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IMAGE INTEGRATION OF MISALIGNED IMAGE PAIR

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Abstract — *Restoration of high quality image form very noisy or blurry image taken in the low lighting condition is a very challenging problem. And also for integration of such images we required well aligned image pair. We propose a image integration method which will enables you to integrate the color of long exposure image with the fine details of flash image in addition with very less time consumption here we are using ORB (Oriented Fast and Rotation BRIFE) for feature matching. Feature matching is at the base of many computer vision problems, such as object recognition, face recognition. ORB is a very fast binary descriptor based on BRIEF. The conventional method for color transfer imposes an unnatural image and low contrast. We can solve this problem with local linear model. The idea is to integrate the color of long exposure image with the details of the flash image without causing any harmful effect on contrast on it.*

Keyword — *Color transfer, correspondence search, Image integration, Feature extraction, ORB.*

I. INTRODUCTION

We are presenting an image integration technique for producing a high quality image form very noisy or burry image taken in a unsatisfied lighting condition. A image taken in low lighting condition is often unsatisfactory. Such photos might be blurred or noisy. Reconstructing a high quality image from a noisy image is not easy task as fine image details and textures. An effective approach is to use multiples of images. In some previous methods, they combine the features of the images to integrate the colors of a no-flash image with the clear contrast of flash image. To capture a high quality image in low lighting conditions, the amount of light is not sufficient for recording a clear contrast image. To solve this problem, some photographic techniques are used. The brightness of the image can be increased by reducing the shutter speed but it causes motion blur in the image. It is again a challenging task.

In our approach we are using two kind of images one is long exposure image and second is flash image to restore the high quality image of vivid color and high contrast in dim light.

First is long-exposure image with slow shutter speed and taken with low **ISO** sensitivity .due to low lighting condition image is blurry. And next one is flash image which is taken with faster shutter speed and supplement light. that kind of image contain sharp contrast but with unnatural color caused by flash image. The brightness of the image can be increased by reducing the shutter speed or by setting high **ISO**. In both the conditions noisy and blurry artifact will also increase.

1.2 Various available algorithms for the integration of misaligned image pair

Feature matching is the base of all computer vision programs. There are many algorithms for feature extraction, most popular of them are SURF, ORB, SIFT, BRIEF. In our framework we are using ORB (Oriented Fast and Rotation BRIFE) which is very fast binary descriptor based on BRIEF. ORB is rotation invariant and resistance to noise. Scale Invariant Feature Transformation (SIFT) is a widely known image feature extraction algorithm. This algorithm is computationally very expensive. So that it is hard for users to use SIFT in their works especially in real time application.

Speeded-Up Robust Features (SURF) is a also a classical approach expressing local features in the images using feature vectors. SURF is a local feature detector and descriptor. In available all the algorithms ORB is fastest method to compute matching features.

II. Previous work

Noisy and blurry image is very annoying in digital image processing and restoring high quality image from blurred and noisy image is a very challenging task. There is plenty of sophisticated denoising algorithms are available but it is difficult to completely avoid this artifact. The use of a flash and non flash image pair can efficently improve the denoising performance. IN [3] Petschnigg et al combines the colors of non flash image and contrast of the flash image. This can be done by using bilateral filter and edge preserving filters like guided filters [ ].

In [9] introduced an image integration technique in which Correspondence algorithm are key technique in the integration of a misaligned image pair. Scale Invariant Feature Transformation (SIFT) is a widely known image feature

extraction algorithm. The features extracted by this algorithm are invariant to many image related variables including scale and rotation. Scale space extrema detection, Key point localization, Orientation assignment, Key point descriptor this are the four steps include in SIFT feature extraction algorithm. This algorithm is computationally very expensive. So that it is hard for users to use SIFT in their works especially in real time application. This is a common problem with many image-processing related algorithm.

In [1] present a fast motion deblurring technique that produce a deblurring result from single moderate size image in a few seconds. They accelerate both latent image estimation and kernel estimation in a iterative deblurring process. They use simple image processing techniques for prediction of strong edges from an estimated latent image. By using this approach a computationally efficient Gaussian prior become sufficient for deconvolution to estimate the latent image. for kernel estimation they formulate the optimization function by using image derivatives. In their experiments, the kernel size was specified by the user and did not have much influence on the accuracy of kernel estimation if the size was large enough to contain the estimated kernel. Although Their method contains several parameters.

