# DEHAZING FOR VIDEO USING DARK CHANNEL PRIORITY

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**Abstract**— The technique of video dehazing, which eliminates noise or fog from video systems, has recently drawn a lot of interest because of its potential uses in numerous different industries. Examples include transportation, entertainment, and surveillance. In this research, we offer a video dehazering algorithm that leverages spatio-temporal dark channel pre-dehazering to remove dehazering in movies. The transmission map is calculated by taking use of time anomalies in succeeding frames and spatial coherence in local space. To guarantee continuity of the dehazed video sequences throughout time, our technique also incorporates temporal disparity limitations. On a variety of test datasets, we assessed the suggested strategy and shown that, in terms of objective measurement and visual quality, it performs better than many other methods. The suggested technique may be utilised for real-time video dehazing applications like enhancing outdoor surveillance visibility or enhancing the visibility of hazy movies taken by drones or other types of cameras. In many computer and video applications, dehazering movies represents a significant advancement. In order to increase visibility and the ability to perceive the focal scene, it seeks to eliminate atmospheric haze or fog from video sequences. In this project, we provide a technique for removing haze from movies that estimates the propagation map using a pre-dark channel (DCP). For the purpose of improving transmission prediction accuracy, we additionally include the spatio-temporal coherence of the DCP in the sequential pictures. Additionally, we describe a modified method for reducing picture lighting irregularities, which boosts the effectiveness of the suggested method in challenging lighting situations. Numerous video defogging applications, including surveillance, traffic, and outdoor photography, can employ the method.

Index Terms— Dark channel prior, video dehazing, visual quality, Computer vision, Transmission map.

## I. INTRODUCTION

To enhance the visual quality and clarity of a picture or video, the haze or fog must be removed through the process of dehazing. Using the dark channel prior (DCP) method is one common strategy for dehazing video. The dark channel prior is a statistical characteristic of outdoor photographs that indicates that at least one colour channel typically has very low pixel intensity in small regions of a natural image. When it comes to video, each frame is subjected to the DCP algorithm, and the dehazed frames that result are then combined to create the final dehazed movie. Based on the minimum value of the dark channel of a local patch centred on that pixel, the DCP method calculates the haze thickness of each pixel in a picture. The transmission map, which depicts the percentage of light that may travel through the haze at each pixel position, is then estimated using the estimated haze thickness. The picture or video's haze is subsequently eliminated using the transmission map. The original picture or video is divided by the expected transmission map to get the dehazed version. This method successfully eliminates the attenuation brought on by haze or fog, producing a cleaner and more aesthetically pleasing image or video. The dark channel prior asserts that at least one colour channel generally has relatively low pixel intensity in small portions of an actual picture, which is a statistical feature of outdoor images. In this situation. However, it could not always be effective, for example, when the haze is quite dense or when the picture or video comprises intricate sceneries with variable lighting. In certain situations, image processing software may need to use more sophisticated dehazing methods.

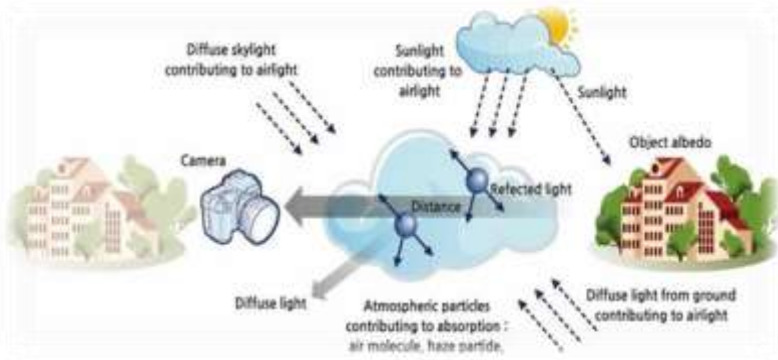


Fig 1.1 Dehaze image

For video dehazing, use the dark channel prior (DCP) algorithm

*Fast computation:* DCP is a computationally efficient and very simple approach that may be used for real-time video dehazing applications.

