ISSN: 2321-8169
486 - 490

A Video Upgradation of Low Vision AVI Video by Individual Pixel Channel Intensity Measurement and Its Enhancement

Mr. Anup Date[1], Dr. P.V. Ingole[2]
dateap@gmail.com[1], prashant.ingole@raisoni.net[2]

Abstract:- From the past few decades, the researchers and scholars have done the quality work in video and image processing and a wide range of outcomes has been discover and invented including the resolutions and sensitivity. Apart from these work there are many aspects are still hidden such as record a high dynamic range images and videos in low-light conditions especially when light is very low. When the intensity of noise is greater than the signal then the traditional denoising techniques cannot done their work properly. For this problem, many approaches being designed and developed to enhance the low-light video but Low contrast and noise remains a barrier to visually pleasing videos in low light conditions. To capture the videos in social gatherings, concerts, parties, musical events, dark forest and in security monitoring situations are still unsolved problem. In such conditions the video enhancement of low light video is really a tedious and tough job. This paper is proposing a new approach of video enhancement. The work is further going on to find a technique for better visibility of video.

Keywords
Video Enhancement, quality assessment, enhancement algorithm, low light images, noise, filter, image enhancement.

*****

1. INTRODUCTION

Over the past few years, there has been substantial capability improvement took place in digital cameras in the area of space of resolutions and sensitivity But still there is limitation in modern digital cameras while capturing the high dynamic range images especially in low-light situation [1][18]. Noise in video frames creates a serious problem in an image quality because it remain present as a large residual errors after motion compensation [3][18]. The typical digital cameras can capture images with a dynamic range of thousands in magnitude.[4] The poor visibility is induced due to the overexposure in bright regions and underexposure in dark regions of a captured video [4][18]. During the processing of dark videos, most of the time the dynamic range videos remains largely untouched by most of the algorithms [5-18]. It's always expected that the digital camera should work effectively in all types of lighting and weather condition but most of them are failed in low light situation, there for the low quality of images and videos being captured by this device [6]. The prime intentions of any video enhancement algorithms are to be presented the hidden information of video such as objects, contrast, brightness, colors and etc [7]. Video upgradation or enhancement may be defined as to be received low quality video and deliver high quality video for specific applications [18]. Videos are the integral and important part of day to day life, there for it carried much attention in recent years [10]. Object colors with similar background, low light condition and the unknown intensity of darkness while capturing a video, makes it more difficult to identify the correct scene of video [10]. To overcome these problems, this paper proposed a framework which works in two phases. Firstly it measured an intensity of each video frames by determining the individual pixel channels values to decided a level of darkness of captured video frames and classify the input video frames into either degraded frames or quality frames and secondly it will apply the proposed algorithms of video enhancement. The proposed system provide a better visibility of video [18]

2. PROPOSED SYSTEM

2.1 **System Architecture for video Enhancement**:

This paper is proposing the mechanism to enhance the low light video and provide a better visibility in output video. To achieve this level, there is a need to measure an intensity of an input video frames by determining the individual pixel channels values for deciding level of darkness of input video frames and classify them into two classes, either in degraded frames or quality frames, so that the system can apply an enhancement algorithm especially on degraded frames so that computation time can be saved and simultaneously avoiding to do unnecessary enhancement over quality frames.

