Image Enhancement by Haze Removal Technique

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Abstract

Fog removal is significant in a variety of applications such as surveillance, automated vehicles, object detection, and so on, and it has proven to be difficult. When severe weather conditions occur, such as fog, haze, darkness, and so on, the driver fails to comprehend a clear view of the roads. It reduces the contrast and color fidelity of artifacts in the captured image, making the object difficult to see with our eyes.

The main cause of the rising number of casualties is considered to be poor visibility. The Ministry of Road Transport and Highways (MORTH) of India also conducted a study on road accidents, which estimated that 170,656 (approximately 35 percent) of the 480,777 road accidents in 2014 were caused by bad weather. This research is based on an algorithm that retains the color quality of the defogged image while preserving precise specifics.

Introduction

When images are taken in poor visibility circumstances such as fog or haze, the image is whitened and thus the contrast is reduced. The scattering of light in the atmosphere due to dust and smoke particles explains all of this.

As the scene radiance enters the viewer, water droplets in the atmosphere cause scattering and absorption, reducing the visibility and contrast of the scene. Two fundamental phenomena, attenuation, and airlight are caused by absorption and scattering. The image quality of a natural environment is diminished due to these two phenomena. Because of attenuation, there would be a low contrast in the scene. We'll remove the fog in this project by using the Dark Channel prior method to restore the defogged image and further Guided filter for the postprocessing.

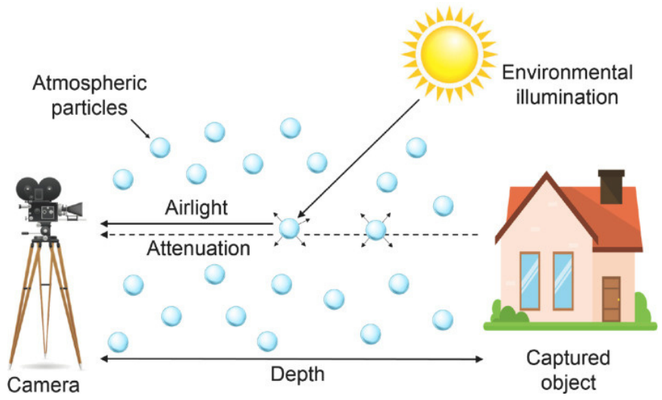

Figure 1. Dark channel prior based Image Dehazing.

Methodology

We preferred Dark Channel Prior over various other approaches because it is based on the fact that the intensity value of at least one color channel within a local window is close to zero in natural outdoor images. The restored picture has low contrast without post-processing. As a result, fine detail contrast enhancement is desired, which can be accomplished with the help of an effective post-processing technique. Thus finally the refined output image is obtained using a Guided Image Filter.

Next, the test images, both Grayscale And RGB are given as input images. The result will contain the output at every step of the process and finally the refined Output Image.

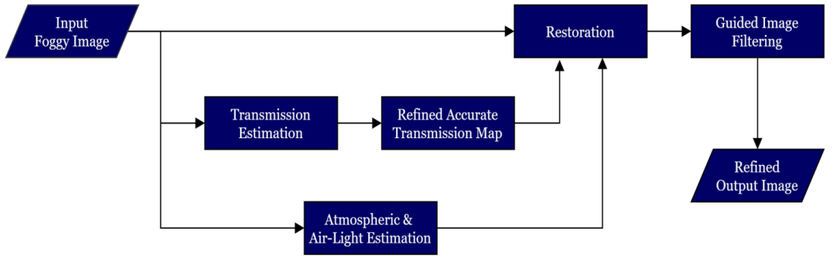

Chart 1. Block Diagram of Methodology.

Results

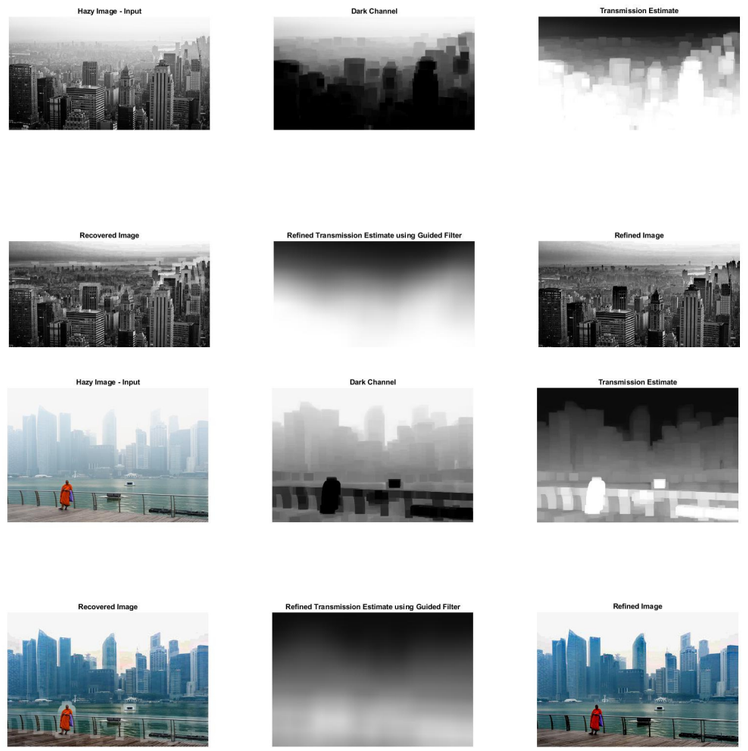

Figure 2. a) Greyscale Image b) RGB Image

Conclusion

In this project, the Single image fog removal technique is applied successfully using Dark Channel Prior Approach with a post-processing Method based on the paper proposed by He, Kaiming, Jian Sun, and Xiaoou Tang . We have successfully obtained the defogged image for Inputs as both RGB and Grayscale. The final refined output image contains more clear edges with details and bright contrast.

The future scope includes the comparison of the different existing models proposed for post-processing of the de-fogged image based on parameters like Contrast Gain (CG) and Colorfulness index (CI) for quantitative analysis. Also, the proposed algorithm is valid for both gray and color images but can also be extended for videos with additional steps.

References

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