(IJIASE) 2023, Vol. No. 9, Jan-Dec **e-ISSN: 2454-9258, p-ISSN: 2454-809X**

Employability of the Artificial Intelligence Tools and Techniques for the Efficacies Enhancement of Low Light Videos

Updesh Sachdeva

Mount Olympus School, Gurugram, Haryana, India

[1]*Received: 02 November 2022; Accepted: 28 December 2022; Published: 19 January 2023*

ABSTRACT

Night videos can be difficult to edit because of the lack of light, noise, and loss of details caused by it. One method for improving night recordings is utilizing a mix of combinations and various upgrade strategies followed by pre-processing. Exposure Fusion is one popular night video fusion technique that combines multiple images with varying exposure levels to produce a well-lit and contrasty final image. Variety improvement strategies can likewise be utilized to work on the nature of night recordings. This includes changing the variety equilibrium and immersion to make a satisfying and normal-looking picture. A method for increasing an image's or video's resolution is known as super-resolution. It involves using deep learning-based methods to produce high-resolution images or videos from low-resolution input. Super-resolution can improve the visibility of details and reduce noise in low-light situations when enhancing a night video.

INTRODUCTION

Improvement of night video alludes to the most common way of working on the visual nature of video film caught in low-light or evening time conditions. These are examples of increasing the video's brightness and contrast, reducing noise and artefacts, adjusting the colour balance, and improving the image's details and sharpness. Other options include using a variety of technologies. Night video must be improved because cameras and sensors often have trouble getting clear, detailed images in low light. This can result in grainy, foggy, and difficult-to-see films that can be hard to break down or use for observation or other purposes. By upgrading the night video, it is feasible to work on the perceivability and clearness of significant subtleties, like countenances, permit plates, and different objects of interest. This can be especially useful for security, law enforcement, and surveillance applications, as well as for artistic and entertainment projects. In general, enhancing night video is a significant area of research and development that has the potential to enhance the usefulness and quality of video footage taken in low light.

There are currently two main types of video enhancement techniques: frequency-based domain and spatial-based domain. The image plane and the direct manipulation of an image's pixels are spatially based. Frequency-based space handling methods depend on changing the spatial recurrence range of the picture as acquired by change. The primary benefit of spatial-based domain techniques is their low time complexity, which favours real-time implementations, and their conceptual simplicity. However, these methods often need to meet the requirements for robustness and imperceptibility.

IMPROVEMENT STEPS

Improvement of a picture is expected to recognize the items and exercises of interest in the recordings caught under faint light. There are two types of enhancement techniques: direct and indirect. Direct methods involve optimizing an objective contrast measure to enhance image contrast. Without the use of a contrast measure, indirect methods make use of the dynamic range. The steps of the proposed enhancement algorithm are as follows:

A. De-noising

De-noising is used as a pre-or post-processing step in an image to make the processed image clearer for later image analysis and comprehension. Image de-noising, in which the fundamental objective is to estimate the

[1] *How to cite the article:* Sachdeva U. (2023); Employability of the Artificial Intelligence Tools and Techniques for the Efficacies Enhancement of Low Light Videos; *International Journal of Innovations in Applied Sciences and Engineering*; Vol 8, 1-4

original image by suppressing noise from a noise-contaminated version, is one of the fundamental obstacles in image processing and computer vision.

Taking a complement of the image is part of de-noising. We used the well-known and widely used Salt and Pepper Noise and Median Filter to eliminate unwanted data that causes error outputs like image distortion noises. Because complemented low-light images have distinct characteristics, directly applying these de-noising techniques is not ideal for image enhancement, even though it requires less computational complexity.

Another step in pre-processing the image is resizing it. Understanding how to properly resize an image and how resizing works is important because not all of our images are the exact size we need them to be. The pixel information is altered when an image is resized. For instance, when an image is reduced in size, the photo editor will discard any unnecessary pixel information. The photo editor must create and add new pixel information based on its best guesses when an image is enlarged, resulting in a very pixelated or soft and blurry image. As a result, reducing the size of an image is much simpler than increasing its size. Due to the difficulty of enlarging, ensure that any image needed for high-quality or large-format prints is captured at the highest resolution and quality possible.

B. Fusion

Using fusion techniques, multiple images or videos of the same scene are combined to produce a composite image with increased contrast and detail. This works best in low light, where noise can make important details hard to see. The exposure fusion method is used in the proposed method. In High Dynamic Range (HDR) imaging, exposure fusion and Mertens' Fusion combine images of the same scene taken at various exposure levels into a single image with a wider range of brightness and detail. Tom Mertens, Jan Kautz, and Frank Van Reeth developed the Exposure Fusion method, which combines multiple exposures of an image by selecting the best pixel value for each location from the various input images. By considering the contrast and saturation of the various exposures, this method produces an image with a more natural look. Mertens' Combination is a comparative procedure that was likewise evolved by Tom Mertens, which utilizes a weighted normal of the info pictures to make a solitary picture with a unique high reach. By increasing the contrast between the various exposures, this method results in an image that is both more artistic and more surreal. The choice of which method to employ will be determined by the particular requirements of the image being processed. Both methods have their own set of advantages and disadvantages. Mertens' Fusion creates more dramatic and artistic images with enhanced contrast and saturation, whereas Exposure Fusion is frequently used to create natural-looking images with a wide dynamic range.