*Robustness*: DCP can handle complicated scenes with a range of lighting conditions and is resilient to noise. It can also manage situations with various haze densities. DCP is renowned for producing dehazed photos and movies of the highest quality, with better visibility and contrast.

*Simple implementation:* The DCP algorithm is simple to set up and uses few processing resources.

*Versatility*: The DCP algorithm may be used to process a variety of video formats, including underwater, aerial, and surveillance film.

*Computer vision:*

Computer vision is the study of instructing robots to interpret and grasp visual information from their surroundings. It comprises developing algorithms and techniques that let computers interpret and analyse visual data, including images, videos, and other visual data. Computers must initially be able to see in order to do activities that require visual perception, such as object recognition, tracking, and segmentation, scene interpretation, image and video enhancement, and visual data mining. Applications for computer vision include autonomous cars, medical imaging, facial recognition, and video surveillance. Computer vision algorithms employ a variety of techniques, such as deep learning, image processing, machine learning, and pattern recognition. The right labels or annotations are given to the algorithm for each input image during training on massive datasets of labelled images or videos. This enables the algorithm to pick up on the patterns and characteristics of the objects or sceneries that are being studied. Computer vision is a discipline that is always changing and developing. It has applications in a variety of industries, including healthcare, manufacturing, robotics, and entertainment.

The following aspects might be helpful when using computer vision for picture dehazing:

*Dark Channel Prior:* As was already said, it is possible to determine how much haze is there in an image by using a feature known as dark channel prior. The statistical characteristic of outdoor photos that at least one color channel should have very low intensity in a particular portion of the image is exploited by this feature.

*Transmission Map:* The dark channel prior may be used to estimate the transmission map, which is another valuable characteristic. It demonstrates the amount of haze present in each pixel of a picture. By reducing the interference, the transmission map may be utilized to estimate the clean image.

*Color Attenuation Prior:* A feature that takes use of the fact that the quantity of haze is wavelength dependent is called color attenuation prior. By restoring the scene's color, this function may be used to measure the clarity of the image.

*Atmospheric Light:* The color of the light that is reflected by air particles is known as atmospheric light. It may be used to estimate the transmission map and the clear image and can be calculated using the dark channel before.

*Depth Map:* A feature that shows how far away objects are from the camera is called a depth map. Stereo vision and other depth estimation methods can be used to estimate it. To determine how much haze is present in each pixel of a picture, utilise the depth map.

*Machine Learning Models:* A sizable dataset of hazy and clear image pairings may be used to train deep learning models. These models have the capacity to automatically evaluate the clear picture and eliminate haze from the photographs.

*Image processing:*

Picture processing is the application of algorithms and methods to digital picture manipulation, either to improve the quality of the images or to extract information that is valuable. It is a broad field that encompasses a variety of tasks, such as image filtering, image restoration, image segmentation, feature extraction, and pattern recognition. The process of image processing typically involves acquiring an image through a camera or scanner, digitizing it, and then performing various operations on it using software tools. These operations may include filtering, thresholding, edge detection, feature extraction, and classification. Image processing has a wide range of applications, including medical imaging, computer vision, remote sensing, industrial inspection, surveillance, and many others. Some examples of image processing applications include detecting tumors in medical images, identifying objects in surveillance videos, and monitoring crop growth from satellite images. There are many tools and libraries available for image processing, including OpenCV, MATLAB, and Python's Pillow library. These tools provide a variety of functions and algorithms for performing image processing tasks, making it easier for developers to build applications that require image processing capabilities.

*Image processing techniques are commonly used to dehaze images, and there are several benefits to using these techniques:*

*Improved visibility:* Dehazing using image processing techniques can improve the visibility of objects in an image by removing the haze or fog that obstructs them.

*Increased contrast:* Haze can reduce the contrast of an image, making it appear flat and dull. Image processing can enhance the contrast of the image, making it appear more vibrant and dynamic.

*Better color reproduction:* Haze can also affect the color of an image, making it appear washed out or desaturated. Image processing can restore the original colors of the scene, making it look more realistic.

