Low Light Video Enhancement In Criminal Justice System

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Abstract- *From last few years, there has been substantial work on video processing and wide improvements being carried out in video processing including resolutions and sensitivity. Despite these improvements, still there is a problem to capture a high dynamic range images and videos in low-light conditions especially when light is very low. Many approaches are developed for enhancing low light video; however most of them consider video from moderately dark conditions. In this project, we propose an effective framework approach to enhance video from low light environments using appropriate noise removal filter technique which will maintain image quality. The enhanced video is used in many applications one such application is criminal justice system. The software tool used is MATLAB.*

Keywords- contrast enhancement, histogram equalization, MATLAB, video enhancement

I. INTRODUCTION

Digital video has become an integral part of everyday life. Video enhancement is one of the most important and difficult components in video research. The aim of video enhancement is to improve the visual appearance of the video, or to provide a "better" transform representation for future automated video processing, such as analysis, detection, segmentation, recognition, surveillance, traffic, criminal justice systems.

It helps analyses background information that is essential to understand object behavior without requiring expensive human visual inspection. There are numerous applications where digital video is acquired, processed and used, such as surveillance, general identity verification, criminal justice systems, civilian or military video processing.
More and more video cameras are widely deployed in many scenarios e.g. Public places, production Plants, domestic surveillance systems etc. Most of the video cameras work in the open air which means the quality of video depends on the weather conditions. Many approaches are developed for enhancing low light video; however most of them consider video from moderately dark conditions. The aim of our system design is to use the contrast enhancement method to enhance the low light video. The output video from this project is used in criminal justice system to find out the criminals and give the accurate result for those criminal cases.

II. RELATED WORK

HenrikMalm., Magnus Oskarsson., Eric Warrant [1] presented a methodology for adaptive enhancement and noise reduction for very dark image sequences with very low dynamic range. Video footage recorded in very dim light is especially targeted. Smoothing kernels that automatically adapt to the local spatio-temporal intensity structure in the image sequences are constructed in order to preserve and enhance fine spatial detail and prevent motion blur.

In color image data, the chromaticity is restored and demosaicing of raw RGB input data is performed simultaneously with the noise reduction. The method is very general, contains few user-defined parameters and has been developed for efficient parallel computation using a GPU.

Qing Xu[1,2],Hailin Jiang[1]., Riccardo Scopigno[3], and Mateu Sbert[4] [2] presented a novel three-stage algorithm for very low light video denoising and enhancement. The proposed technique invokes twice, in the first and the third stages, the well-known Non-Local Means (NLM) method for spatial and temporal denoising: it is well adapted to the application, leading to the definition of a novel NLM tool. The intermediate stage performs a custom tone adjustment specifically aimed at enlarging the dynamic range of very dark videos.

Jinhui Hu, Ruimin Hu, Zhongyuan Wang, Yan Gong, MangDuan [3] presented a technique of kinect depth basedMethod for low light surveillance image enhancement. Pre-processing for Kinect depth map, depth constrained non-local means denoising and depth aware contrast stretching are performed successively in this algorithm to promote the visual quality for low light surveillance image.

Minjae Kim1, Student Member, *IEEE*, Dubok Park1,David K. Han2, and Hanseok Ko1 [4] proposed a novel framework for enhancement of very low-light video. For noise reduction, motion adaptive temporal filtering based on the Kalman structured updating is presented.

Dynamic range of denoised video is increased by adaptive adjustment of RGB histograms. Finally, remaining noise I removed using Non-local means (NLM) denoising. The proposed method exploits color filter array (CFA) raw data for achieving low memory consumption. Histogram adjustment using the gamma transform and the adaptive clipping threshold is also presented to increase the dynamic range of the low-light video.

III. PROPOSED METHOD

Video enhancement is one of the most important and difficult component of video security surveillance system. The aim is to improve the visual appearance of the video. The increasing use of night operations requires more details and integrated information from the enhanced image. There are number of steps used for getting the enhanced video they are pre-processing, noise reduction, contrast enhancement technique and last step is denoising method. The steps are shown in the figure.

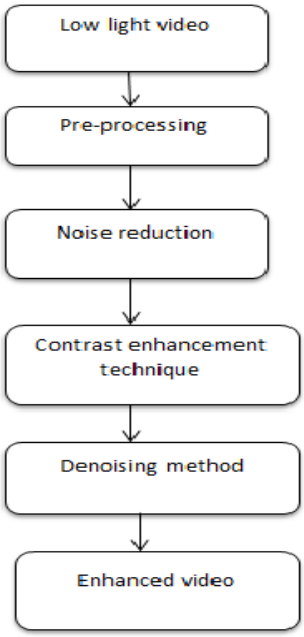

Fig: Flow to get enhance video

A. Pre-processing

The low light video is applied to the first step which is pre-processing. Pre-processing is the term for operations on images at the lowest level of abstraction. The aim of pre-processing is an improvement of the image data that suppresses undesired distortions or enhances some image features in video relevant for further processing and analysis task.

B. Noise reduction

The output from first stage is given to the noise reduction. Noise reduction is the process of removing noise from a signal. Noise is the result of errors in the image acquisition process that result in pixel values that do not reflect the true intensities of the real scene.

Image sequences are temporally correlated; noise can be reduced effectively by temporal filtering. Videos are prone to a variety of types of noise. in our proposed method we use median filter for removing the noise from the each video frame. Median filter usually remove the “salt and pepper” noise from the video.

C. Contrast enhancement technique

This technique is used for brightening the unclear or dark videos. The contrast of an image is a measure of its dynamic range, or the "spread" of its histogram. The dynamic range of an image is defined to be the entire range of intensity values contained within an image, or put a simpler way, the maximum pixel value minus the minimum pixel value.

The aim of contrast enhancement process is to adjust the local contrast in different regions of the image so that the details in dark or bright regions are brought out and revealed to the human viewers. Contrast enhancements improve the perceptibility of objects in the scene by enhancing the brightness difference between objects and their backgrounds.

A contrast stretch improves the brightness differences uniformly across the dynamic range of the image, whereas tonal enhancements improve the brightness differences in the shadow (dark), midtone (grays), or highlight (bright) regions at the expense of the brightness differences in theother regions.

Contrast enhancement technique has many different methods they are histogram equalization, gamma correction, color model conversion method, frequency domain methods, channel division methods and dynamic range compression method.

D. Denoising method

For the final step of low light video enhancement we have to apply filtering for smoothing the remaining noise. Even though most of the noise is removed by the noise reduction, the noise is introduced by tone mapping step. The level of the noise is much higher than the low light environment, edges and textures are often over smoothed during the denoising process.

IV. EXPERIMENTAL RESULTS

Initially we can take the low light video from the video source. Apply the proposed method on this video and getting the enhanced video the enhanced video is used in many areas.in criminal system the enhanced video identifies the criminals as well as it give the evidence of the particular cases. Using those evidence and related information we can give the batter judgment.

V. CONCLUSION

The previously used methodologies are able to reduce the noise as well as increase the contrast level of the video but used methods are not still effectively work on color video. Our aim to get clear video from the low light video for find out the criminals and give the better result for those criminal cases.

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