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Abstract of Proposed Seminar Topic

# Improved Haze Removal Method using Proportionate Fusion of Color Attenuation Prior and Edge Preserving

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## Abstract

Fog and haze are becoming a global challenge. Images captured under the hazy condition have poor contrast and corrupted color.This type of images limit the visibility and thus hinder the way for the computer vision purposes like video observation, entity recognition. The image captured shows this behaviour because of the air light. Analyzing two widely used techniques for haze removal from images alias color attenuation prior based haze removal and haze removal with edge preserving.In proposed model the better haze removing techniques using fusion based approach which gives better quality haze removal compared to the bench mark haze removal techniques.

Image quality is degrading because of poor weather conditions such as haze,smog,fog. When we capture an image during the time of haze, the lights get scattered by fog,smog,haze in the atmosphere and the output obtained is either blurred or degradation in the quality of image.Existing haze removal techniques is based on certain calculations and environment conditions are estimated.It is a time consuming method.In the proposed method technique used such as color attenuation prior and edge preserving have drawbacks like darkening of image and overedging. In physical model based haze removal techniques the computational complexity is very high , take more time to calculations and also unknown parameters need to be assumed as constants. But in non physical model based haze removal techniques basically perform image enhancement or restoration.

Strategy of haze removal is classified into two ways :-

1. Image enhancement techniques don't includes the reason behind the degradation of the image.Its just enhance the input image.
2. In image restoration techniques it preserves the originality of the input image.

This haze removal techniques will demand for future in most applications like surveillance,security etc.Also in biometric application haze removal techniques can be used as a preprocessing method to get best identification accuracy.

Various existing methods which removes the haze from the image. Dark Channel Prior (DCP) is Single image dehazing approach and it works on outdoor haze-free images.DCP is based on the Dark Pixel which is available in most local patches in outdoor haze-free images contain some pixels whose intensity is very low, in at least one color (RGB) channel. approach is physically valid and works well in dense haze. DCP increase the contrast of image and maintains color reliability. It also works on greyscale images if shadow is not present. As Dark Channel Prior is time consuming process, so number of unnecessary step can be removed to make Dark Channel Prior work faster.

Image fusion technique is used to fuse two de-haze images. In this method, we make use of Weight Maps to improve to quality of the Image. Image fusion can be applied on multiple as well as single Image. But single Images are

considered to be the most informative and accurate. Image Fusion can be applied for indoor and outdoor images.

Color attenuation prior based haze removal is novel linear method which is based on difference of brightness and saturation of the pixels within the hazy images. To recover the dehazed image, color attenuation first identifies or estimates certain attributes related to input image provided.The color attenuation-based haze removal methods have five steps :-

1. Atmospheric Scattering Model : The equation of atmospheric scattering model is

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

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

I is the hazy image, J is the scene radiance, A is atmospheric light,beta is scattering coefficient, x is the position of pixel, t is transmission medium, also I, J, K represents the three-dimensional vectors in RGB. T can be calculated using the second equation when depth is given. It is observed that in normal images i.e. haze free images; the brightness is moderate whereas the saturation is high.In the case of hazy images its inverse. In hazy images the brightness is high, and saturation is extremely low which makes the image appear white.

2. Estimation of linear coefficient matrix : The training data contains the hazy image and ground truth map associated with it. When the values of the coefficients are determined, they can be used for any single hazy image.To recover the scene depth of the hazy image their parameters will be used.

3. Estimation of depth information : Transmission map can also be recovered with this method. Using this both depth map and transmission map dehazing become easier.

4. Estimation of atmospheric light : The depth map of the input hazy image has been recovered, the distribution of the scene depth is known. For representing distant places bright regions in the map are used.

5. Scene Radiance recovery : the depth of the scene d and the atmospheric light are known, transmission t can be easily estimated, and J can be recovered. Now that the depth and atmospheric light are known transmission t(x) can be estimated easily.

Edge preserving based haze removal : Removing the haze from the image, the most prominent factor that affects the image quality is the edges.need arises to preserve the edges in the improved image. Edge preserving techniques uses filters like bilateral filter, weighted guided image filter,guided image filter. Bilateral filter is used because of its simplicity. In guided image filter and weighted guided image filter guidance image is used, it helps to reconstruct the degraded image, generally the guided image is identical to the original image .Edge preserving techniques using different filters generally follows 3 steps :

1. Estimation of Transmission Map : Raw transmission map is created based on the input image without using Dark Channel Prior. Transmission map describes the details in the image.

2. Refining of transmission map : The transmission map obtained is not satisfactory to get filtered output , so guided filter is applied as to refine the obtained transmission map.Guided filter will use a guidance image to dehaze the image.Guidance image is similar to input image.It smoothen the image along edge preservation.

3. Recover the Output Image : o finally acquire the output image, the processed image is finally refined using matting Laplacian and de hazed image is obtained.

From the existing techniques, s, it is clear that Color Attenuation based haze removal method works for the sky images but gives blurred dehazed images which are little darker where detailing is not coarticulated. Similarly, the edge preserving based image dehazing do not blur the dehazed images, but result is over edging.Proposing system tries to select the advantages of both existing methods and apply them all together to produce better dehaze images. The proposed system will use edge preserving methods as well as color attenuation technique. Reason is, edge preserving tries to preserve the edges of the input images, which makes the output image more perspicuous. Similarly, color attenuation technique helps to preserve the natural color of the input image.

Attenuation Prior whereas the second is the output of Edge Preserving. Both the outputs are fused in a certain proportion. Using the existing methods, we have modelled three sets. The sets are in the ratios 30(x)-70(y), 40(x)-60(y),45(x)-55(y). Where x is output image of color attenuation prior and y is output image of edge preserving.

# References


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