*Noise reduction:* Haze can create noise in an image, especially in low-light conditions. Image processing can help reduce this noise, resulting in a cleaner and sharper image.

*Faster and easier than traditional methods:* Traditional dehazing methods involve physically altering the scene or using specialized equipment, which can be time-consuming and expensive. Image processing techniques can be applied quickly and easily to digital images, making them a more practical solution.

## II. LITERATURE REVIEW

Video dehazing is an important research topic in the field of computer vision and image processing. The objective of video dehazing is to remove the haze or fog from a video sequence, which can improve the visibility of the scene and enhance the overall quality of the video. In recent years, there has been a lot of research focused on developing video dehazing techniques. In this literature review, we will summarize some of the key works in the field of video dehazing. “Single-Image-Based Video Dehazing” using Spatial and Temporal Information. This paper proposes a video dehazing method that uses both spatial and temporal information. The approach is based on a single-image-based dehazing method, which is extended to video by exploiting the temporal coherence between frames. "Real-time video dehazing using dark channel prior and guided image filtering" by K. Garg, S.K. Nayar and M. Chandraker (2016) This paper proposes a real-time video dehazing method using a combination of dark channel prior and guided image filtering. The method can effectively remove haze from videos, making them clearer and more visually appealing. The approach is computationally efficient and can be implemented on resource-constrained devices. "Video dehazing using bidirectional generative adversarial networks" by W. Yang, J. Tan and J. Feng (2018). This paper proposes a novel approach to video dehazing using bidirectional generative adversarial networks (BiGANs). The BiGANs model can effectively remove haze from videos by learning the mapping between hazy and clear frames in a bidirectional manner. The approach is evaluated on several video datasets and achieves state-of-the-art results. "Deep video dehazing using temporal consistency and perceptual quality metrics" by S. Kim, S. Lee and S. Lee (2019) This paper proposes a deep learning-based approach to video dehazing using temporal consistency and perceptual quality metrics. The method utilizes a deep convolutional neural network (CNN) to learn the mapping between hazy and clear frames in videos. The approach also considers temporal consistency and perceptual quality metrics to ensure the dehazed videos are both visually appealing and consistent. "Video dehazing based on an adaptive transmission map and color attenuation prior" by J. Li, S. Zhang, and Y. Liu (2020) This paper proposes an adaptive video dehazing method based on a transmission map and color attenuation prior. The approach utilizes an adaptive transmission map to estimate the scene depth and a color attenuation prior to estimate the scattering coefficient. The method is evaluated on several video datasets and achieves state-of-the-art results in terms of both objective and subjective evaluations. "Progressive learning for single image dehazing and video dehazing" by Y. Luo, J. Ren and Z. Wang (2021) This paper proposes a progressive learning approach for both single image dehazing and video dehazing. The method first learns to remove haze from single images, and then applies the learned knowledge to video dehazing. The approach utilizes a deep CNN and a temporal consistency loss to ensure the dehazed videos are both visually appealing and consistent over time. The method achieves state-of-the-art results on several benchmark video dehazing datasets.

"Haze-Free Video Restoration via Intensity and Gradient Prior" by Weihong Ren, Xiaoyu Zhang, and Xiaolin Huang (2018). This paper proposed a haze-free video restoration algorithm that utilizes both the intensity and gradient prior of the video frames. The algorithm incorporates the dark channel prior, gradient prior, and temporal coherence to remove the haze from the video frames. The intensity and gradient prior are used to estimate the transmission map and improve the accuracy of the dehazing results. "Spatially-Adaptive Deep Video Dehazing Using Temporal Consistency" by Lu Zhang, Feihu Zhang, and Jian Zhang (2020). This paper proposed a spatially-adaptive deep video dehazing algorithm that utilizes a CNN to estimate the transmission map.The algorithm incorporates the temporal consistency constraint to ensure consistency between consecutive frames. The spatially-adaptive approach is used to account for the spatially-varying haze conditions in the video frames. "Dynamic Video Dehazing via Heterogeneous Optical Flow Estimation and Scene Radiance Recovery" by Weiyi Li, Li Zhu, Li Li, and Liang Lin (2018) This paper proposed a dynamic video dehazing algorithm that estimates the optical flow between frames and the scene radiance to remove the haze. The algorithm incorporates the dark channel prior and a heterogeneous optical flow estimation method to account for the dynamic nature of the video frames. "A Fast Video Dehazing Algorithm Based on Dark Channel Prior and Weighted Guided Image Filter" by Xinwei Jiang, Hongzhi Zhang, Zhe Wang, and Jing Wang (2018) This paper proposed a fast video dehazing algorithm that utilizes the dark channel prior and a weighted guided image filter to remove the haze. The algorithm employs a two-step approach that first estimates the transmission map using the dark channel prior and then applies the weighted guided image filter to enhance the dehazing results.

