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A Noval Approach for Image Quality Enhancement via Image Super-Resolution

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Abstract— The Super-Resolution (SR) or High Resolution Image reconstructed from noisy, blurred and aliasing the low resolution image using techniques known as super-resolution reconstruction.The super-resolution reconstruction process to combining the low resoultion images to form high resolution images using the algorithm (i.e interpolation).The super-resolution have phases such as registration,interpolation,restoration,the low resolution is registration with to the referanceimages then to interpolation using the algorithm,then after the restoration to from image to removing noise, blure.Hence, the super-rsolution to gernrate high resolution image using the low resolution image and it iis graphical interface to measure the parameters.In this papers the MATLAB based result to using the Robust Super-resulution algorithms and in it graphical interface to measure parametres.

Keywords— Registration, Interpolation, Restoration, Blurring & Aliasing, Super-resolution.

I. INTRODUCTION

Now day's in the many image proceesing aplication to need the high resolution images.The super reslution reconstruction techniques to genrate high resolution image from the low resolution images using noisy,blurres .aliasing and shifting pixels in images.Today super-resolution tchniques are used in lot fileds. The some application areas are surveillance, forensic and satellite imaaging, medical imaging application.Today 's image processing apllication mostly using inth areas are electronics and medical fields,in the medical field the high resolution image very useful for doctror to acorrect diagnosis. The low resolution noisy image captured from common imaging sysetm.It is having different unwanted parameters such as optical distortion, aliasing, motion blur and noise.This low resolution image is input image to our super-Resolution algorithm to generate high resoultion image.One most approach is to use signal processing methods to obtain an high resolution image (or sequence) from observed multiple low-resolution images. Recently, such a resolution enhancement approach has been one of the most active research areas, and it is called super resolution (SR) (or HR) image reconstruction or simply resolution enhancement.High resolution output image from Super-Resolution alogrithm with low resolution input image.

II. OBSERVATION MODEL

For extensive analysis of SR image reconstruction problem, the required thing is to formulate, an observation model that relates the original HR image to the observed LR images..The first step to understand SR is to formulate an observation model to relate the LR images to the desired HR image.A scene with continuous intensity distribution $\underline{P}$ is seen to be warped at the camera lens because of the relative motion between the scene and camera.The images are blurred by atmospheric disorder and camera lens by continuous point expanded functions $H_k=H_k^{cam}H_k^{atm}$. Then, they will be discretized using CCD sensors systems which results in a digitized noisy frame $\underline{Q}$. We reprsent this forward model by equation (1). Fig.1 shows us to how the frame of real world scene gets runined due to several parameter of super resolution such as turbulence of atmospheric, camera lens of continous point spread functions and noise of system.The following process can illustrated using the figure of the equation.

$$\underline{Q}_k = D_k F_k H_k \underline{P} + V_k \qquad k = 1, 2, \ldots, N \qquad (1)$$

Where the camera's point spread function (PSF), is modeled by the blur matrix H_k, and D_k represent the decimation operator. F_k is the geomatric warp operator between the HR frame P, the k_{th} LR frame $\underline{Q}_k$ which are rearranged in lexicographic order (P and Q_k present their matrix from). V_k is the additive noise and N is number of available LR frames. Fig. 1 illustrates equation (1).

In this process of super-resolution have two steps such as registration and interpolation.

Registration:

The estimation of motion information is registration and all the images are aligned in the same coordianate system.The multiple low resolution images can represnet diffrenet view points of the same scene and image registration deals with mapping corresponding points in these images to the actual points in original scene and transforming data into one coordinate system.Several types of transformations could be required for registration of images like affine transformations could be required for registration of images like affine transformations.

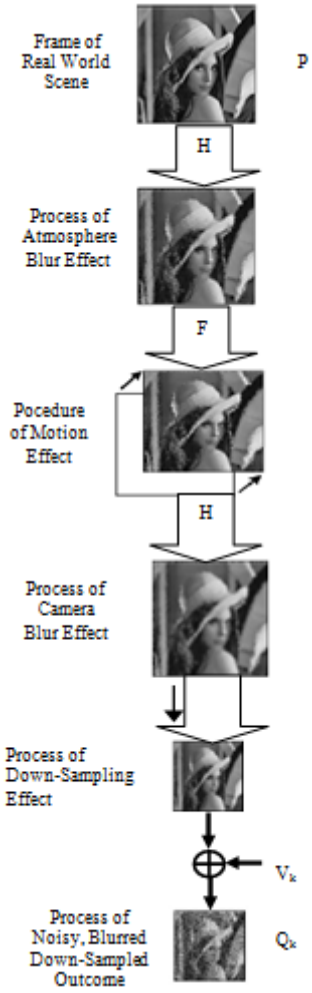

Figure 1. Block diagram representation, process to where P is the continuous intensity distribution of the scene, V_k is the additive noise, and Q_k is the to resulting discrete low-quality image.