C. Color Enhancement

The Retinex techniques serve as a model for colour enhancement techniques. To improve the image's dark areas effectively, histogram equalization techniques use a probability density function and a distribution function. The image's contrast is enhanced while the mean brightness is used. The enhanced image causes colour distortion and a decrease in colour fidelity. In contrast to Histogram evening-out strategies, Retinex techniques supplant the constant pixel values with the mean of encompassing pixels. Numerous powerful picture upgrade strategies are proposed in light of the Retinex technique. The Single Scale Retinex (SSR) method, Multiscale Retinex (MSR), and Multiscale Retinex with colour restoration (MSRCR) models are among the subsequent proposals. These techniques could produce halo effects if the enhanced image is too bright. The proposed method uses super-resolution to improve colour. Raising a low-resolution image to a higher resolution is called "super-resolution." Algorithms that extrapolate the missing data and generate new pixels consistent with the image's overall structure are typically used to accomplish this.

There are two fundamental kinds of super-goal strategies:

1) Super-resolution for a single image: A single low-resolution image is used in this method to produce a higher-resolution image.

This is commonly accomplished by utilizing calculations that extrapolate the missing data and make new pixels in a manner that is steady with the general picture structure.

2) Super-resolution for several images: Multiple low-resolution images of the same scene are used in this method to produce a higher-resolution image. This is regularly accomplished by utilizing calculations that adjust and combine the low-goal pictures to make a solitary high-goal picture.

Super-goal methods are broadly utilized in clinical imaging, remote detecting, and video handling. The accuracy of image analysis can be improved, image quality can be improved, and high-resolution image-based applications can be made possible by these methods. However, it is essential to remember that super-resolution techniques cannot incorporate any additional information into an image that is not already present in the low-resolution image.

TECHNIQUE

The proposed calculated system sticks to the original methods, which work on the visual appearance of the articles in the video. The framework that has been proposed reduces noise and provides the image with its finest details as a result. It is essential to note that upgrading night recordings utilizing these procedures can be tedious and computationally serious, so it might be important to utilize a strong PC or cloud-based handling administration. The final image's quality will also be affected by the quality of the original videos and how well the fusion and colour enhancement techniques worked. Figure 1 depicts the proposed methodology's flowchart.

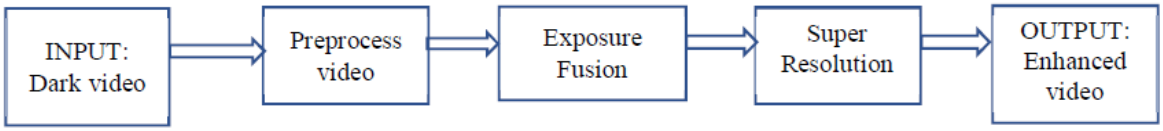

Fig 1: Flow chart

The dark input video must first be pre-processed to work with noise-free data in the proposed method. Applying Fusion to the images that have been pre-processed is the next step. The process of combining multiple images into a single one is known as Fusion. Enhancement image fusion can be based on a single image or multiple images. Fusion based on a single image combines all of the images and employs various enhancement techniques on a single image to produce superior results. Performance can be enhanced by combining enhanced dark images with day reference images and using the enhancement of dark images as input. Blend the videos into a single, well-lit image with an exposure fusion algorithm like Exposure Fusion. This method combines multiple exposures of an image by selecting the best pixel value from the various input images. By directly fusing a series of bracketed images, exposure fusion creates a tone-mapped HDR image. The final step is using colour enhancement tools like super-resolution to improve the image's colour balance and saturation. Because enhancing the brightness of the video and increasing its resolution are required, enhancing a dark video using super-resolution can be challenging. Make any necessary adjustments to any parameters to get the desired outcome.

Super goal alludes to upscaling a low-goal video to a higher goal while saving as much detail as conceivable. Even though super-resolution can increase a video's resolution, it cannot add new details not present in the original. Additionally, increasing the amount of enhancement applied to a dark video can increase noise or artefacts in the final output; therefore, it is essential to strike a balance to avoid these issues.

RESULTS

The proposed technique gave the fundamentally upgraded outcome without glimmering, variety twisting, and immersion issues utilizing a financially savvy execution. It can furnish improved results with a basic structure, simple to carry out with improved arrangement as displayed in the trial results. The effectiveness of the proposed method is demonstrated in this section. Python is used to put the proposed algorithm into action. Pre-processing is the initial step of execution. Because clear and free-of-noise data are essential to any research project. Noise, dimensions, visualization, and other issues can arise when we acquire data from the internet or pre-captured information. These issues have consequences for the element extractions stage, preparation stage and confirmation and examination stages. On four video data sets, the algorithm was put to the test. The experimental results of the original image on the left and the enhanced image on the right, as shown in Figure 2, are depicted in the following images. The plan is to use a day image as a reference image in the future to reduce the production of colours that are not natural.

