International Journal of Research
Available at https://edupediapublications.org/journals
e-ISSN: 2348-6848
p-ISSN: 2348-795X
Volume 04 Issue14
November 2017

A New Approach For Image Denoising By Motion Estimation And Patch-Based Method

[1] Masool Baba Fakruddin, [2] B.Balachandrudu
[1]M.Tech Student DECS, Dept. of ECE, SSSISE, Affiliated to JNTUA , Andhra Pradesh, India
[2]Assistant Professor in Dept. of ECE, SSSISE, Affiliated to JNTUA , Andhra Pradesh, India

Abstract: *Techniques for noise removal in digital images comprise transform thresholding, local averaging, patch based methods and variational techniques. Image fusion is not directly of interest in the removal of noise but in a more general restoration of the image, that is, deblurring, increase of detail or even of resolution. The key of these approaches is the use of a global registration, more robust to noise, blur and color or compression artifacts and, additionally, providing subpixel accuracy. These global registration techniques usually rely on feature matching, for example SIFT, and on a parametric registration, either using an affinity or an homography. The viewfinder alignment performs such a registration by an affine function, with the important characteristic of being extremely fast. A novel image sequence denoising algorithm is presented in the proposed approach takes advantage of the self similarity and redundancy of adjacent frames. The algorithm is inspired by fusion algorithms, and as the number of frames increases, it tends to a pure temporal average.*

Index Terms—patch processing, optical flow, non-local means, motion compensation.

I. INTRODUCTION

Denoising is any signal processing method, which reconstructs the signal from a noisy one. Its goal is to preserve the useful information by removing unnecessary noise. Video denoising is actually process of removing noise from the original video signal, where noise reduction in image can be performed through the frame individually and between the frames. Different denoising methods make different presumptions, depending upon the picture and the kind of picture. Typical noise types are analog and digital. Analog noise includes film artifacts, VHS artifacts, and Radio channel artifacts. Digital type includes blocking, ringing and block slices. In the paper discussed, the creator considered first edge as foundation edge and contrasting this casing and the present edge to get the distinction. It takes an advantage of motion detection in Real time video streaming using continuously moving frame background. Here the initial step for video denoising is taken as moving object detection and additionally objects tracking. This method utilizes division of moving articles from stationary foundation objects. This is focused on higher level processing and decreases calculation time. Shadow object segmentation is troublesome and noteworthy because of light changes. A large portion of video denoising method depends up on a single noise for example, Gaussian or background noise. Different statistical distributions are being found with major contributing sources of noise, for example, dark current noise and quantization noise. The most widely recognized way to deal with taking care of impediments in the optical stream literature is to define them as regions where forward and backwards motion estimates are inconsistent. Most methodologies return estimates of motion in the occluded regions, where they cannot be invalidated. As we have effectively brought up, in an occluded region one can't decide a movement field that maps one picture onto another, because the scene is not visible. Some methodologies, while additionally misusing motion symmetry, discount occlusions by weighting the data fidelity with a monotonically decreasing function. The resulting problem is non-convex, and in this manner the proposed rotating minimization procedures can be prone to local minima. A substitute approach is to define joint movement estimation and occlusion detection in a discrete setting, where it is NPhard. Many approximate and near point solutions using combinatorial optimization technique require fine quantization and thus suffer through a wide number of labels which results in loose approximation bounds. Another class of techniques uses the motion estimation residual for classifying a location

International Journal of Research
Available at https://edupediapublications.org/journals
e-ISSN: 2348-6848
p-ISSN: 2348-795X
Volume 04 Issue14
November 2017

as occluded or visible either with a direct threshold on the residual or with a more elaborate probabilistic model.

