated by using MSE value. Means if PSNR value is less than 30 units then blocks divided in 4*4 size, if PSNR value is greater than 30 units but less than 60 units then blocks divided in 2*2 size, if PSNR value is greater than 60 units then there is no need of bock formation.

8. Image restoration:
Once the blur angle & blur length is estimated using these blur parameters. "Local parametric blur model is developed". This Local parametric blur model is de-convolved with blur sub-images. Combining de-convolution outcome of all sub images we get clear image.

V. CONCLUSION

The proposed work is based on problem involving blur in the images due to camera shake. For this purpose Fourier burst accumulation algorithm is presented. It takes blurry image as an input, applies Fourier transform and Radon transform to estimate blur parameters based on which further deconvolution is performed on blocks of images to get a blur free reconstructed image as a final output, which is more sharp, clear and conveys correct information.
This method gives better result than the conventional method. The algorithm has several advantages over other deconvolution methods, It does not introduce ringing artifacts. The algorithm works significantly faster and low memory is required.

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