CONCLUSION

Various technologies and methods for dark video enhancement have been used. However, it is still difficult to produce visually appealing videos in low light due to the low contrast and noise. In this scenario, to propose an effective and efficient video enhancement method, it is necessary to detect and measure the intensity level of each pixel channel to obtain a higher level of accuracy in the video enhancement process. Additionally, it is necessary

to present an appropriate enhancement factor for enhancement. Pre-process the info dull video and apply the openness combination and super goal strategies for improved results.

REFERENCES

1. E. Provenzi, C. Gatta, M. Fierro, and A. Rizzi, "A spatially variant white-patch and gray-world method for color image enhancement driven by local contrast," IEEE Transaction on Pattern Analysis and Machine Intelligence, vol. 30, no. 10, pp. 1757–1770, 2008.
2. T. Arici, S. Dikbas, and Y. Altunbasak, "A histogram modification framework and its application for image contrast enhancement," IEEE Transactions on image processing, vol. 18, no. 9, pp. 1921–1935, 2009.
3. Jing Wu, Ziwu Wang and Zhixia Fang ,"Application of Retinex in Color Restoration of Image Enhancement to Night Image ",978-1-42444131-0/09 ©2009 IEEE
4. M. A. Hogervorst and A. Toet, "Fast natural color mapping for nighttime imagery," Information Fusion, vol. 11, no. 2, pp. 69–77, 2010.
5. Y. HaCohen, E. Shechtman, D. B. Goldman, and D. Lischinski, "Nonrigid dense correspondence with applications for image enhancement," in ACM Transactions on Graphics (TOG), vol. 30, no. 4, 2011, pp. 70:1–70:9.
6. A. R. Rivera, B. Ryu, and O. Chae, "Content-aware dark image enhancement through channel division," IEEE Transactions on Image Processing, vol. 21, no. 9, pp. 3967–3980, 2012.
7. Huiyuan Fu, Huadong Ma, Shixin Wu, "Night Removal by Color Estimation and Sparse Representation", 21st International Conference on Pattern Recognition (ICPR 2012) November 11-15, 2012. Tsukuba, Japan
8. Xuesong Jiang, Hongxun Yao, Shengping Zhang, Xiusheng Lu and Wei Zeng, "Night Video Enhancement Using Improved Dark Channel Prior", 978-1-4799- 2341-0/13 ©2013 IEEE
9. Abdullah Nazib, Chi-Min Oh and Chil Woo Lee, "Object Detection and Tracking in Night Time Video Surveillance", 2013 10th International Conference on Ubiquitous Robots and Ambient Intelligence (URAI) October 31-November 2, 2013 / Ramada Plaza Jeju Hotel, Jeju, Korea
10. R. Vijayarajan and S. Muttan, "Fuzzy C-Means Clustering Based Principal Component Averaging Fusion", International Journal of Fuzzy Systems, Vol. 16, No. 2, June 2014
11. Cheng-Chang Lien, Wen-Kai Yu, Chang-Hsing Lee, Chin-Chuan Han, "Night Video Surveillance Based on the Second-Order Statistics Features", 2014 Tenth International Conference on Intelligent Information Hiding and Multimedia Signal Processing , 978-1-4799-5390-5/14 © 2014 IEEE DOI 10.1109/IIHMSP. 2014.94
12. Q.Xu, H.jiang, R.scopigno, M.Sbert, "A novel approach for enhancing very dark image sequences", corpus ID: 34260140, 10.1016/j.sigpro.2014 .02.013, 2014
13. Ms. Anjali A. Dhanve, Mrs. Gyankamal J. Chhajed , "Review on Color Transfer Between Images", International Journal of Engineering Research and General Science Volume 2, Issue 6, October, 2014, ISSN 2091-2730
14. Soumya T, Sabu M Thampi , "Day Color Transfer Based Night Video Enhancement for Surveillance System ", 978-1-4799-1823-2/15 © 2015 IEEE
15. Soumya T, Sabu M Thampi , "Night time visual refinement techniques for surveillance video: a review", corpus ID:199370248, 10.1007/s11042-019-07944-z, 2019
16. R. Debnath, Anu singha, B.saha, M.K. Bhowmik, " A comparative study of background segmentation approaches in detection of person with gun under adverse weather conditions", corpus ID: 224777333, 10.1109/ICCCNT49239.2020.9225409, 2020
17. J.Li, Yuanxi peng, Minghui song, L.Lui, " Image fusion based on guided filter and online robust dictionary learning", corpus ID: 213976477, 10.1016/j.infrared.2019.103171, 2020
18. http://www.mhhe.com/jayaraman/dip, "Digital Image Processing" by S Jayaraman, S Esakkirajan and T Veerakumar