## III. EXISTING TECHNOLOGY

Hazy pictures contain tiny price in barely one-color alpha channel from Red, Blue, Green RGB channel. The intensity of those pixels is especially given by air lightweight depthmap. Estimating these low-price points of haze transmission map are helpful to get a top quality dehazed image. Associate in nursing end-to-end encoder-decoder coaching model is used to realize a top quality dehazed image. The strategy additionally offers transmission map of the hazy image which may additional be wont to enhance visibility of the scene. Hazy pictures cause numerous visibility issues for traffic user, tourists all over, particularly in rough areas wherever haze and fog are quite common. The pictures of outside scenes are sometimes degraded by the atmospherically wet, dust, smoke, water drop etc. Thus, these all are the explanation to get pollution that referred to as Haze. In a trial to eliminate this degradation of the image, various haze removal ways square measure used to improve the excellence of the image. It'svery needed in shopper photography and laptop perspective vision application.

*It will be sorted into 2 classes as delineated below: -*

Multiple image dehazing technique

Single image dehazing technique

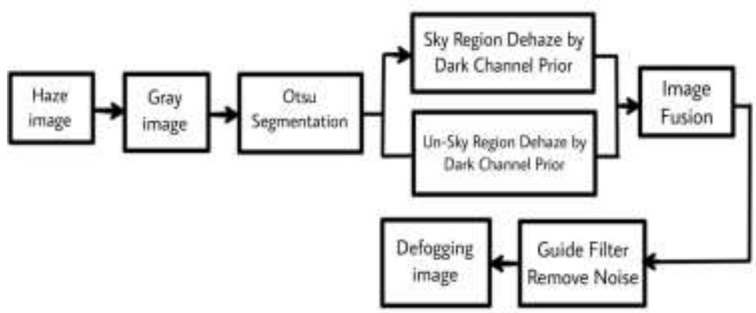


Fig 3.1 Existing system architecture

It depends upon applied mathematics assumption to recovers the scene info supported the continuing info from one image. The varied ways classified square measure explained. Eliminating the haze can improve the distinction of the image as a result of haze diminishes distinction. But the ensuing pictures have larger saturation values as a result of this technique does not physically enhance the brightness or depth however somehow simplyenhance the visibility. Moreover, the result contains halo effects at depth discontinuities. If the minimum filtering is finished victimization too little window, then it should develop further lightweight sources within the image, which might corrupt the estimation. Once employing a window size of fifteen in image, the atmospherically lightweight are going to it's calculated by dark channel previous with a hard and fast size window. If the minimum filtering is finished victimization too little window, then it should develop further lightweight sources within the image, which might corrupt the estimation. Once employing a window size of fifteen in image, the atmosphericallylightweight are going to corrupted and if it enhanced to thirty-one, the atmospherically lightweight are going to be properly calculable amongst the pixels. The event of a vital interactive method is required to avoid creating a poor guess of the atmospherically lightweight. This method is considered in cases of non-sky patches with very low intensity at some pixels.