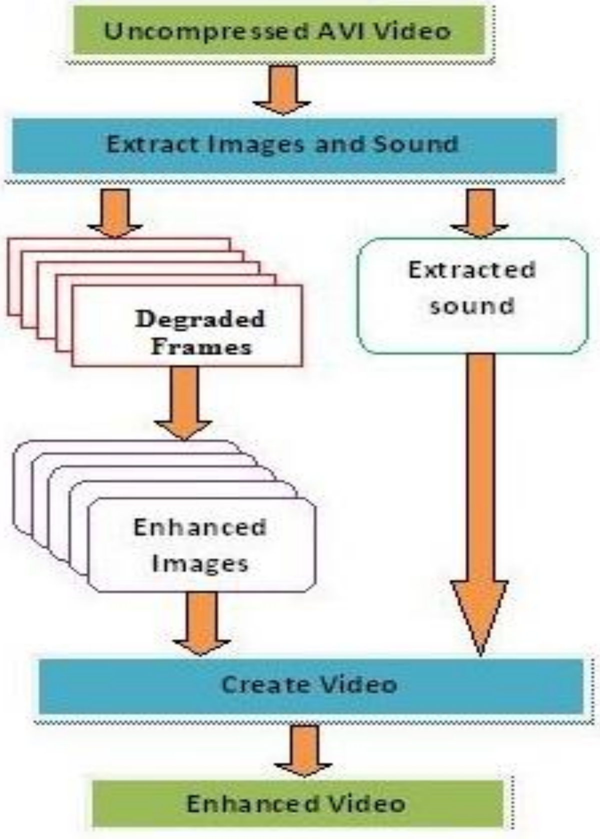


Figure No 2.1 Concept of Proposed System

2.2. Functional Diagram of Video Enhancement:

This system receive an uncompressed AVI video as an input because of uncompressed AVI video is free from encryption so it is easier to extract the audio from the given video. After this system extract only those numbers of video frames which have been mentioned by user. Once it have been done then system extract the sound from the video if it is available and classify the video frames in two segments either in degraded frames or Quality frames on the basis of darkness (noise) present in the given video frame. After this classification, the enhancement algorithm take the charge and perform the enhancement by using Temporal Image Enhancement, Tone Mapping (Histriogram equalization) and Non local Means Denoising on only degraded frames. When all degraded frames being enhanced then at last video is created either with or without sound depends on user requirement.

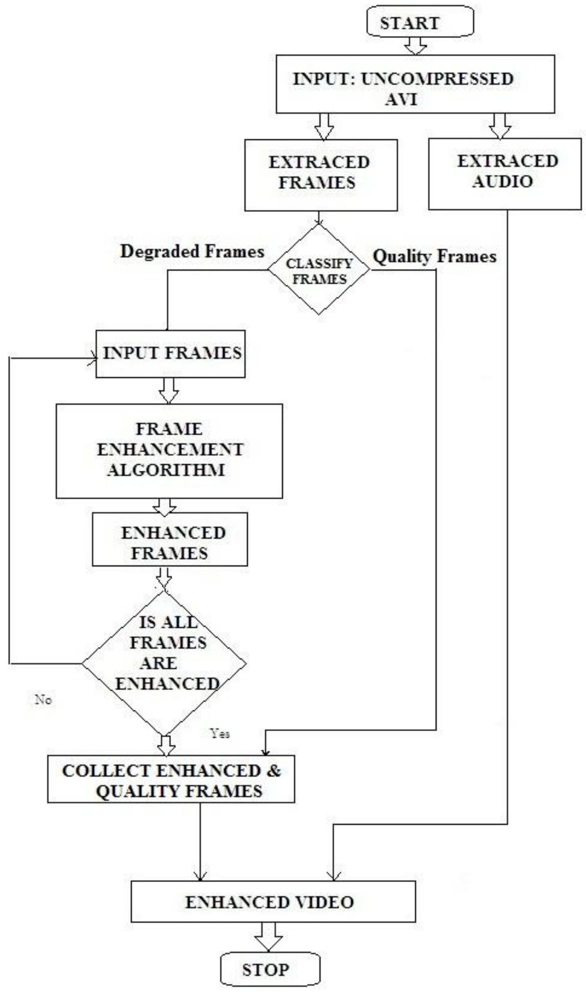


Figure No. 2.2: Functional Diagram of Video Enhancement

2.3 Enhancement Algorithms for Video:

2.3.1 Algorithm No. 1: Temporal Noise Reduction:

Once an image sequences are temporally correlated, noise can be reduced effectively by temporal filtering [1]. While preventing the motion blur, the temporal noise reduction approach is best suit for that [18]. In temporal noise reduction the noise get reduced by selecting all degraded frames as an input and applied Enhancement Factor [E.F] over them to modify the individual pixel channel values (R,G,B values) by multiplying with Enhancement Factor. System may choose any enhancement factor but by using trial and error mechanism here system has adopted the enhancement factor is 0.6 which is going multiplied to R, G, & B channels of each pixels, like [R=R+R*0.6, G=G=G*0.6, B= B+B*0.6]. To avoid crossing the maximum limit of each pixel channel values, there is a need to maintain the individual pixel channel intensity value within the range of 0 to 255, hence system never exceed this range directly or indirectly.

