ENHANCED OBJECT IMAGING IN HAZZY AND FOGGY AREAS

Tanush Singh, Aakash Shinde, Jatin Jangid

[1]Designation of 1st Author, [2]Designation of 2nd Author, [3]Designation of 3rd Author
Department Of Information Technology ,
Bharati Vidyapeeth College Of Engineering, Navi Mumbai, India

Abstract : Fog and haze degrade the quality of preview and captured image by reducing the contrast and saturation. As a result the visibility of scene or object degrades. The objective of the present work is to enhance the visibility, saturation, contrast and reduce the noise in a foggy image. This paper presents the fast and efficient method to remove the haze from a single image. It employs maximum filter to reduce the artifacts arising in the transmission estimation. The transmission map estimated by an improved guided filtering scheme is smooth and respect with depth information of the underlying image . Results demonstrate that the proposed method achieves good de-hazing effect as well as real time performance. A comparison with existing method shows that the proposed method performs better in terms of both processing time and quality. The proposed algorithm , due to its speed and ability to improve visibility may be used with advantages and pre-processing in many systems like remote sensing , intelligent vehicles etc.

IndexTerms **- Image dehazing; dark channel prior (DCP); video processing**

I. INTRODUCTION

Outdoor scenes are often afftected by fog,haze or smog. Often we like to capture such landscapes as fog or haze adds significant visual pull. But a user may like to capture a clearer picture by reducing the effect of fog especially when the density of fog is too high. In driving scenarios dense fog reduces the visibility and may cause accidents . It also affect light take -offs and landing . Hence reducing the effect of fog or haze in preview frames and captured images may add a significant value in our daily life . In this work we proposed an enhanced method of reducing fog or haze from a captured image or from a low resolution camera preview.

Poor visibility due to fog or haze is caused by suspended particles in the atmosphere. The incoming light from a scene or object is scattered due to these particles and hence is attenuated till it reaches the camera. As a result both saturation and contrast of the captured image reduces significantly.

In this project we have used a conventional method to perform a single image haze removal and addition to this we have also performed the removal of haze or fog from a short video and hence got good results. In this method the transmission is estimated roughly first on the basis of DCP , which suffers from the halo and blocking artifacts: the transmission is refined afterwards by using smoothing techniques like guided filtering.

This paper proposes the fast and high-quality method for the haze removal. The proposed method is modified from the conventional method by applying the maximum filtering to the transmission which is estimated roughly based on DCP. Haze removal is a challenging process since the degradation is measured from different locations which is also known as spatial variant.