II. RELATED WORK

In literature survey, the previously developed techniques for video denoising are discussed with their advantages and disadvantages. lmed Ben Dhaou and lrek Defee presented the paper, „DVC decompression with denoising for picture quality improvement‟, in which they explained how the digital video cassette for real time video recording applications. Also it is described that how noise can be decreased by digital post-filtering using the approach of wavelet denoising. The basic version of wavelet denoising is implemented and applied to the DVC, so as to get much higher quality of video. The disadvantage of this approach is that at low-light conditions, the picture quality is degraded even if the denoising algorithm is applied

Daniel Pak-Kong Lun and Tai-Chiu Hsung presented a paper on, 'Image Denoising wavelet transform modulus sum'. The research explained the WTMM approach that is wavelet transform modulus maxima to decrease blocking effect of decoded image sequence. SN ratio is increased with this approach and ultimately increased in the quality of image .

Rakesh Dugad and Narendra Ahuja, presented a paper as 'Video Denoising by Combining Kalman and Wiener Estimates', in which a computationally quick fast scheme for video denoising is presented. spatial redundancy and adaptive edge-preserving Wiener filter are combined using averaging to get denoised frame. IPSNR that is improvement in PSNR compared to the PSNR of corresponding noisy frame gets us a comparison for deriving the increment in denoising

J. Abbas, M Domariski presented the paper, 'median-based filters with predication error processing for video restoration', in which median based filters are used for denoising of video color sequences. Implementation uses the concept of prediction of pixel value using non-liner filter and then its comparison with corrupted input image. Achievement is to check the improvements respectively in efficiency of video sequence denoising for both twodimensional and three-dimensional filters for motion compensation. As per the results error prediction processing leads to better results than the classic median-based filters. Computational cost is very less

Peter Rieder and Gunter Scheffler presented a paper on, 'New Concepts on denoising and sharpening of video signals'. Concepts in this paper leads to sharpening of images with separating noise from the video.LTI that is Luminance Transition Improvement, Contrast adaptive peaking and CTI that is Chrominance Transition Improvement algorithms are developed in the mentioned approach. The algorithms used can be efficiently and practically realized in hardware. Sharpness and optimum quality are the key aspects for achievements

Y. H Lohl, L. Y. Chew and U. Chan presented a paper on, 'Multi-processor denoising of weak video signals in strong noise'. Approach is based on the algorithms, Least square estimation and best Linear unbiased estimation. Practical processing was achieved using DSPs and videos with low SNR values. Practically more efficient multiprocessing algorithms and techniques are used to denoise more noisy videos. Technique is efficient for the signal system when the system has weak video signal.

III. EXISTING SYSTEM

In the literature, image fusion is not directly of interest in the removal of noise but in a more general restoration of the image, that is, deblurring, increase of detail or even of resolution. The key of these approaches is the use of a global registration, more robust to noise, blur and color or compression artifacts and, additionally, providing subpixel accuracy.

These global registration techniques usually rely on feature matching, for example SIFT, and on a parametric registration, either using an affinity or an homography. The viewfinder alignment performs such a registration by an affine function, with the important characteristic of being extremely fast.

DISADVANTAGES OF EXISTING SYSTEM

The general approach is the use of an homography. It must be noted that an homography is valid only for planar scenes or if the optical center is not modified.

IV. PROPOSED SYSTEM

We propose a new algorithm making use of motion estimation algorithms and patch based methods for denoising. Our method is inspired by image fusion algorithms in the sense that it tends to a fusion algorithm as the temporal sampling of the sequence gets dense and the motion estimation or global registration is able to perfectly register the frames and no occlusions are present.

As this is an ideal scenario, our algorithm compensates the failure of these requirements by introducing patch comparison and denoising in an adapted PCA based transform. Unlike VBM4D the motion estimation used by our algorithm relies on the optical flow constraint (OFC), that is, we suppose that the color of each pixel remains constant along its trajectory through the sequence.

The optical flow is used to warp adjacent frames and not only for compensating neighborhoods. Thus, the subpixel accuracy improves the patch comparison and averaging. Results in motion estimation are far from being totally satisfactory, there are many unsolved issues as occlusions, non translational motions, non color constancy, etc. Despite these limitations, we will show that OFC algorithms are a useful tool for denoising.