Figure 2.3.1 Input low light captured image (left) and enhanced image by Temporal Noise Reduction (right)

2.3.2 Algorithm No. 2: Tone Mapping (Histriogram Equalization):

Tone Mapping is a technique used in image processing and computer graphics to map one set of colors to another to approximate the appearance of high dynamic range images in a medium that has a more limited dynamic ranges [1-18]. It is process of amplify an intensity of low-light video by judicious histogram adjustment [1-18]. In extremely low light conditions, most of the pixels have a very small intensity values compare to maximum intensity of an image, in such situation it is very difficult to stretch all pixels because it causes an associate degree incorrect conversion with a high offset intensity [1][18].

Histogram Equalization is one more image enhancement technique in which greater is the histogram stretch greater is the contrast of the input image and it mostly preferred for contrast enhancement of digital images and videos [1-18]. When an input image is to be exaggerated then the histogram equalization distribution of the corresponding image has to be amplified. Histogram equalization is widely used enhancement method in digital image processing because it delivers quality output to refine the edges of an object present in an image [3]. Histograms take input in form of color picture and may provide individual demonstration of red, green and blue color channels of histograms or also works with gray scale images [3-18]. The proposed algorithm selects only those frames which have been enhanced by temporal noise reduction method and applied blue color channel of Histriogram over them, which has been chosen by trial and error basis.

Figure 2.3.2 Input low light captured image (left) and enhanced image by Tone mapping (right)

2.3.3 Algorithm No. 3: Non-Local Means Denoising:

In last step of video enhancement, system applies spatial filter for removing the remaining noise [1-18]. The maximum noise is already removed by the temporal noise reduction and the remaining noise can be embellished by the tone-mapping [1]. But still the level of noise is high in low-light environment in such situation edges and textures are rarely smoothed during the denoising process [1]. In such cases the Non-local means denoising is a promising approach in the field of video denoising because of its superior edge preserving performance compare to conventional local means method.

Local mean denoising only takes the surrounding pixels to target pixel for calculating the mean of these all collected pixels but non local mean denoising takes the mean of all pixels present in video frame hence it is better for smoothing and refinement in video enhancement. This method received the frames which have been enhanced by Tone mapping and compute the difference present between the red-green channels and green-blue channels. Then only those channel are taken into consideration which has lowest value compare to other channels and it is multiplied by enhancement factor (E.F), i.e 0.1 which also selected on trial and error basis such as [channel=channel-channel*E.F]. Due to this the range difference present between the color channels get uniformly enhanced and quality of image get improved

Figure 2.3.3 Input low light captured image (left) and enhanced image by Non-Local Noise Denoising (right)

EXPERIMENTAL RESULTS

In proposed system, all proposed methods have been tested with low light videos and also implemented on real low light video captured by mobile phones [2]. The proposed methods showed their experimental result in figure 2.3.1, 2.32 and 2.3.3. These methods took different processing time depends on the algorithms chosen by them and frame size (width & height) of input video. Appropriate enhancement factors have been selected by performing the trial and error method on proposed algorithms. The proposed system delivered the quality results when compared with Decorrelation Stretch method. The proposed method eliminates the most of noise from input video frames where as the Decorrelation stretch method is just extend and enlarge the color patterns of input video frames rather than to eliminate the complete noise. The experimental result present a table of three columns, out of this first column showing input video frames, where as the second column presented the video frames enhanced by proposed system and third column derived the video frames which have been enhanced by Decorrelation stretch method. The results is showing that the proposed system being delivered better quality output as compare to Decorrelation stretch method.