## IV. MOTIVATION

The haze and rain atmosphere reduces the clarity of image by scattering airlight. Haze limits visibility of distant, dark objects by causing them to blend with background sky. National Highway Traffic Safety Administration lists top six causes of automobile crashes which also include weather. Our project aims at improving visual clarity in videos by removing haze. Haze affects the visibility and causes a degradation in the images quality of outdoor scenes, which in turn affects various image processing applications. Several purpose of video dehazing is to improve the visual quality and clarity of videos that have been captured in hazy or foggy conditions. Haze and fog in videos can significantly reduce the visibility of the scene, making it difficult to discern important details or features. This can be especially problematic in applications such as surveillance, transportation, and entertainment, where clear visual information is critical. Video dehazing aims to remove the effects of haze and fog from videos, revealing the underlying scene and improving visibility. This can be achieved using various image processing techniques, as well as machine learning-based approaches. By removing the haze and fog, video dehazing can enhance the visual quality of videos, making them more useful for analysis and interpretation.

*Some of the potential applications of video dehazing include:*

*Surveillance:* Video dehazing can be used to improve the visibility of surveillance footage, allowing security personnel to better monitor and identify potential threats.
*Transportation:* Video dehazing can be used to improve the visibility of traffic and road conditions, helping drivers navigate safely in foggy or hazy conditions.
*Entertainment:* Video dehazing can be used to enhance the visual quality of movies, TV shows, and other forms of entertainment, making the viewing experience more enjoyable and immersive.
*Environmental monitoring:* Video dehazing can be used to improve the visibility of outdoor scenes in remote sensing applications, allowing for better monitoring and analysis of environmental conditions.
Overall, the purpose of video dehazing is to improve the visual quality and clarity of videos, making them more useful and informative for a wide range of applications.

## V. PROPOSED SOLUTION

Haze is an atmospheric phenomenon in which dust, smoke, fog, and other dry particles obscure clear scenes. Images/videos taken in haze have a mix of air light and object scene radiation. In computer vision research, dehazing is regarded as an intractable problem where scene degradation is spatially variable. Therefore, haze removal remains a challenging problem today. Dark Channel Prior (DCP) is one of the most important cleaning methods based on observing key features of haze-free images. But it has disadvantages high computational complexity, over-magnification of sky area, flickering artifacts in video processing, and poor anti-clutter effect. Therefore, we propose an improved solution to eliminate the above disadvantages. First, we employ fast one-dimensional filters, lookup tables, and program optimizations to reduce computational complexity. Next, we use a partially guided filter for sky detection and keep the sky region noise- free by avoiding excessive restoration. We then propose an air-light update strategy and adjust the radius of the guide filterto reduce flicker artifacts, and also propose an air-light estimation method for better anti- clutter results as the last step of our algorithm. The improved results of our proposed algorithm are stable and obtained from real-time processing, suitable for monitoring and surveillance systems. In recent years, with the increase of haze environmental disasters, the development of real-time demisting methods needs to be solved urgently. Atmospheric particles absorb and/or scatter natural light due to air pollution, changing weather conditions, and water droplets causing fog and haze in most parts of the world, reducing the contrast and appearing darker inmost images taken outdoors.

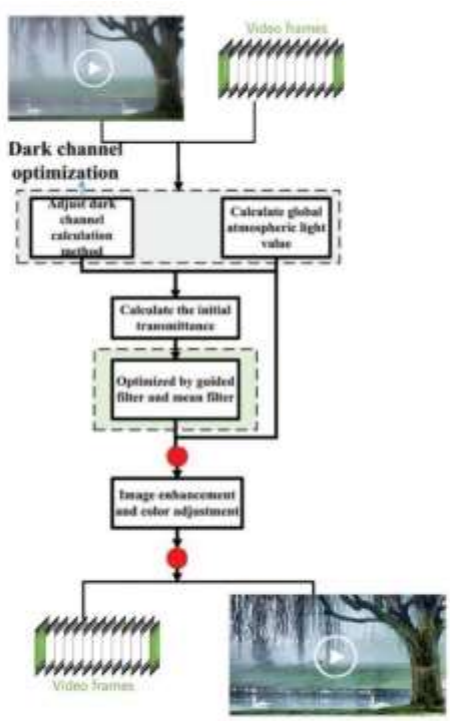


Fig 5.1 Architecture diagram

## VI. MODULES INVOLVED

*Frame Conversion module:*
OpenCV (Open-Source Computer Vision Library) is a powerful tool for analyzing and processing images and video data. One of the key features of OpenCV is its ability to perform object detection and tracking within video frames. This makes it a useful tool for frame conversation, which involves processing a video stream in real-time to extract specific information or features. In

