IMAGE-DEFOGGING USING HYBRIDIZATION OF FILTERS

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Abstract - *When we capture images where there is fog during early in the morning, it's very hard to capture a clear picture. These images are not clear and have reduced quality. Smog leads to blur images. Haze is an atmospheric occurrence which reduced the clarity and accuracy of a picture because of fog and smoke which are minute portions of matter. It affects not only the visibility but also complexes implementation of image processing techniques. In this paper, we present an efficient productive smog elimination technique when an image is taken in as input. On the basis of estimated transmission or depth map, this procedure re-establish the hazy or foggy image. We have used a Dark Channel Prior and Color Attenuation Prior technique which is useful for clearing the degraded image. We eliminate smog from blurry images so that the clarity and attributes of images are improved. Our output image is smog free image by these technique. We have used MATLAB code for this.*

Key Words: **Defogging, Hybrid, Image Defogging, Dark Channel Prior.**

1. INTRODUCTION

Exterior images captured in bad weather, such as fog and fog, are not clearly articulated, so they don't make sense. It is caused by smoke, fog and dust that is present in the atmosphere. Such images are reduced in quality, thus reducing variability and visibility. This ultimately complicates distinguishing between objects. This will be important for traffic security, remote sensing space cameras and video surveillance. So here we are using hybrid of filters for better results of the images.

2. LITERATURE SURVEY

Chen, Mengyang (2009) [5] has put forward an algorithm which is iterative to balance the distortion of color affected by more saturation. The methods such as iterative matte optimization and image matting are used.

Hitam M.S et al. (2013) [6] has presented a method known as mixture contrast limited adaptive histogram equalization techniques for the improvement of images taken underwater. The images in this paper were captured from Bidong Island and Redang Island located in Malaysia

Xu, Haoran et al. (2012) [7] did study for a long time on the method of haze removal and came up with an evacuation algorithm. It uses fast bilateral filtering combined with dark channel prior. One more calculation is done having some enhanced estimation of transmission map

K He et al. (2011) [8] have reached to the result that the method of dark channel prior is nothing but a kind of statistics related to outdoor de-hazed images. The extent of fog can be known and a clear defogged image can be acquired. The dark pixels give a valid estimation of the amount of fog transmission. Combination of a delicate interpolation system and haze- imaging model can give a clear fog free picture.

C.Tomasi et.al (1998) [9] proposed a method bilateral filtering. It preserves edges but smoothens the image. It is a local and simple method that is non-iterative as well. This study involves combination of different gray levels or colors based on their geometric closeness.

Yong-Qin et al. (2012) [10] have proposed an algorithm based on image filtering approach. It makes use of low-rank technique and median filter for improved visibility. Shortened single value decomposition along with dark channel prior is used to restore the defogged image. The drawback being that it suffers from halo effects. It may also not perform adequately when heavy fog is present in the scene and when there are great depth jumps.

Tarel J-P et al. (2009) [11] have proposed an algorithm based on filtering approach. It needs several parameter for adjustment and it is based on the linear operations. The main advantage is in terms of its speed. It can also be used for real time de-hazing. Moreover, a new filter is also proposed which preserves corners as well as edges. It is an alternative to median filter. The disadvantage is that the restored image is not much improved because it has discontinuities in the scene depth.

Ramesh K. et. al., (2014) [12] solves the degraded illumination complication including the foggy weather range assessment. It increases the accuracy in degraded image by application of convergence index filters. COIN filters are used in this study. The disadvantage is that the scene elements are almost same as the atmospheric light. So the directional knowledge with gradient energy magnitude is used as an additional parameter

3. METHODOLOGY

3.1 Existing Model

The Existing models are separately defined for the dehazing and defogging, so they are not clearly able to achieve the desired output.

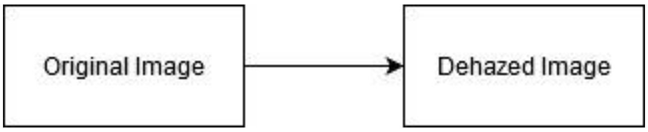


Fig -1: Dehazing process using dark channel prior

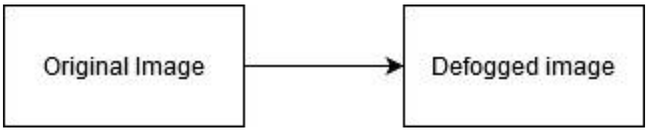


Fig -2: Dehazing process using dark channel prior

3.2. Proposed Model

As you have seen the early models, Now we are going to hybrid the filters and make better output as compared to earlier ones. In place of applying algorithms separately we are going to use the output of dehazed image and apply the further processing on that. Below are details of the filter we are going to use:

3.2.1 Dark Channel Prioritization

The widely used model to describe the foggy images in computer vision is as follows:

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

where,

I Observed Intensity

J Scenic Radiance

AGlobal Air light

t transmission within a medium representing the fraction of light reaching the camera without being scattered.

