Generate Shake Free Image Using Weighted FBA

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Abstract- *Capturing snaps under faint light circumstances using a portable camera is very daring. If the camera is placed with large shutter speed, the image can be blurred due to camera shake. Diversely if the camera is placed with short shutter speed, the snaps become noisy and dark. So, this paper proposes a technique to overcome this situation by using burst of images as input, since each image will be vague differently. The technique is easy, it first computes the Fourier transform and then calculates the average of the weights in the Fourier domain, and the weights depends on the Fourier spectrum magnitude. The proposed techniques is also used to video deblurring , if the given input video have at least one clear frame.*

Keywords- Burst Registration, Fourier Burst Accumulation, Gaussian Sharpening, Noise Aware Sharpening, SURF.

I. INTRODUCTION

Several amateur shutterbug, most favourite snaps has been spoiled due to camera shake. It is very difficult for the shutterbug to recapture the memorable shots under the controlled condition once again. So for them if the camera shake occurs in the image due to any reason, the image is "LOST". This is a heart broken situation handled by some photographers. So this paper is developed as an aid for this situation.

In this proposed technique, the Camera shake arise from hand twitch shaking are noticed. According to this technique, continuous shots of a scene will be taken with the idea that the movement of the camera in different shot will be independent. So, the vague in one frame will vary from the one in another snap of the burst. The method is developed with the basic principle which presents a technique that takes a burst of images as input, then finds out the reference image (here, first image on in the burst of images), identifies the image similarity with the help of SURF algorithm. Next the Fourier weights are computed in Fourier Burst Accumulation section. Finally Noise aware sharpening is done over the Fourier burst accumulated images, which outputs the Deblurred image.

II. METHODOLOGY

This technique consists of three main modules – Burst registration Fourier Burst accumulation and Noise Aware Sharpening. The burst registration module takes the continuous shots of image as input and find out the image correspondence between each of the burst images and the reference image (first shot out of the continuous snaps).

Then comes the Fourier Burst Accumulation Section where the Fourier transform of each registered images are calculated. Then the Fourier transforms are low pass filtered before computing the weights, in order to adjust with the varying Fourier spectrum magnitude.
Next, the noise aware sharpening module where image denoising is done to remove noise from the image using any of the denoising algorithm. Finally Gaussian Sharpening is also carried out.

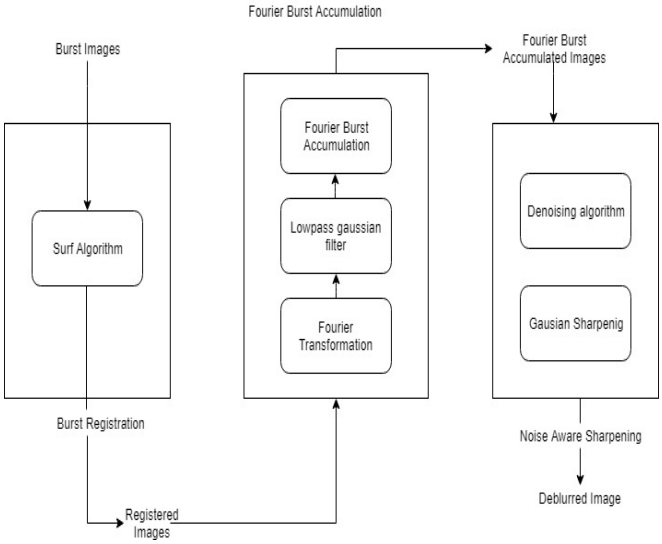

Fig -1: a) Overall process in the methodology.

III. IMPLEMENTATION

Burst mode is an option available in the cameras which allows the camera man to take continuous snaps of the scene one after the other. If the taken snaps have been blurred, then it can be smoothened using the following steps:

A. Burst Registration

Initially, we input the shaky continuous snaps of the images to this module and set the first image of the burst as the reference one. Image similarity of each image in the burst with reference is detected with the help of SURF algorithm.

• SURF Algorithm

SURF algorithm works by finding out the aspirational points from various regions of the given image and then find out the similarity in the given image with the reference one.This algorithm consist of three min portions: aspirational point detection, description of the local neighbours and finding matching pairs.

The feature similarity received from the SURF algorithm are used along with Mestimator SAmple Consensus (MSAC) algorithm (a follower of RANSAC) to fit homographic transformation.

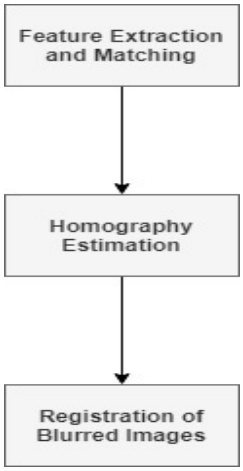

Fig -2: (a) Burst Registration steps.

B. Fourier Burst Accumulation

In Fourier Burst accumulation section, first we calculate the Fourier transforms of the registered images. Then the Fourier transforms are low pass filtered before computing the weights, in order to adjust with the varying Fourier spectrum magnitude. The supplement to color images is also undemanding. Here, the same Fourier weights are used for all the channels. Before low pass filtering is carried out, the weights are calculated by mathematically averaging the Fourier magnitudes of all the channels.

• Gaussian Smoothing

These filters are normally used to reduce noise present in the image. The power of the low pass filter depends upon the assumed motion kernel size.