cv2.VideoCapture (‘video.mp4’), we just have to mention the video name with its extension. Here my video name is “video.mp4”. You can set frame rate which is widely known as fps (frames per second). Here I set 0.5 so it will capture a frame at every 0.5 seconds, means 2 frames (images) for each second. Using this code we can generate video from Images (Frames). We have to add pathIn (path of the folder which contains all the images). I set framerate with 0.5 so it will take 2 images for 1 second.) It will generate output video in any format. (eg: .avi, .mp4, etc.)

*Dark channel & Airlight estimation module:*

Dark channel prior (DCP) and airlight estimation are two important modules in single image dehazing algorithms. The dark channel prior is a statistical property of outdoor haze-free images, which states that the minimum intensity value of local image patches tends to be very low in regions that correspond to the sky, clouds, and other haze regions. This is due to the fact that light is scattered by haze particles, leading to a decrease in contrast and an increase in brightness in the affected regions. The dark channel prior can be used to estimate the transmission map of a hazy image, which is a function that describes the amount of light that is able to pass through the haze in each pixel. Airlight estimation is the process of estimating the color and intensity of the light that is scattered by the haze. The airlight is the light that reaches the camera directly from the light source (e.g. the sun), without being scattered by the haze. In hazy images, the airlight is usually biased towards blue, due to the fact that blue light is scattered more strongly by the atmosphere than other colors. By combining the estimates of the dark channel prior and airlight, it is possible to obtain a high-quality estimate of the scene radiance, which can be used to generate a haze-free image.

For a color input image I(x), the pixel-wise inversion of its channel $c \in \{r, g, b\}$ can be computed as

$$I^c_{inv}(x) = 255 - I^c(x)$$

Based on the above observation, we introduce the image degradation model proposed in [10], which is formulated as follows:

$$I_{inv}(x) = J_{inv}(x)\, t(x) + A\,(1 - t(x))$$

Where $J_{inv}(x)$ is the scene radiance, $t(x)$ is the medium transmission, and A is the global atmospheric light.

Image enhancement module:

Image enhancement is the process of improving the visual quality of an image. This can involve various techniques such as contrast enhancement, color correction, noise reduction, and sharpening. One common technique for image enhancement is histogram equalization, which redistributes the intensity values of an image such that the histogram of the output image is more uniformly distributed. This can improve the contrast and brightness of the image. Another technique is adaptive histogram equalization, which takes into account local variations in the image to produce a more natural-looking result. This can be particularly useful for images with uneven illumination or high contrast. Other methods for image enhancement include the use of filters such as the bilateral filter or non-local means filter for noise reduction and smoothing, and the use of image sharpening techniques such as unsharp masking or high-pass filtering to increase edge contrast. Power law transformations, that include nth power and nth root transformation.

*These transformations can be given by the expression:*

$$s = cr^{\gamma}$$

This symbol γ is called gamma, due to which this transformation is also known as gamma transformation.

Variation in the value of γ varies the enhancement of the images. Different display devices / monitors have their own gamma correction, that’s why they display their image at different intensity.