ISSN: 2321-8169
486 - 490

Table No. 6.8: Comparative Output of Proposed System to Decorrelation Stretch

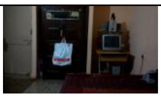
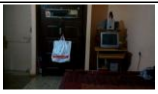
Degraded Frames as an Input	**Enhanced by Proposed System (Output)**	**Enhanced by Decorrelation Stretch**
 **Frame 0**	 **Frame 0**	 **Frame 0**
 **Frame 1**	 **Frame 1**	 **Frame 1**
 **Frame 2**	 **Frame 2**	 **Frame 2**

Table No. 6.9: Comparative Result Analysis of Proposed System to Decorrelation Stretch. (A, B, C)

Video name	Video-1
Video Duration	12.437 sec
Video Format	RGB24
Type of Video	3GP
Video Frame Rate	16.6525
Video Bit Per Pixel	24
Video Height	720
Video Width	1280

	Original Frame		Enhanced Frame by Proposed System				Enhanced Frame by Decorrelation Stretch			
	Mean Intensity	Entropy	Mean Intensity	Entropy	MSE	PSNR	Mean Intensity	Entropy	MSE	PSNR
Frame 1	0.21176	6.6253	0.41569	7.3048	4423.65	11.673	0.4	7.3447	3093.73	13.226
Frame 2	0.20784	6.5254	0.41569	7.2266	4516.39	11.582	0.39216	7.2486	3093.72	13.226
Frame 3	0.21176	6.6431	0.42745	7.3134	4586.98	11.515	0.4	7.3419	3195.3	13.085

Resultant Video By Proposed System					Resultant Video By Decorrelation Stretch				
Time for Calculate the result	mean Intensity	Average Entropy	MSE	PSNR	Time for Calculate the result	mean Intensity	Average Entropy	MSE	PSNR
60.95 Sec	0.4238	7.31	4621.812	11.48	60.0504 Sec	0.40251	7.338	3227.71	13.04

CONCLUSION

This paper proposed and presented a new approach of video enhancement which showing new framework that done classification of input video frames and drawn a conclusion to separate them in two classes, either in degraded frames or quality frames depends on the noise present in the input frames. The proposed system provides a facility to perform an enhancement on only degraded frames by using Temporal Noise Reduction, Tone Mapping and Non-Local Mean Denoising algorithms. The said system delivered the quality output when it compared with Decorrelation Stretch method because a proposed method eliminates most of the noise from input video frames where as the Decorrelation stretch method is just extend the color patterns of an object present in input video frames rather than to eliminate complete noise. The extensive analysis shows that the proposed methods satisfied the desired enhancement criteria and guaranteed efficiency as well.

REFERENCES

[1] Minjae Kim, Dubok Park, David K. Han and Hanseok Ko, "A Novel Framework for Extremely Low-light Video Enhancement," IEEE International Conference on Consumer Electronics (ICCE), 2014.

[2] Zhengying Chen, Tingting Jiang and Yonghong Tian, "Quality Assessment for Comparing Image Enhancement Algorithms," IEEE, Computer Vision Foundation, CVPR, 2014.

[3] Er. Mandeep Kaur, Er. Kiran Jain and Er Virender Lather, "Study of Image Enhancement Techniques: A Review," International Journal of Advanced Research in Computer Science and Software Engineering, Volume 3, Issue 4, April 2013.

[4] Chi-Yi Tsai, Member, "A Fast Dynamic Range Compression with Local Contrast Preservation Algorithm and Its Application to Real-Time Video Enhancement," IEEE Transactions On Multimedia, Vol. 14, No. 4, August 2012.

[5] Snehal O. Mundhada and Prof. V. K. Shandilya, "Image Enhancement and Its Various Techniques," International Journal of Advanced Research in Computer Science and Software Engineering, Volume 2, Issue 4, April 2012.

[6] Yunbo Rao, Leiting Chen, "A Survey of Video Enhancement Techniques," Journal of Information Hiding and Multimedia Signal Processing Ubiquitous International, Volume 3, Number 1, January 2012.