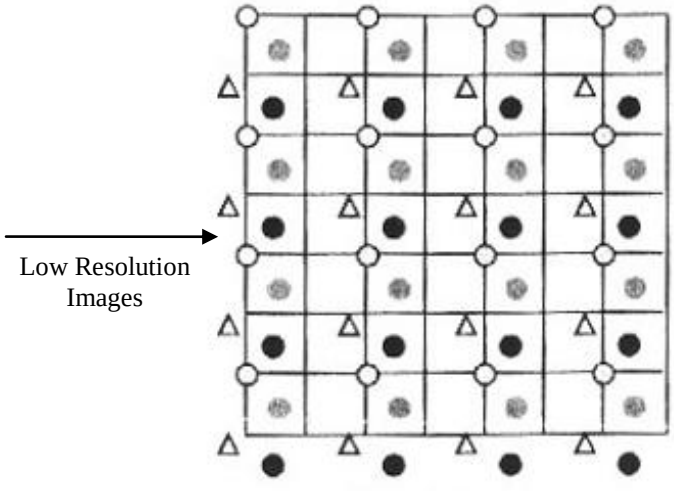

Fig2. Registration of Low Resolution Images.

Fig.2 shows of registration of low resolution images is to reprsents the estimation of motion information between the reference low resolution image and the low resolution images.The extremely so difficult,to estimating the completely arbitrary motion in frame of real world image scene, with no almost gurantees of estimator performance. On the overall super-resolution performance to estimates incorrect of motion have diastrous implications.

Interpolation: Fig.3 shows the Interpolation process onto high grid and debluring is to the low resolution between the shifts are different from each other,to the generated high resolution image will not always match into a spaced high resolution grid uniformly.Hence the interpolation is needed. The fractional unit of motion is not equal to the high resolution grid refrence image to the estimation to require the interpolation.

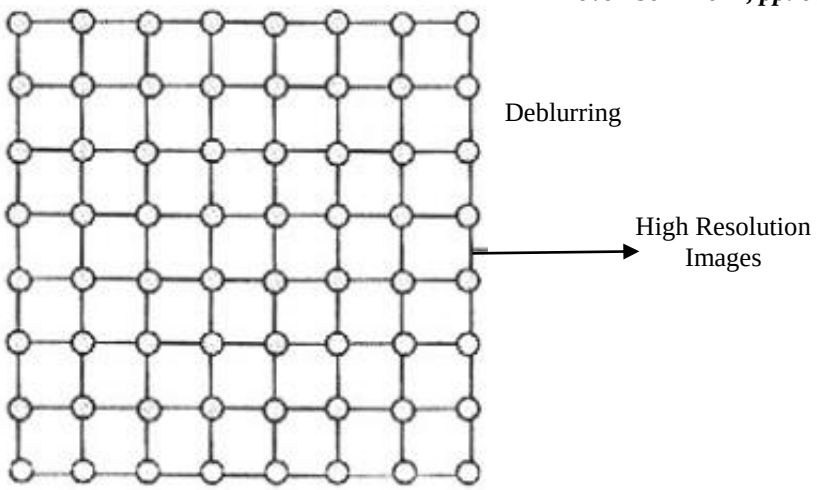

Fig3: Interpolation process onto high grid and debluring

The since the shifts between the low resolution images are arbitrary,the images not match to the high resolution grid uniformaly.The From a nonuniformly spaced composite of low resolutionimages to obtain a uniformaly spaced high resolution image is to nonuinform interpolation. To improve the resolution in between the low resolution images to usethe nonuniform interpolation.

III. SUPER-RESOLUTION ALGORITHM

The algorithm implemented in this paper is robust super-resolution.In the robust super-resolution method to estiamtion of an unknown high resloution image is not exclusively based on the low resolution measurments. The data fusion is blurred high-resolution image from the low-resolution is finding and estimation the deblurred image and estimating the deblurred image. It is also base on many asumptions based such as noise or motion.The Robust super-resolution method are robust estimation is concepts of robust,error in modelling,error in motion,inconsistent pixels and noise. In interpolation the adding a regularization term to calculating missing data.in robust regularization is a very usful in the squar and determined cases ($p = r^2$ and $p > r^2$ respectively) and also reregularization very help the algorithm to remove artifacts from the final answer & improve the rate of convergenceIn super resolution cases ($p < r^2$ in which p is the non-redundant low-resolution frames of number and r is enhancement resolution factor) and thepixel locatios will not estimate at all.. The following expression formulates our minimization criteria (2).