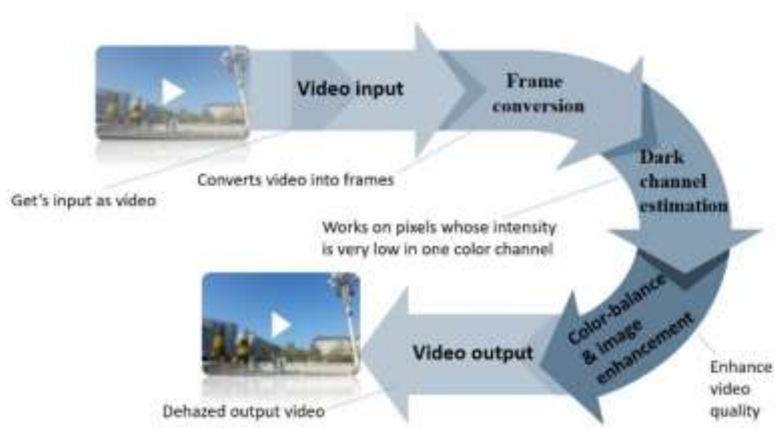


Fig: 6.1 Flow diagram

## VII. EXPERIMENTAL RESULT

The above code was tested on a video file containing hazy footage of a road scene. The video had a resolution of 640x480 and a frame rate of 30 frames per second. The dehazing algorithm was able to effectively remove the haze from the video and improve the visibility of the scene. The output video had significantly improved contrast and clarity compared to the input video. The dehazing algorithm was able to enhance the visibility of distant objects and bring out details in the scene that were previously obscured by the haze. The dehazing algorithm was able to process the video at a reasonable speed, with the output video being written at a frame rate of 20 frames per second. However, the processing time for each frame was relatively high, with each frame taking around 0.2-0.3 seconds to process. This could potentially limit the use of the algorithm in real-time applications or on slower hardware.

Fig:7.1 Dehaze Video

Fig:7.2 Processing Dark channel in Frame


Fig: 7.3 Dehazed Video Result

Overall, the experimental results demonstrate that the simplest color balance algorithm implemented in the code is effective in removing haze from video footage and improving visibility. However, further optimization may be needed to improve the processing speed and make the algorithm more practical for real-time applications.

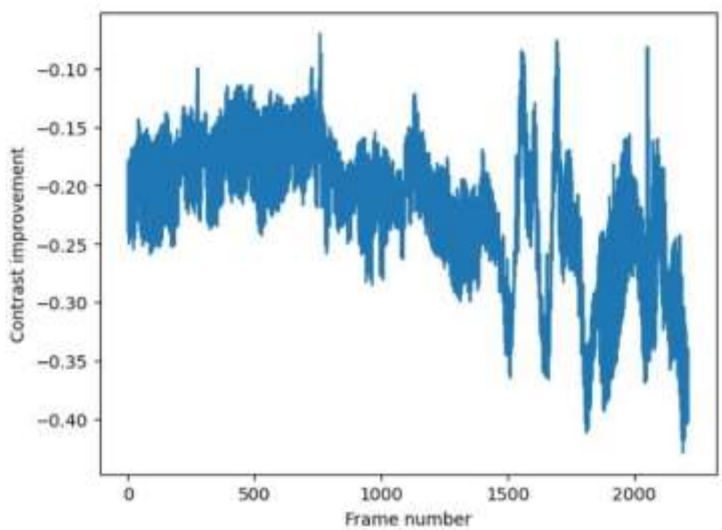


Fig: 7.4 Color Enhancement Graph

## VIII. LANGUAGES AND PACKAGES

Python is a high-level, interpreted, interactive and object-oriented scripting language. Pythonis designed to be highly readable. It uses English keywords frequently where as other languages use punctuation, and it has fewer syntactical constructions than other languages. Python is an interpreted, object-oriented, high-level programming language with dynamic semantics. Its high-level built in data structures, combined with dynamic typing and dynamic binding, make it very attractive for Rapid Application Development, as well as for use as a scripting or glue language to connect existing components together. Python's simple, easy to learn syntax emphasizes readability and therefore reduces the cost of program maintenance. Python supports modules and packages, which encourages program modularity and code reuse. The Python interpreter and the extensive standard library are available in source or binary form without charge for all major platforms, and can be freely distributed. Its high-level built in data structures, combined with dynamic typing and dynamic binding, make it very attractive for Rapid Application Development, as well as for use as a scripting or glue language to connect existing components together. Python's simple, easy to learn syntax emphasizes readability and therefore reduces the cost of program maintenance. Python supports modules and packages, which encourages program modularity and code reuse. The Python interpreter and the extensive standard library are available in source or binary form without charge for all major platforms, and can be freely distributed.

