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A REVIEW ON SINGLE IMAGE DEHAZING BY USING FUSION BASED STRATEGY

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***Abstract*- Bad weather, such as fog, haze significantly degrade the visibility of the scene. Haze is an atmospheric phenomenon that significantly degrades the visibility of outdoor scenes. It is due to the atmosphere particles that absorb and scatter the light. Removing haze means increases the visibility of the scene and applicable for both color and gray images. The method is a fusion based strategy that derives the inputs and weight maps only from the original degraded image. To minimize the artifacts introduce the weight maps. The information of the derived inputs to preserve the regions with good visibility, by computing three measures: luminance, chromaticity, and salience**

Index Terms- Image dehazing ,outdoor Images, weight maps

I. INTRODUCTION

The images of the outdoor scenes are degraded by bad weather condition .The quality of the photograph in our life is easily undetermined by the aerosols suspended in medium such as dust ,mist or fumes. In such cases , atmospheric phenomena like haze and fog degrade. Since removal scattered and as a result ,distant objects and the scene are less visible, which is characterized by reduced contrast and faded colors. The goal of haze removal algorithms is to enhance and recover details of scene from hazy image. There are many circumstances that accurate haze removal algorithms are needed. Restoration of images taken in these specific conditions has caught. This task is important in several outdoor applications such as remote sensing, intelligent vehicles, object recognition and surveillance. First, removing haze can significantly increase the visibility of the scene correct the color shift caused by the air light. In general, the haze-free image is more visually pleasuring. Second, most computer vision algorithms, from low-level image analysis to high-level object recognition usually assume that the input image in that scene radiance.

This task is Important in several outdoor applications such as remote sensing, intelligent vehicles, object recognition and surveillance remote sensing systems, the recorded bands of reflected light are processed in order to restore the outputs multi-image techniques solve the image dehazing problem by processing several input images, that have been taken in different atmospheric conditions. Another alternative is to assume that an approximated 3D geometrical model of the scene is given.

The first derived input ensures a natural rendition of the output, by eliminating chromatic casts that are caused by the air light color, while the contrast enhancement step yields a better global visibility, but mainly in the hazy regions. However, by employing these two operations, the derived inputs taken individually still suffer from poor visibility second input restores the contrast of the hazy inputs, but at the cost of altering the initial visibility of the closer/haze-free regions)image[9].

II. RELATED WORKS

A. Color Constancy Using Natural Image Statistics and Scene Semantics: The methods are all based on specific assumptions such as the spatial and spectral characteristics of images[1]. In general, color constancy algorithms can be divided into two groups. The first group consists of algorithms based on low-level image features that can be directly applied to images. The second group consists of algorithms that use information acquired in a learning phase to obtain knowledge about the images, like possible light sources and the distribution of possible reflectance colors to be present in natural scenes.

This algorithm is based on the assumption that in real-world images, for a given illuminant, only a limited number of colors can be observed. Using this assumption, the illuminant can be estimated by comparing the distribution of colors in the current image to a distribution of colors[3].

For instance, the Gray-World algorithm assumes that the average color in a scene taken under a neutral light source is achromatic, while the Gray-

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Edge algorithm assumes that the average edge is achromatic. This means that the set of possible adjacent color values (i.e., color edges) in real-world images is more restricted than the set of possible pixel values. Hence, the use of local spatial information will provide more stable gamuts than pixel values to compute color constancy. Furthermore, a higher accuracy is obtained when there are a large variety of edges in a scene. Hence, color constancy methods are largely dependent on the distribution of colors and color edges in an image.

Comparing the median angular error of this algorithm having, an increase of nearly 20 percent can be obtained when the circumstances under which the algorithm will be used are known a priori.

B.Edge-Preserving Decompositions for Multi-Scale Tone and Detail Manipulation

Many recent computational photography techniques decompose an image into a piecewise smooth base layer, containing large scale variations in intensity, and a residual detail layer capturing the smaller scale details in the image[10].

Using edge-preserving operator Based on weighted least squares framework and Used to reduction ringing in deblurring images in noise and Using smoothing propagation of sparse constraints and Well-suited for coarsening of image and also Extraction of detail at various spatial scales .
It have two layers Base layer and detail layer. Base layer is the Larger scale variations in intensity and Applying edge-preserving smoothing operator in image. Detail layer has the difference between original image and base layer the problem is decrease in preserve edges. While manually adjusting the saturation alleviates the problem, a more principled solution is needed.

Applications to edge-preserving operator are Tone mapping , Detail enhancement ,Contrast manipulation.

C. Single Image Haze Removal Using Dark Channel Prior: It is based on the statistics of outdoor haze-free images In hazy images, the intensity of these dark pixels in that channel is mainly contributed by the air light[4]. Therefore, these dark pixels can directly provide an accurate estimation of the haze transmission. Combining a haze imaging model and a soft matting interpolation method, recover a high-quality haze free image and produce a good depth map. for example the low intensity in the dark channel is mainly due to three factors like a) shadows, e.g., the shadows of cars, buildings, and the inside of windows in cityscape images, or the shadows of leaves, trees, and rocks in landscape images) b) colorful objects or surfaces) dark objects or surfaces, e.g., dark tree trunks and stones. Dark channel is computed on square neighborhoods . Block artifacts and halos are reduced by using a soft-matting algorithm[7].

Advantages: simple but powerful ,bad haze image can be put to good use and Disadvantages: Invalid when the scene objects are inherently similar to the atmospheric light and no shadow is cast on them .

It is designed to remove spatially invariant haze, when the depth of the image is not constant it can only remove a thin haze layer corresponding to the nearest objects. The dark channel prior is based on the statistics of outdoor haze-free images.