The first term on the RHS is a multiplicative term known as *direct attenuation*[1]. The other term is called *air light*[1]. The direct attenuation describes the radiance of scene and its decay in the medium. The air light is an additive distortion resulting from previously scattered light and leads to shift of scene colors.

In the homogenous atmosphere, the transmission is expressed as[2]:

$$t(x) = e^{-\beta d} \quad (2)$$

where,

β Scattering coefficient of atmosphere

d Scenic depth

3.2.2 Color Attenuation Prior

The phenomenon haze is usually caused by scattering of light that is caused by particles in the atmosphere. The region where the scattering has occurred will have high brightness and low contrast or saturation. We can reach a conclusion such that the scene depth changes with density of haze and difference between brightness and saturation of image, is:

$$d(x)\ \alpha\ c(x) \alpha\ v(x) - s(x)$$

Where,

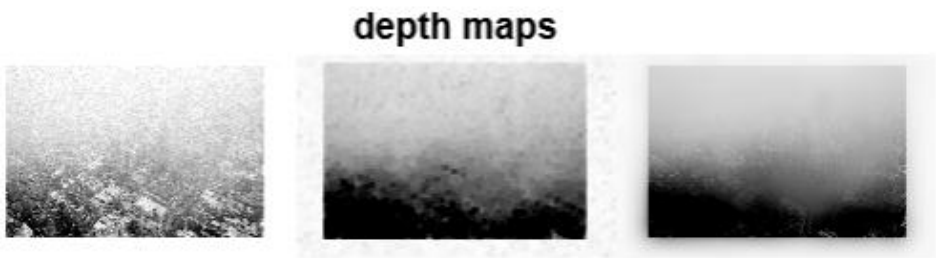
d is the scene depth,

c is the density of haze,

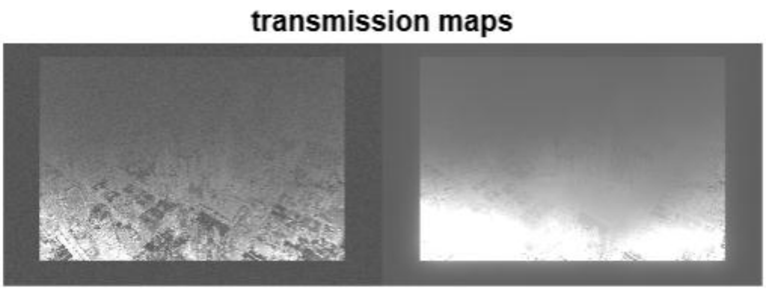
v is the brightness of the image and, s is the saturation

4. IMPLEMENTATION

(a)



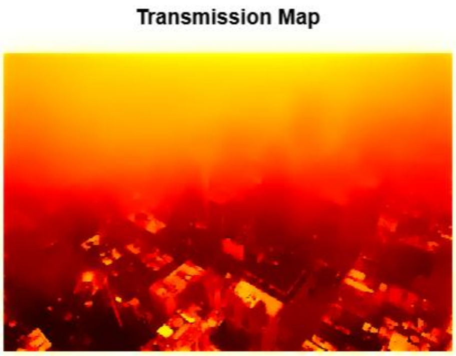
(b)



(c)

(d)

(e)



(f)

(g)

Fig -3: Defogging Step by Step Process

(a) Original Image; (b) Depth maps; (c) Transmission maps; (d) Dehazed Image;
(e) Constraint Bounded Dark channel prior image; (f) Transmission map; (g) Defogged Image

FLOW CHART

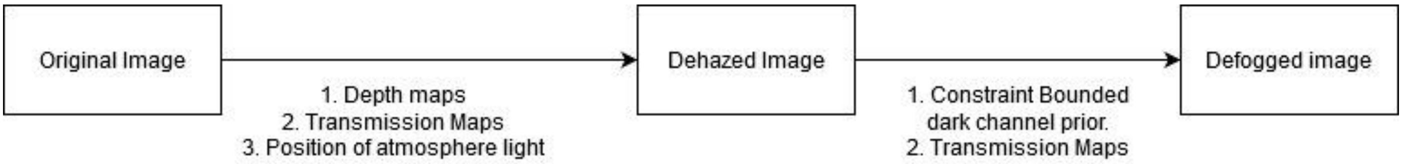


Chart -1: Flowchart for the procedure

Fig -4: Defogging Using Hybridization of filters

5. CONCLUSION

In the above presented paper, we have put forward an easy and powerful defogging technique. In recent era, fog removal is very essential in the field of image processing. The proposed scheme uses great defogging technique and it is well adapted to any possible future technology in which clear images (fog free) are required. Since haze removal is highly desired in computer vision applications, it is necessary to make a further effort to put the proposed method into real-time applications. Such as the video-surveillance systems and the in-vehicle vision systems.

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