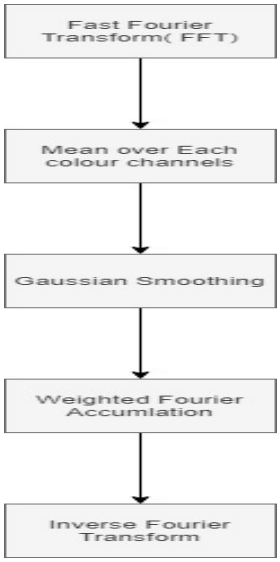

Fig 3 -: Weighted Fourier burst accumulation steps.

C. Noise Aware Sharpening

Even though the output from the previous step seems to be good, a perfect sharpening is performed over it to produce a much better output. The sharpening of the Fourier burst accumulated image is done using some denoising algorithm like NL means denoising algorithm. After that, the Gaussian sharpening is performed over the denoised images. Finally, a fraction of removed noise is added back to the sharpened image in order to avoid removing magnificent details.

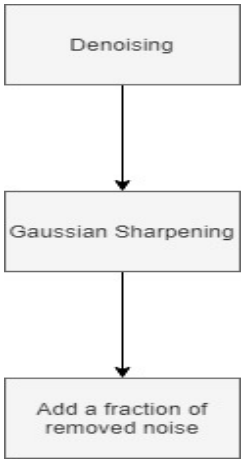

Fig -4: Noise Aware Sharpening steps

IV. RESULTS

The results of camera shake removal with weighted FBA using image processing as follows:

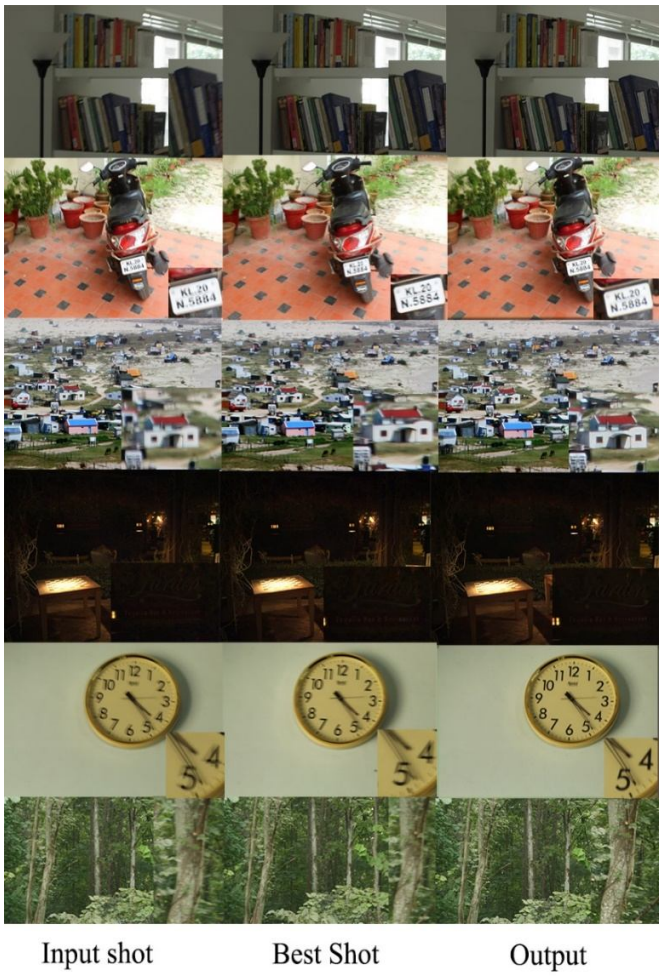

Fig -5: Reference shot, best shot and output image.

Table -1: Output images with SSIM and PIQE values

Sl No	*Burst set*	*SSIM Value*	*PIQE Value*
1	Bookshelf	0.962983	75.0406
2	Scooter	0.930664	42.8656
3	City	0.97014	36.0118
4	Night	0.929455	7.77212
5	Clock	0.947106	48.8643
6	Woods	0.947887	20.0453

The SSIM value is an image quality measure using a reference image and here its value does not determine the quality of the image because there is no original quality reference image to compare. So a non-reference image quality measure called as PIQE (Perception based Image Quality Evaluator) is used and the low values of it indicates the quality of the output image.

Fig -6: Bookshelf (PIQE -75.0406)

Fig -7: Scooter (PIQE -42.8656)

Fig -8: City (PIQE -42.8656)

V.CONCLUSION

This paper aims to develop a simple technique to generate shake free images with the help of continuous shots of a scene. This technique make use of the burst of images as input. The same idea can also be used to remove the blurness in the video if the given input video have at least one clear frame. This idea also helps to get better result in case of low light images. The area that needs to be improved is the number of shots in the burst that is as the number of shots in burst increases the output quality also increases.

REFERENCES

[1] Mauricio Delbracio and Guillermo Sapiro, ”Removing Camera Shake via Weighted Fourier Burst Accumulation” IEEE Transactions on Image Processing, Vol. 24, No. 11, November 2015.

[2] Atsushi Ito Sony Corporation and Aswin C. Sankaranarayanan Carnegie Mellon University and Ashok Veeraraghavan and Richard G. Baraniuk Rice University ”BlurBurst: Removing Blur Due to Camera Shake using Multiple Images” ACM Transactions on Graphics, Vol. VV

[3] O.Whyte, J. Sivic, A. Zisserman, and J. Ponce ”Non-uniform deblurring for shaken images” Int. J. Comput. Vis., vol. 98, no. 2, pp. 168186, 2012