III. ORB FEATURE MATCHING

ORB (Oriented Fast and Rotation BRIFE) is the efficient replacement of SIFT feature matching algorithm[10]. Which has similar performance. This method is very fast binary descriptor based on BRIFE. This method is rotation invariant and noise resistance. ORB is less affected by image noise, and is capable of being used for real-time performance. BRIEF is a very popular feature descriptor that uses simple binary tests between pixels in a smoothed image patch. Its performance is similar to SIFT in many respects including robustness to lighting, blur, and perspective distortion, However, it is very sensitive to in-plane rotation very fast in computation in compare to SIFT. Its keypoint calculation is very fast and its variants are the method of choice for finding keypoints in real-time systems that match visual features. This method is efficiently find the reliable corners keypoint.

IV. FLOW CHART OF OPERATION

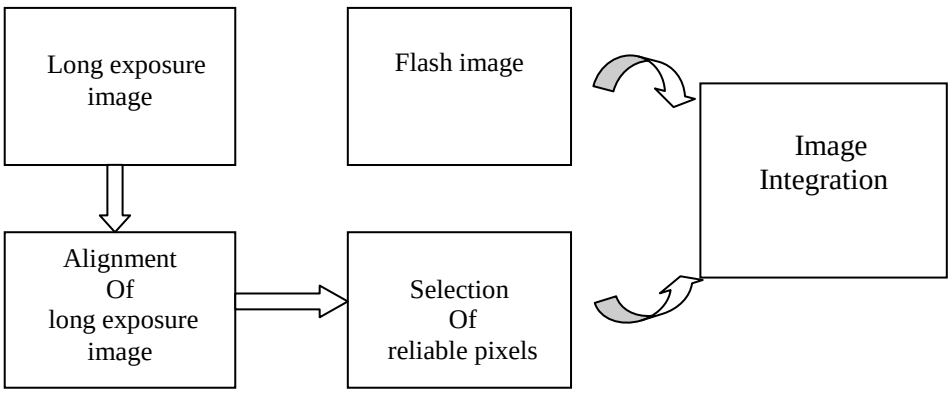

Fig 1: flow chart of image integration process

V. ALGORITHM

Step1: Taking two images

R: Flash image, **S:** long-exposure image

Step2: IMAGE REGISTRATION (R,S)

$S' = T_n(S)$

Define a set that consists of the pixels in the aligned region.

Step3: PIXEL SELECTION (R, S', T')

$T := \{ t \in T' \mid d_t \leq \tau \}$

Step4: IMAGE INTEGRATION(R, S', T)

In this step flash image R, aligned long exposure image S' and selected reliable pixels are integrated.

VI. IMAGE INTEGRATION OF MISALIGNED IMAGE PAIR BASED ON ORB FEATURE

In our framework we are using two kinds of image pair one is long exposure image **R** and second is flash image **S**. Long-exposure image is taken at a slower shutter speed due to this image is blurred and also contains natural color. Flash image is taken with additional flash light, with a low ISO sensitivity and a short exposure time, it has a high Signal-to-noise ratio and sharp contrast but contains unnatural color caused by additional light source. Main idea is to construct high quality image from this two image set taken in different lighting conditions.

In first step image Alignment is done to align the long exposure image with respect to flash image. This image alignment is based on ORB features. This method extract the best matching feature of long exposure image. ORB is the best available method for feature matching rather than SIFT method. The similarities between this two images are determined. In this step Long-exposure image is transformed to aligned image set S'.

$$S' = T_n(S)$$

Where: S is the long-exposure image, S' is the aligned image, $T_n(.)$ is the ORB flow operator.

Following by image registration, pixel selection process is performed in which fractions of reliable pixels are selected. There are many mismatches and unwanted regions presented in aligned image. These unwanted regions are removed to improve the quality of image integration.

After computation of aligned image S' and pixel selection T' and flash image R are integrated to obtain a high quality image which contain the best features of both image pair. This integrated image contains clear contrast, sharp edges and natural colors without any burr or noise artifacts.