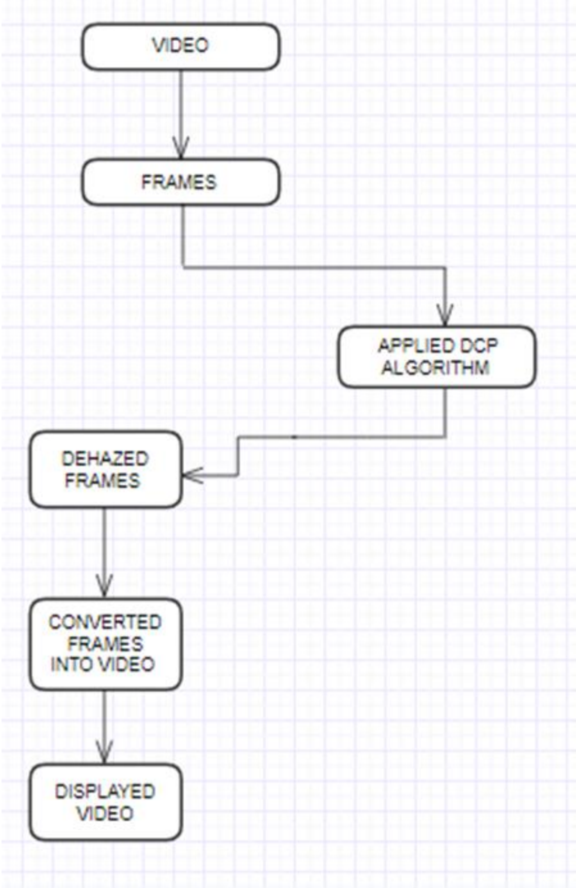
II. METHODOLOGY

A foggy image can be represented as-

$$I(x)= J(x)t(x)+A(1-t(x))$$

Here, I is the identity of the pixel

J is the original scene radiance , A is the global Airlight and t is the medium of transmission describing the portion of light that is not scattered and reaches the camera. A typical fog removal method involves estimating A to find the original scene radiance . The block diagram of the proposed method is shown. This method computes dark channel prior and saturation map to find transmission map for three different block sizes.



Block diagram of the proposed method

The artifacts in the rough transmission arise while calculating the dark channel. As described the dark channel calculation necessitates the patch operation which selects the minimum intensity for the pixels in the local patch. If a local patch has a pixel of very low intensity the dark channel intensity of every pixel contained in this patch is decided to the low intensity.

In order to minimize the artifacts arising in the calculation of the dark channel the proposed method applies the maximum filtering after the calculation of the dark channel. By applying the filters, the undesirable erosion caused by the minimum filtering can be recovered, which results in the reduction of the artifacts in the rough transmission.

In the proposed method, the refinement of the rough transmission can be performed in the simplified manner without compromise on the quality of the results, since the artifacts of the rough transmission are reduced.

This method also employs the guided filter to refine the rough transmission but the dimension of its guidance is reduced to a single channel. More specifically in the proposed method "t" is refined by the guided filtering where the guidance "I" is the single channel image reduced from I. This leads to the reduction of the computations required of the guided filtering. Because the computational complexity of the guided filtering accounts for the dominant part of the overall complexity of a haze removal method. the proposed method can achieve a fast haze removal.

III. LITERATURE SURVEY

These following methods have been used in the project and there pros and cons are shown below:

1. Thermal cameras
2. Ultra sonic sensors
3. Fog lights
4. Lidar

1. Thermal cameras: The thermal cameras with high resolution is very expensive, and it is also quite hard to detect the edges of an object.
2. Ultra Sonic Sensors: These sensors cannot work in the foggy situations and sound waves and tiny particles present in the condition will affect the sensors. And accuracy also gets affected by those particles.
3. Fog lights: These lights are very expensive and the other limitation is it can only be used to see the road boundaries .
4. LIDAR: This has very limited usage, as compare to all other sensors this is the most expensive and the other limitation is that its get degraded at higher resolutions.

The above shown are the methods which was used but there were so many problems which we faced while implementing them in the project. So we came up with the other solution and the method which we used is Dark Channel Prior algorithm (DCP) , and along with DCP we have also used guided filter.

IV. EXPERIMENTAL RESULTS

Below these are the images which was shot before implementing the DCP algorithm and guided filter.

Fig 1: image in a foggy condition

As shown in the figure 1 the image consist of fog and the view is not clear. In the shown image we have applied the dark channel prior algorithm and we have also used the guided filter, after applying the filter and the algorithm the image will look as shown below:

Fig : 2 Image after applying the guided filter and algorithm.

As shown in the figure 2nd the image is clear and the fog has been removed.

V. CONCLUSION

Image hazing and removing fog from a video is an important aspect when it comes to the real life problems. This paper proposes a simple and efficient method known as DARK CHANNEL PRIOR ALGORITHM with the help of which the fog and haze can be removed.

We have used this method on an image and also on a video. When we applied this method on a video we converted that video into frames and afterwards we applied DARK CHANNEL PRIOR ALGORITHM on those frames and again converted those frames into video and at the end we displayed the video and the fog was removed.

The same algo was used on a image and the fog was removed with the help of DCP algorithm.

The method which we have used in efficient and less time taking when it comes to the conversion of video into frames. The method can also be used in real time which the help of which there will be less number of accidents where the situation is hazy and foggy.

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