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A Review Towards Digital Image Defogging Using Dark Channel Prior and Histogram Stretching Method

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Abstract: In recent world scenario digital image processing is the most widely used application. Digital image processing is the method to perform some operation on the image, in order to get an enhanced image and extract the useful information from that image. Mostly in winter season the visibility of outdoor images captured in inclement weather is often degraded due to the presence of fog. Because of this problem clear image is not obtained. In this paper, the proposed method uses the dark channel prior and histogram stretching methods for digital image defogging. Whereas dark channel prior is used to improve the quality of restoring images and histogram stretching method is used to improve the contrast of the image. Also analysis on various fog removal techniques has been done.

Keywords: Image processing, defogging, dark channel prior, histogram stretching method.

I. INTRODUCTION

The image processing is the vast promising field in the era of technology of machine vision, machine intelligence and automation for real time processing or the post processing of the image captured in different atmospheric conditions. The image captured in the outdoor scene are highly degraded due to the poor lighting condition or over lighting condition or due to the presence of various suspension particles like the water droplets or dust particles.

Fog is kind of common natural phenomena. In the cloudy weather, muddy media of atmosphere such as modular and suspended particals can create a pollution of feedback images and make fidelity and contrast of the color for images reduce to a great extent. Fog removal is highly desired in both consumer/computational photography and computer vision applications. Removing fog can significantly increase the visibility of the scene and correct the color shift caused by the airlight. As we know that poor visibility becomes a major crisis for most outdoor vision applications. Bad weather, such as haze or fog, can significantly degrade the visibility of the scene. Most computer vision applications, such as image segmentation and object tracking, usually suffer from the poor visibility of the foggy images. Therefore fog removal is highly desired in many practical applications. For this we have to use the Dark Channel Prior and Histogram Stretching method for digital image defogging.

Objectives

- To simulate the model for improving the quality of restoring images. Which cannot only remove the fog effectively but also enhance the details and color of scene from foggy image significantly.
- To degrade a fog which makes a great improvement in image visibility.
- To develop a comprehensive solution to the restoring (foggy) images.

II. LITERATURE REVIEW

Background History

Wei Sun presented a technique for single image fog removal which is based on the physical model of atmospheric scattering and the optical reflectance imaging model, mainly three major factors which are going to affect the effect of fog removal are discussed in detail, dark channel phenomenon is explained via the optical model, and an approach for solving the parameter in the atmospheric scattering model is severely derived from a new perspective. Using fast joint bilateral filtering techniques and gray-scale opening operation, the proposed algorithm can efficiently obtain the global atmospheric light and significantly improve the speed and accuracy of atmospheric scattering function solving. Finally, the scene albedo is recovered by inverting this model. [1]

Hongyu Zhao, Chuangbai Xiao, Jing Yu, and Xiujie Xu. proposed a technique for single image fog removal based on Local extrema. The proposed method utilizes atmospheric scattering model to recognize the fog removal. It applies the local extrema method to figure out three pyramid levels to estimate the skylight and white balance, estimation of atmospheric veil, and image restoration by local extrema. The results on the experiments of comparison with traditional methods demonstrate that the projected method can achieve more precise restoration for the color and details, resulting in a great improvement in image visibility.[2]

Tan's work is mainly based on the assumption that the clear-day images have higher contrast as compared to the input fog image, which has remove the haze by

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maximizing the local contrast of the restored images. This method generates convincing images by enhancing the contrast, but it may also result in a physically-invalid extreme haze removal.[3]

Tarel et al. proposed a method for fog removal based on median filter. He used the median filtering method to estimate the atmospheric veil. This method performs faster than above given methods. But still it have the limitation that its detail restoration is not ideal. Yu J et al. used the bilateral filter for the estimation of atmospheric veil. It will improving the performance of defogging. This proposed method used to handle the two types of fields of unknown variables scene albedo and depth which is having a higher complexity. Based on planner road constraints, he introduces the another efficient approach to improve the restoration of road area, here assuming an approximately flat road. [4,5,6,7]

Tripathi et al proposed a technique for single image fog removal using bilateral filter. This filtering method is used to smooths the images without effecting the edges. In this, the given filter replaces every pixels of image by the weighted average of its neighbor pixel. This filter is used to get the quicker contrast. While using bilateral filter we uses the preprocessing and post transforming steps for the betterment. Histogram equalization is utilizes as a preprocessing and histogram stretching is utilizes as post preparing. [8]

Existing Systems

- Physical Model

The atmospheric scattering model is normally used for the formation of hazy or foggy image. This method is based on this physical model which is used to produce the better quality of defogging results. But under different atmospheric conditions some of these methods required the multiple images of the same scene. In practice, it is usually difficult to fulfill these type of special conditions. So, if enough additional information is not present then these types of methods are not able to perform. [9,10]

- Fattal's approach

Fattal's approach is used for defogging or dehazing the image. This approach provides the impressive results. But it will not able to handle the heavy haze or heavy fog images when the assumption is not satisfied. Actually Fattal assumes that image albedo is a constant vector in local region and that the transmission is locally statistically uncorrelated. He proposed the dark channel prior to estimate the atmospheric veil by using the soft matting as a filter to refine it. But by using this method the time and space complexity is quite high. They further improve their method using guided filter. [11,12]

III. PROPOSED WORK

Methodology

We design architecture for digital image defogging by using dark channel prior and histogram stretching method.

- Image defogging

In this proposed scheme we have to used dark channel prior and histogram stretching method for improving the visibility of restoring images. Where as dark channel prior method is used for fog removal and histogram stretching method is used to increase contrast.

The following figure shows the data flow diagram for the proposed approach:

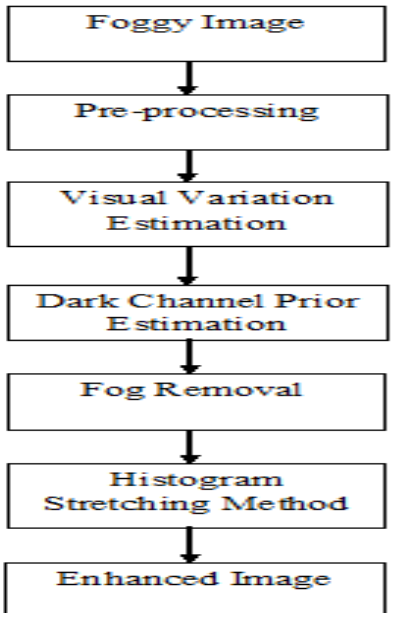

Fig. 1. Data flow diagram for image defogging and enhancement

The steps for fog removal of digital image is given as below:

1. Perform image pre-processing on the image with noise: In order to achieve better de-noising effect, some pre-processing should be done before wavelet threshold de-nosing. The purpose of pre-processing is to reduce the illumination changes, sharpen the edge details, preserve details and eliminate the noise in the image. It is used to smooth textures and reduce artifact by deleting small image features amplified by filtering.
2. To estimate the visual variation.
3. To estimate the dark channel prior. Dark channel prior is a method to remove fog from a single input image. Using this method we can directly estimate the thickness of the fog and recover high quality fog-free image.
4. Obtain the fog-free image.
5. After removing the fog, the next step is to increase the contrast of a fog-free image using
6. Histogram stretching method. This method is used to improve an image by stretching the range of intensity values it contains to make full used of possible values.
7. Finally defog enhanced image will obtain.

IV. CONCLUSION

In recent era, fog removal is very essential in the field of image processing. According to above analysis every technique has its own advantages and their limitations. Fog removal techniques provide a way to improve the visibility of restoring images. In future work, there is need to investigate more optimal schemes for determining the better results.

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