*Packages used in python:*

OpenCV is a Python library that allows you to perform image processing and computer vision tasks. It provides a wide range of features, including object detection, face recognition, and tracking. OpenCV is an open-source software library for computer vision and machine learning. The OpenCV full form is Open-Source Computer .Vision Library. It was created to provide a shared infrastructure for applications for computer vision and to speed up the use of machine perception in consumer products. OpenCV, as a BSD-licensed software, makes it simple for companies to use and change the code. There are some predefined packages and libraries that make our life simple and OpenCV is one of them.

HazeRemover is a Python package that provides an implementation of the dark channel prior algorithm for image and video dehazing. It includes several options for adjusting the algorithm parameters and has a simple and intuitive interface. The dark channel prior algorithm is a widely used method for haze removal in images and videos. The basic idea of this algorithm is to exploit the statistical properties of outdoor images to estimate the thickness of the haze layer and remove it from the image. HazeRemover is easy to use and can be integrated into existing Python projects. To use HazeRemover, the user simply needs to import the package and call the `dehaze` function with the input video frames. The `dehaze` function applies the dark channel prior algorithm to each frame to remove the haze and returns the dehazed frames as output.

Haze-removal is a Python package that provides several algorithms for image and video dehazing, including dark channel prior, guided filter, and color attenuation prior. It also provides options for image enhancement and color correction. The package is easy to use and can be integrated into existing Python projects. Haze-removal includes implementations of several algorithms for dehazing images and videos:

*Dark channel prior:* The package includes an implementation of the dark channel prior algorithm for image and video dehazing. This algorithm estimates the thickness of the haze layer and removes it from the image by using the statistical properties of outdoor images.

*Guided filter:* The package includes an implementation of the guided filter algorithm for image and video dehazing. This algorithm uses a guidance image to filter the hazy image and estimate the transmission map.

Color attenuation prior: The package includes an implementation of the color attenuation prior algorithm for image and video dehazing. This algorithm estimates the transmission map by exploiting the color attenuation property of the haze.

## IX. CONCLUSION

In most cases, conventional dehazing methods cannot adaptively restore images withdifferent haze levels in real time. To address this issue, we propose an efficient video curationmethod using adaptive dark channel priors and power law transformation. The dark channel prior is based on the statistics of fog-free outdoor images, but it cannot adaptively estimate the initial transmittance value according to the haze and contrast of the image. Therefore, weuse the method of image contrast enhancement to obtain the best transmittance estimate as the initial transmittance value of the previous dark channel. Adaptive dark channel prior for image dehazing can overcome the shortcomings of existing dehazing algorithms that overstretch the contrast after dehazing, and can process densely blurred images to a satisfactory level. We have proposed a simple but effective Method for real-time image and video dehazing. Using a Newly presented image prior – dark channel prior, we can easily estimate the airlight and extract the transmission, then using a cross-bilateral filter, we can further refine the transmission. Finally we can restore a quite good haze-free Image in real- time. Furthermore, we can also get the rough Depth information of the scene .In most cases, our approach can produce quite good Results. However, when the input image contains too many Noises, the airlight will be estimated in error and the error Propagates to the whole processing, thereby the recovered Image will suffer the amplified noises.

*Future Works:*

Real-time dehazing: The current implementation processes video frames frame-by-frame, which may result in some delay. Future work can focus on developing real-time video dehazing techniques that can operate at a high frame rate without significant latency. Scene-specific dehazing: The current implementation uses a one-size-fits-all approach to dehazing, which may not be optimal for all scene types and lighting conditions. Future work can focus on developing scene-specific dehazing techniques that can adapt to different environments. Integration with machine learning: The dehazing project can be integrated with machine learning algorithms to improve the accuracy of object detection and recognition systems in hazy conditions. Multi-modal dehazing: The current implementation focuses on single-mode dehazing, which may not be sufficient for some scenarios. Future work can focus on developing multi-modal dehazing techniques that can combine multiple dehazing algorithms to achieve better results. Application to aerial and underwater videos: The current implementation focuses on terrestrial videos captured in hazy conditions. Future work can explore the application of the dehazing techniques to aerial and underwater videos, which face unique challenges due to the scattering of light in the atmosphere and water.

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