$$\hat{\underline{P}} = \underset{\underline{P}}{ArgMin} \left[\sum_{k=1}^{N} \left\| D_k H_k F_k \underline{P} - \underline{Q}_k \right\|_1 + \lambda \sum_{l=0}^{P} \sum_{m=0}^{P} \alpha^{m+l} \left\| \underline{P} - S_x^l S_y^m \underline{P} \right\|_1 \right] \quad (2)$$

λ is a scalar to weighting the first term (likeness cost) against the second term (regularization cost). S_x^l is the operator to horizontal direction way shifting P by l pixels and S_y^m is operator to shifts P by m pixels in vertical direction way, (presenting a few scales of derivatives. Scalar weight α, $0 < \alpha < 1$, spatially decaying effect to the summation of the regularization term is applied. The steps of Robust SR method is load the low resolution iamge in the .mat format then it is registertion the images with shifting of pixels using pyramidal LK optical flow process with resolution factor increase. This method is accountable for deblurring –intepolation , non iterative artifical removes ,blur, a edge preservation as well as seeks robustness with respect to motion error, outliers, and other kinds of errors not explicitly modeled in the fused images. The "regulerization" term this induces piecewise smoothness on the HR image using the bilateral filter. The PSF fuction common to all frames and space inveriant.The funtion uses the steepest descent and method to minimize the super resolution cost function which includes terms is “energy" term, which is the L1 norm of the residual error between the HR image and the LR imag sequence. The property structure used to control the algorithm parameters. It then uses the bilateral filter as a regulating term for the debluring and interpolation step then it estimated high resolution image.

IV. EXPERIMENTS

We have studied the performance of the resolution algorithm. The resulting image was sub sampled by the factor.Low resolution frames oreder created using one high resolution image as shown in Figure. The same approach with different motion vectors (shifts) in vertical and horizontal directions was used to produce low resolution images from the original scene. First, in high resolution image by a pixel shifted in the vertical direction. The low resolution frames are shown in Figure below. The generation of super-resolved images using the Robust super-resolution algorithm is shown in Fig.4 (b,d,f) from the low resolution images are shown in Fig4.(a,c,e).The graphical interface of super resolution algorithm parameters such resolution factor, PSF sigma, Alpha, Beta, Lambda and Iterations were also computed.