VII. RESULT ANALYSIS

In this paper we have detail discussed about image integration process. As a input we take two image long exposure image fig:2 and flash image fig:3. Flash image is aligned with respect to flash image. In this resultant aligned image fig :5 unwanted pixels are removed and obtain only reliable pixels. This pixels, aligned long exposure image and flash image are integrated to restoring the high quality image fig:5 with sharp edges and clear contrast.

Fig:2

fig:3

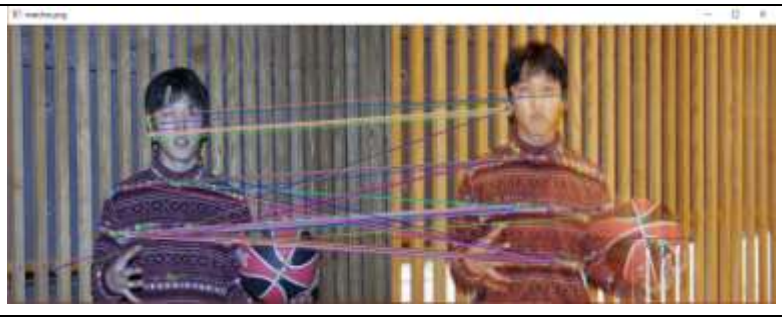

Fig:4 matching points

Fig: 5 integrated image

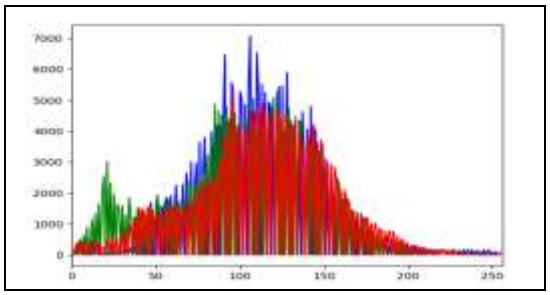

Fig: 6 histogram of integrated image

VIII. COMPARISON BETWEEN SIFT AND ORB

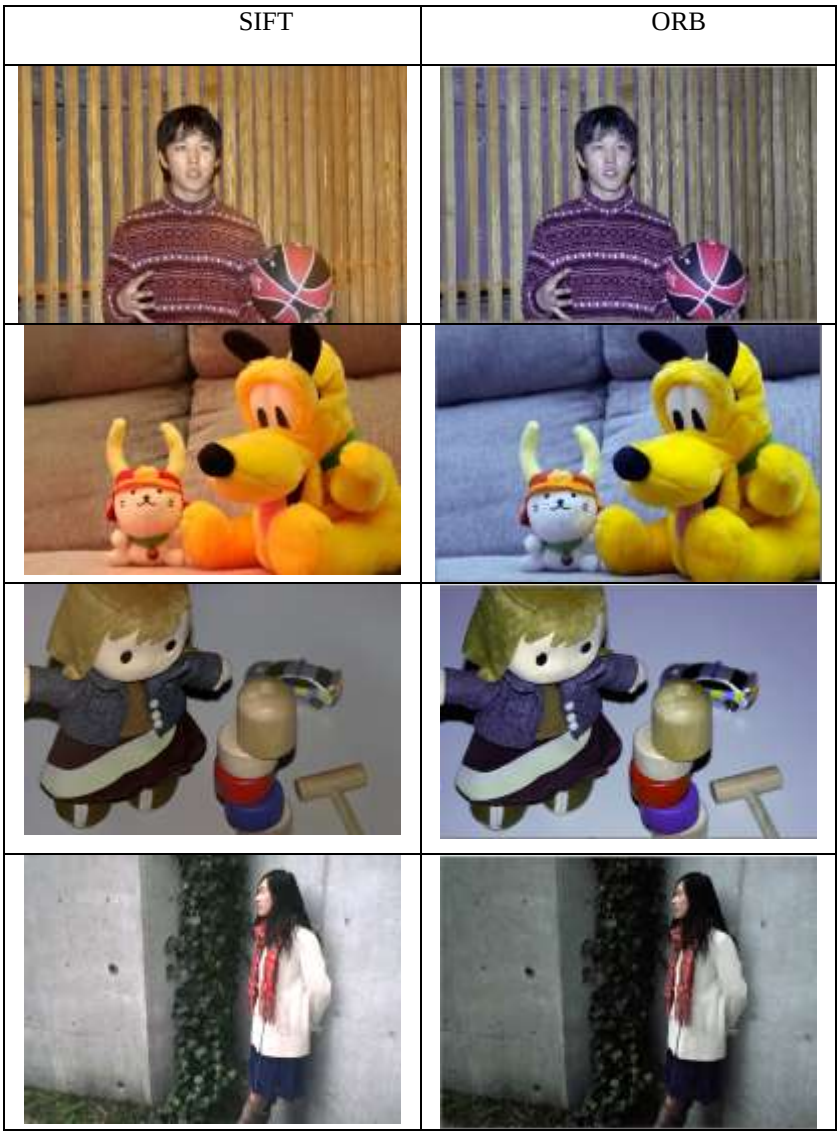

Fig: 7 COMPARISON BETWEEN SIFT AND ORB

IX. CONCLUSION

A technique for reconstructing a high quality image from image taken in low lighting condition is detailed in this paper. In this paper we are presenting an image integration technique which is based on a ORB feature matching. The main aim of this paper is to reduce the computational complexity of SIFT feature extracting algorithm, As well as

time consumption by this method. ORB feature is effective alternative of SIFT algorithm. Since SIFT based method takes 39 seconds for 640*427 images and ORB based method takes average of 3.53 millisecond (ms) implemented on python 3.5 which is much lesser then the previous work based on SHIFT. Our method is tested on 640*427 images on personal computer with Intel Pentium dual core processor 4405U.

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XI. REFERENCES

[1] S. Cho and S. Lee, "Fast Motion Deblurring", *ACM Transactions on Graphics, vol. 28, no.5, pp. 145:1145:8, 2009.*