ADVANTAGES

An extensive comparison with the state-of-the-art methods illustrates the superior performance of the proposed approach, with improved texture and detail reconstruction

V. SYSTEM ARCHITECTURE:

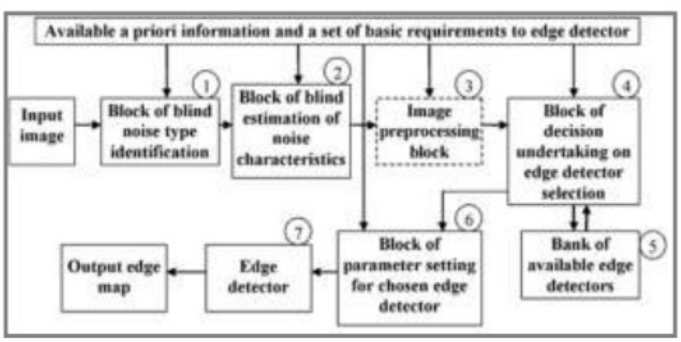

Fig 1: Flow Diagram.

VI. IMPLEMENTATION

Image Acquisition:

In this module, first we develop the Image Acquisition module. The initial module does the process of Pre-processing steps. The Input Video are acquired from Gallery. Then video is converted into frames for further process. These output frames are used as the input for the next modules, for the evaluation of our proposed model.

Motion Compensation:

In this stage, motion compensation is done by motion estimation. First, the optical flow between I_k and adjacent frames in a temporal neighborhood is computed and used for warping these frames onto I_k. If registration was accurate and the sequence free of occlusions, a temporal average in this aligned data would be optimal, even if the noise reduction would slowly decrease as 1/M, where M is the number of adjacent frames involved in the process. Generally, this will not be the case, inaccuracies and errors in the computed flow and the presence of occlusions make this temporal average likely to blur the sequence and have artifacts near occlusions. The proposed approach tends to solve these limitations. Occlusions are detected depending on the divergence of the computed flow: negative divergence values indicate occlusions. Additionally, the color difference is checked after flow compensation. A large difference indicates occlusion, or at least failure of the color constancy assumption. We combine both criteria for a pixel x=(x, y) and the computed flow between I0 and I1. These occluded points having a negative divergence of the flow and a large color difference after flow compensation are located near the discontinuities of the motion field. In this patch wise motion compensated is performed.

Denoising:

In this stage, Denoising is performed. After extract the motion compensation between noised i and i+1frame, PCA is applied in motion compensated frames. Use of PCA for patch denoising preserves fine and texture details.

Performance Analysis:

In this module, we show the graph results for the Performance analysis module. We show the performance analysis results for 1) PSNR for Noise Frames 2) PSNR for Motion Estimated Frames and 3) PSNR for Denoised Frames. Peak signal-to-noise ratio, often abbreviated PSNR, is an engineering term for the ratio between the maximum possible power of a signal and the power of corrupting noise that affects the fidelity of its representation. Because many signals have a very wide dynamic range, PSNR is usually expressed in terms of the logarithmic decibel scale. PSNR is most commonly used to measure the quality of reconstruction of lossy compression codecs (e.g., for image compression). The signal in this case is the original data, and the noise is the error introduced by compression. When comparing compression codecs, PSNR is an *approximation* to human perception of reconstruction quality. Although a higher PSNR generally

e-ISSN: 2348-6848
p-ISSN: 2348-795X
Volume 04 Issue14
November 2017

indicates that the reconstruction is of higher quality, in some cases it may not. One has to be extremely careful with the range of validity of this metric; it is only conclusively valid when it is used to compare results from the same codec (or codec type) and same content.

VII. SIMULATION RESULTS

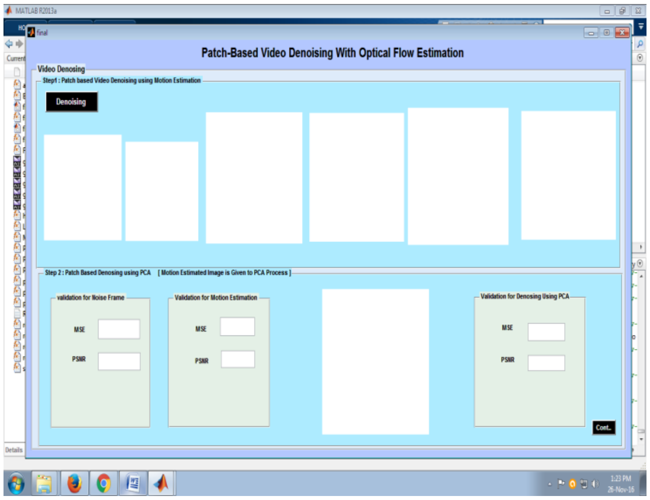

Fig 2:

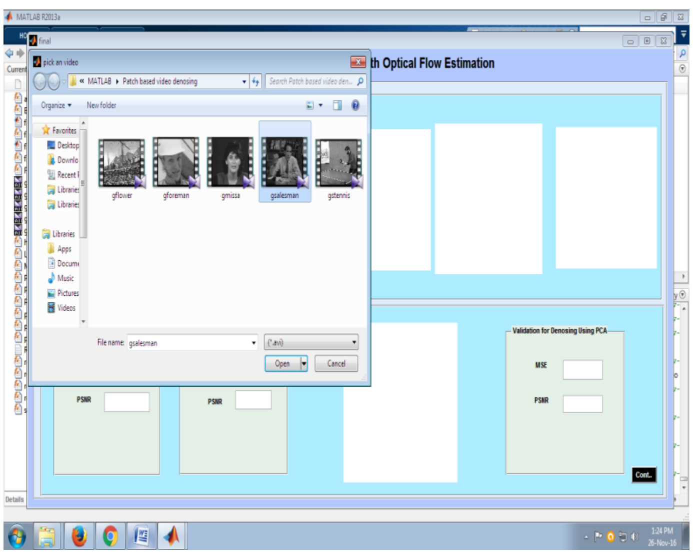

Fig 3:

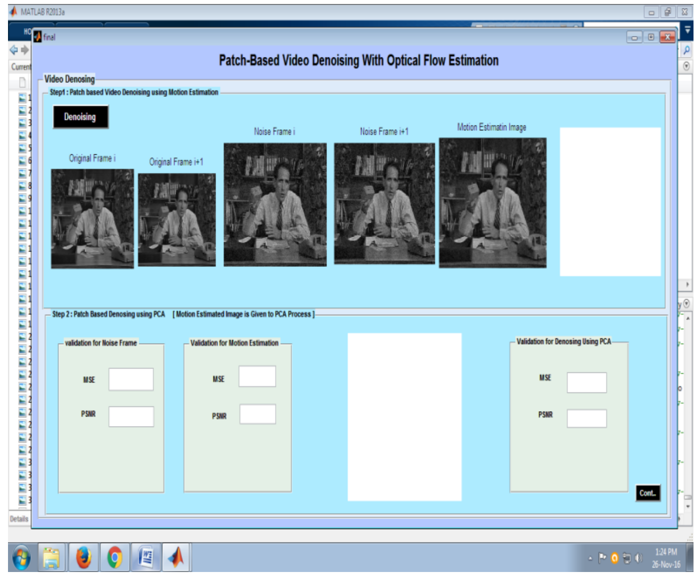

Fig 4

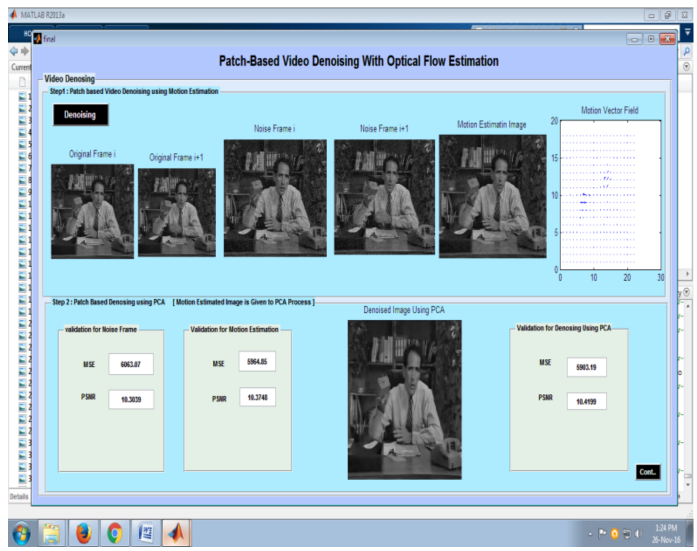

Fig 5

e-ISSN: 2348-6848
p-ISSN: 2348-795X
Volume 04 Issue14
November 2017

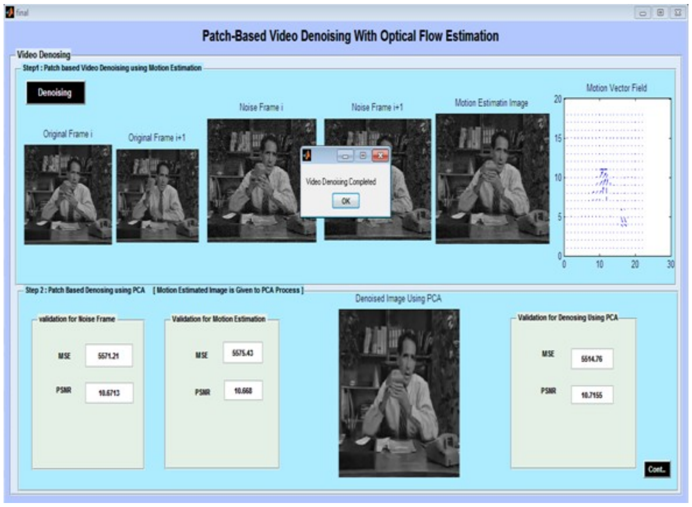

Fig 6

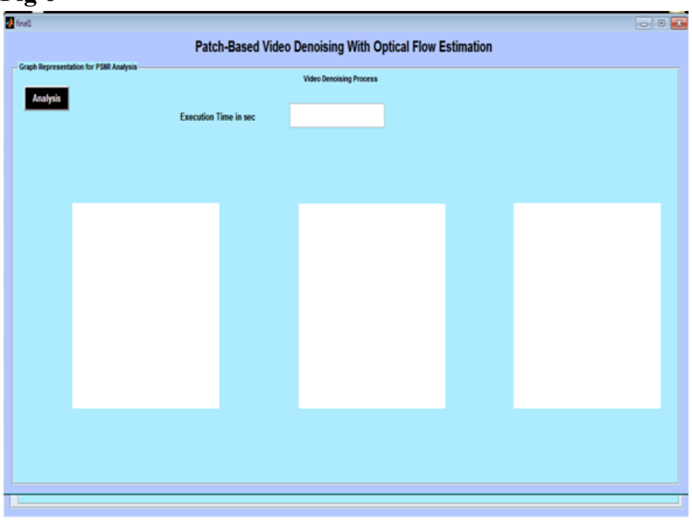

Fig 7

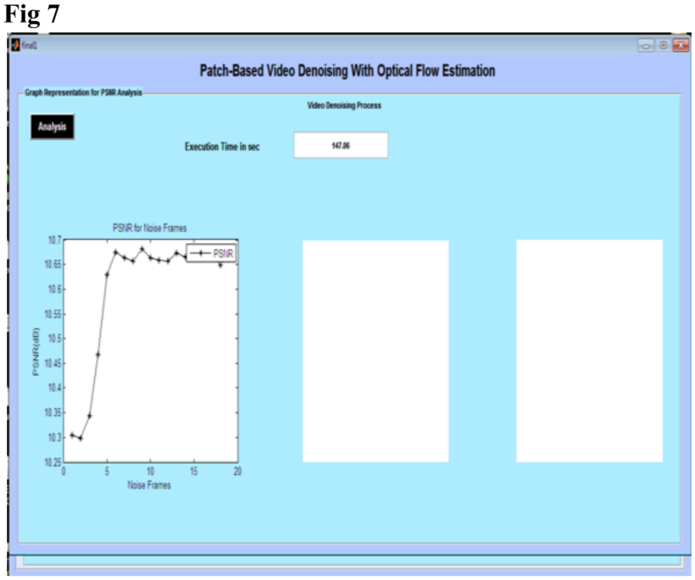

Fig 8

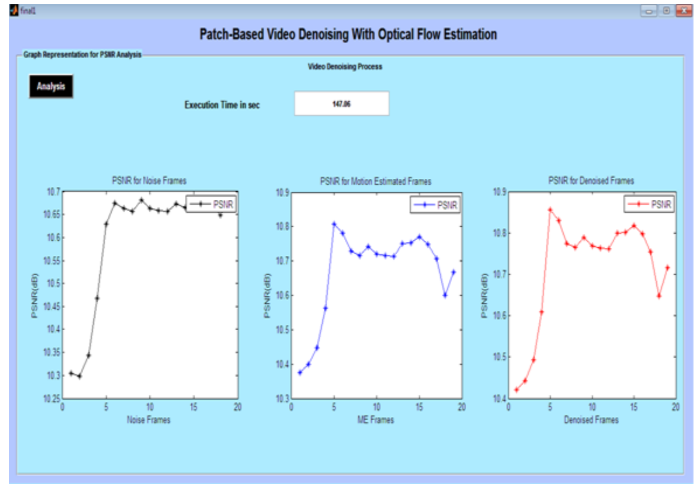

Fig 9

VIII. CONCLUSION

We presented a novel denoising algorithm combining motion estimation and patch based denoising algorithms. Motion compensation permits the use of spatio-temporal patches for a more robust comparison while the use of PCA for patch denoising preserves texture and details. The comparison with state-of-the-art algorithms illustrates the gain on performance of the proposed approach.

The next step is the extension of the current algorithm to other type of noise models, including correlated noise but also compression artifacts of video standard compression algorithms.