V. RESULTS

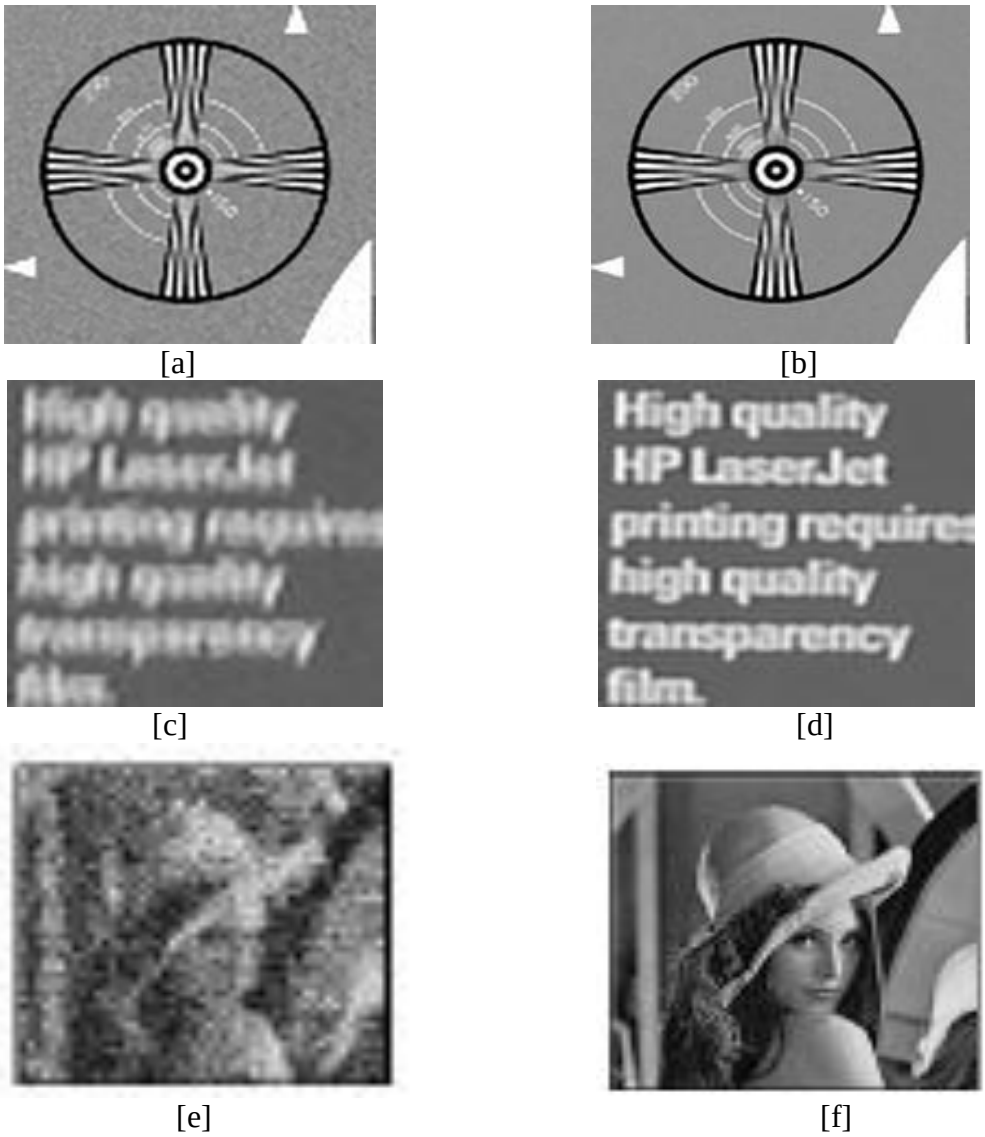

Fig. 4. High resolution images are generated using the Robust super-resolution algorithm from low resolution images.

VI. CONCLUSIONS

In this paper, the results shown using the robust super-resolution algorithm and it is implemented in MATLAB and GUI is developed for image super-resolution.The study shwos to image quality enhancement via image super-resolution from low resolution images by using the robust super-resolution algorithm and also computed parameters to the graphical interface in it.

REFERENCES

[1] S. C. Park, M. K. Park, and M. G. Kang, *Super-Resolution Image Reconstruction*: A Technical Overview,IEEE signal Processing Magazine,May 2003.

[2] Sina Farsiu, M. Dirk Robinson, M. Elad, and P. Milanfar, *Fast and Robust Multi frame Super-Resolution*, IEEETrans. on Image Processing, vol. 13, no. 10, pp. 1327-1344, October 2004.

[3] Z. Wang, A. Bovik, H. Sheikh, and E. Simoncelli, *Image quality assessment: From error visibility to structural similarity*, IEEE Trans. Image Processing, 13(4), 2004.

[4] N. Nguyen and P. Milanfar, *A wavelet-based interpolation-restoration method for super-resolution*, *Circuits Systems and Signal Processing*, vol. 19, no. 4, 2000, pp.321-338.W.-K. Chen, Linear Networks and Belmont, CA: Wadsworth, 1993, pp. 123–135.

[5] Hidenori Takeshima et al., *Image Registration using Subpixel-Shifted Images for Super-resolution*, ICIP, IEEE Conference 2008.

[6] K. T. Leung, C. S. Tong, *Effective Use of Low Resolution Images for Super-Resolution Reconstruction*, In Proceedings of IEEE, Congress on Image and Signal Processing, 2008.

[7] S. Baker, T. Kanade, *Super-Resolution Optical Flow*, CMU-RI-TR-99-36, 1999.

[8] Sina Farsiu ,Michael Elad,Peyman Milanfar, *Multi-Frame Demosaicing and Super-Resolution of Color Images ,IEEE Trans. on Image Processing*, vol. 15, no. 1, pp. 141–159, Jan 2006.

[9] Manuel Guizar-Sicairos et al, *Efficient subpixel image registration algorithm*, Optics Letters / Vol. 33, No. 2 / January 15, 2008.

[10] Wan Rui, Li Minglu, *An Overview of Medical Image Registration*, in Proceedings of the Fifth IEEE International Conference, on Computational Intelligence and Multimedia Applications (ICCIMA'03), 2003.

[11] Attila Nagy et al. *Super-Resolution for Traditional and Omnidirectional Image Sequences*, Acta Polytechnica Hungarica, Vol. 6, No. 1, 2009.

[12] Xiao-hua Yuan et al, *A New Alternative Blind Super-Resolution Algorithm Based on Motion Estimation*, Congress on Image and Signal Processing, 2008.

[13] Y. Altunbasak, A. Patti, and R. Mersereau, *Super-resolution still and video reconstruction from mpeg-coded video*, IEEE Trans. Circuits And Syst. Video Technol., vol. 12, no. 4, pp. 217–226, Apr. 2002.