[2] Rob Fergus, Barun Singh, Aaron Hertzmann, Sam T. Roweis, "Removing Camera Shake from a Single Photograph", *ACM Transactions on Graphics, vol. 18, no. 6, Oct. 2006.*

[3] G. Petschnigg, R. Szeliski, M. Agrawala, M. Cohen, H. Hoppe, and K. Toyama, "Digital photography with flash and no-flash image pairs", *ACM Transactions on Graphics, vol. 23, no. 3, pp. 664672, Aug. 2004.*

[4] Y. HaCohen, E. Shechtman, D. B Goldman and D. Lischinski, "Non-Rigid Dense Correspondence with Applications for Image Enhancement*", ACM Transactions on Graphics, pp. 28742882, 2011.*

[5] G. Petschnigg, R. Szeliski, M. Agrawala, M. Cohen and K. Toyama, "Flash Photography Enhancement via Intrinsic Relighting", *ACM Transactions on Graphics, vol.26, no. 8, pp. 154:1-4, Mar. 2004.*

[6] Xiaopei Liu, Liang Wan,Yingge Qu, Tien-Tsin Wong, Stephen Linv, "Intrinsic Colorization", *ACM Transactions on Graphics, vol. 26, no. 8, pp. 154:1-4, Mar. 2008.*

[7] L. Yuan, J. Sun, L. Quan, and H.-Y. Shum, "Image Deblurring with Blurred/Noisy Image Pairs", *ACM Transactions on Graphics, vol. 16, no. 8, pp. 255:6-10, 2007.*

[8] C. Liu,J. Yuen, A.Torralba ,J. Sivic, and W. T. Freeman "SIFT Flow: Dense Correspondence across Different Scenes" *In proc.ECCV,2008,pp.28-42.*

[9] Tatsuya Baba, Ryo Matsuoka, Keiichiro Shirai and Masahiro Okuda, "Misaligned Image Integration with Local Linear Model", *IEEE Transactions on Image Processing, vol. 25, no. 5, May 2016*.

[10] Ethan Rublee Vincent Rabaud Kurt Konolige Gary Bradski "ORB: an efficient alternative to SIFT or SURF" *IEEE Transactions on Image Processing,* Nov. 2011 .

[11]R. Matsuoka, T. Yamauchi, T. Baba, and M. Okuda, "Weight optimization for multiple image integration," in IEEE ICIP, Sep.2013, pp. 795–799.

[12] T. Baba, R. Matsuoka, S. Ono, K. Shirai, and M. Okuda, "Flash/no-flash image integration using convex optimization," in IEEE ICASSP, May 2014.