[7] Qing Xu1, Hailin Jiang, Riccardo Scopigno and Mateu Sbert, "A New Approach For Very Dark Video Denoising And Enhancement," IEEE 17th International Conference on Image Processing, Hong Kong, September 26-29, 2010.

[8] Xuan Dong,Yi (Amy) Pang, Jiangtao (Gene) Wen, Guan Wang, Weixin Li, Yuan Gao, Shiqiang Yang, "A Fast Efficient Algorithm for Enhancement of Low Lighting Video," Journal of Information & Computational Science, Page No. 2021–2030, Year 2010.

ISSN: 2321-8169
486 - 490

[9] M. Rizwan, M. K. Islam and H. A. Habib, "Local Enhancement for Robust Face Detection in Poor SNR Images," IJCSNS International Journal of Computer Science and Network Security, Vol. 9, No.6, June 2009.

[10] Seong-Won Lee, Vivek Maik, Jihoon Jang, Jeongho Shin and Joonki Paik, "Noise-Adaptive Spatio-Temporal Filter for Real-Time Noise Removal in Low Light Level Images," IEEE Transactions on Consumer Electronics, Vol. 51, No. 2, Page No. 648-653, May 2005.

[11] Patrick Martinchek Nobie Redmon and Imran Thobani, "Low Light Mobile Video Processing," Stanford University Publication.

[12] Sandeep Mishra and Abanikanta Pattanayak, "Integrated Low Light Image Enhancement in Transportation System," International Journal of Image Processing and Vision Sciences (IJIPVS), Volume-2 Issue-1, Page No. 70-74, 2013

[13] A. Buades, B. Coll, and J.M. Morel, "A Review Of Image Denoising Algorithms, With A New One," Siam Journal On Multiscale Modeling and Simulation, Vol. 4, Issue 2, Page No. 490-530, 21 Jan 2010.

[14] Adrian Stern, Doron Aloni and Bahram Javidi, "Experiments With Three-Dimensional Integral Imaging Under Low Light Levels," IEEE Photonics Journal, Volume 4, Number 4, Page No. 1188-1195, August 2012.

[15] Gary J. Sullivan, Fellow, Jill M. Boyce, Senior Member, YingChen, "Standardized Extensions of High Efficiency Video Coding (HEVC)," IEEE Journal of Selected Topics In Signal Processing, Vol. 7, No. 6, Page No. 1001-1015, December 2013.

[16] Nikos Deligiannis, Joeri Barbarien, Marc Jacobs, Adrian Munteanu, Athanassios Skodras and Peter Schelkens, "Side-Information-Dependent Correlation Channel Estimation in Hash-Based Distributed Video Coding," IEEE Transactions on Image Processing, Vol. 21, No. 4, Page No. 1934-1949, April 2012.

[17] Rickard Sjöberg, Ying Chen, Akira Fujibayashi, Miska M. Hannuksela, Jonatan Samuelsson, Thiow Keng Tan, Ye-Kui Wang, and Stephan Wenger, "Overview of HEVC High-Level Syntax and Reference Picture Management," IEEE Transactions On Circuits And Systems For Video Technology, Vol. 22, No. 12, Page No. 1858-1870, December 2012.

[18] Anup Date, Dr. P. V. Ingole, "Low Light Video Enhancement: A Survey", International Journal of Computer Applications (0975 – 8887) National Conference on Recent Trends in Computer Science & Engineering, MEDHA 2015.

[19] Alessandro Lapini, Student Member, IEEE, Tiziano Bianchi, Member, IEEE, Fabrizio Argenti, and Luciano Alparone, "Blind Speckle Decorrelation for SAR Image Despeckling", IEEE Transactions on Geoscience And Remote Sensing, VOL. 52, NO. 2, Page No. 1044-1058, February 2014.

[20] Hung-Tao Lu, Chien-Ping Chang, Yu Su, Jyh-Chian Chang, and Te-Ming Tu, "A New Sight for Direct Decorrelation Stretch Techniques", Journal of C.C.I.T., VOL36, NO.2, Page No. 1-7, MAY, 2008