REFERENCES

[1] A. Adams, N. Gelfand, and K. Pulli, "Viewfinder alignment," *Comput. Graph. Forum*, vol. 27, pp. 597–606, Apr. 2008.

[2] L. Alvarez, P.-L. Lions, and J.-M. Morel, "Image selective smoothing and edge detection by nonlinear diffusion. II," *SIAM J. Numer. Anal.*, vol. 29, no. 3, pp. 845–866, 1992.

[3] L. Alvarez, J. Weickert, and J. Sánchez, "Reliable estimation of dense optical flow fields with large displacements," *Int. J. Comput. Vis.*, vol. 39, no. 1, pp. 41–56, Aug. 2000.

[4] A. Ayvaci, M. Raptis, and S. Soatto, "Occlusion detection and motion estimation with convex optimization," in *Proc. Adv. Neural Inf. Process. Syst.*, 2010, pp. 100–108.

[5] C. Ballester, L. Garrido, V. Lazcano, and V. Caselles, *A TV-L1 Optical Flow Method With Occlusion Detection* (Lecture

Notes in Computer Science), vol. 7476. Berlin, Germany: Springer-Verlag, 2012, pp. 31–40.

[6] J. Boulanger, C. Kervrann, and P. Bouthemy, “Space-time adaptation for patch-based image sequence restoration,” *IEEE Trans. Pattern Anal. Mach. Intell.*, vol. 29, no. 6, pp. 1096–1102, Jun. 2007.

[7] T. Brox, A. Bruhn, N. Papenberg, and J. Weickert, “High accuracy optical flow estimation based on a theory for warping,” in *Proc. 8th Eur. Conf. Comput. Vis.*, 2004, pp. 25–36.

[8] T. Brox and J. Malik, “Large displacement optical flow: Descriptor matching in variational motion estimation,” *IEEE Trans. Pattern Anal. Mach. Intell.*, vol. 33, no. 3, pp. 500–513, Mar. 2011.

[9] A. Buades, B. Coll, and J.-M. Morel, “A review of image denoising algorithms, with a new one,” *Multiscale Model. Simul.*, vol. 4, no. 2, pp. 490–530, 2005.

[10] A. Buades, B. Coll, and J.-M. Morel, “A non-local algorithm for image denoising,” in *Proc. IEEE Comput. Soc. Conf. Comput. Vis. Pattern Recognit.*, vol. 2. Jun. 2005, pp. 60–65.

.