Combining the prior with the haze imaging model, single image haze removal becomes simpler and more effective. Since the dark channel prior is a kind of statistics, it may not work for some particular images. When the scene objects are inherently similar to the atmospheric light and no shadow is cast on them. This method is fail to recover the true scene radiance of the distant objects and they remain bluish.

III. FUSION BASED STRATEGY

Our fusion-based enhancement process is driven by several weight maps. The weight maps of our algorithm assess several image qualities that specify the spatial pixel relationships. These weights assign higher values to pixels to properly depict the desired image qualities[6]. Finally, our process is designed in a multi-resolution fashion that is robust to artifacts. Compared with previous dehazing methods, our algorithm has three main advantages: (i) it performs an effective per-pixel computation, different than the majority of the previous methods that consider patches. A proper per-pixel strategy reduces the amount of artifacts since patch-based methods have some limitations due to the assumption of a constant air light in every patch. In general this assumption is not true and therefore additional post processing is required (e.g. the method of He et al. [8] needs to smooth the transmission map by alpha-matting); (ii) the complexity of our method is more reduced than the previous strategies; (iii) our technique performs faster being suitable for real-time applications.

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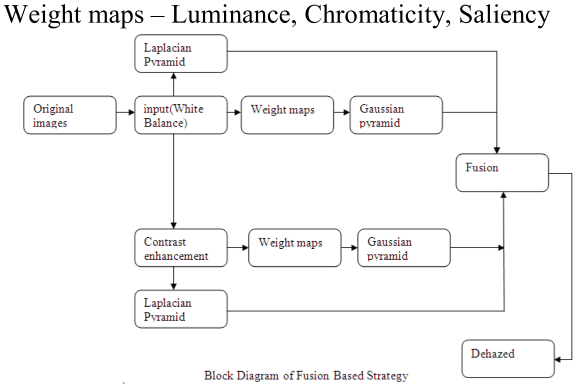
A. Inputs

In practice, there is no enhancing approach that is able to remove entirely the haze effects of such degraded inputs. Therefore, considering the constraints stated before, since process only one captured image of the scene, the algorithm generates from the original image only two inputs that recover color and visibility of the entire image.

B.Weight maps and derived inputs

The derived inputs still suffer from low visibility mainly in those regions with dense haze and low light conditions. The idea that global contrast enhancement techniques are limited to dealing with hazy scenes. the general contrast enhancement operators (e.g. gamma correction, histogram equalization, white balance) is due to the fact that these techniques perform (constantly) the same operation across the entire image. In order to overcome this limitation, we introduce three measures (weight maps). These maps are designed in a per-pixel fashion to better define the spatial relations of degraded regions.

Weight maps – Luminance, Chromaticity, Saliency



Block Diagram of Fusion Based Strategy

Fig 1: Overview of our technique. From the input hazy image are derived two enhanced versions.

This weight map is simply computed (for each input Ik , with k indexes the derived inputs) as the deviation (for every pixel location) between the R,G and B color channels and the luminance L from the input:

$$W_k^1 = (1/3[(R^k - L^k)^2 + (G^k - L^k)^2 + (B^k - L^k)^2])^{1/2} \quad \text{….equ(1)}$$

Since the luminance L is computed by averaging the RGB channels, this disparity yields higher values for the saturated pixels which are assumed to be part of the initial haze-free regions. On the other hand, because haze produces colorlessness and low contrast, this measure will assign small values (reducing the contribution of these locations to the output) for the hazy but also for the deteriorated regions (e.g. in the second derived input refer to the regions that have lost their luminance and therefore have a dark appearance).

a.Luminance

The luminance weight map measures the visibility of each pixel and assigns high values to regions with good visibility and small values to the rest. Since hazy images present low saturation, an effective way to measure this property is to evaluate the loss of colorfulness[2].

b.Chromaticity

The chromatic weight map controls the saturation gain in the output image. This weight map is motivated by the fact that in general humans prefer images characterized by a high level of saturation. Since the color is an inherent indicator of the image quality, often similar color enhancement strategies are also performed in tone mapping.

c.Salience

The saliency weight map identifies the degree of conspicuousness with respect to the neighborhood regions. This perceptual quality measure assesses that a certain object/person stands out from the rest of the image, or from nearby regions.

C.Fusion method

In our case, each input is decomposed into a pyramid by applying the Laplacian operator to different scales. Similarly, for each normalized weight map W , a Gaussian pyramid is computed. Considering both the Gaussian and Laplacian pyramids have the same number of levels, the mixing between the Laplacian inputs and Gaussian normalized weights is performed at each level independently yielding the fused pyramid.

The Laplacian multi-scale strategy performs relatively fast representing a good trade-off between speed and accuracy. By independently employing a fusion process at every scale level and the two temporal fused images, the potential artifacts due to the sharp transitions of the weight maps are minimized. Multi-scale fusion is motivated by the human visual system that is primarily sensitive to local contrast change such as edges and corners[8].

IV. LAPLACIAN PYRAMID

The Laplacian Pyramid is computed from the Gaussian Pyramid. Let I be the original 1D image, and let W be a Gaussian smoothing mask, normalized as usual so PmWm = 1. De¯ne Wn ¤ I as

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the result of convolving the image n times with W; e.g., W2 ¤ I ′ (W ¤ W) ¤ I = W ¤ (W ¤ I). Also, define W0 ¤ I ′ I

V. GAUSSIAN PYRAMID

The original image is convolved with a Gaussian kernel. The cut-off frequency can be controlled using the parameter σ. The Laplacian is then computed as the difference between the original image and the low pass filtered image. This process is continued to obtain a set of band-pass filtered images (since each is the difference between two levels of the Gaussian pyramid).

VI. PROPOSED SYSTEM

To prove the robustness of method, the new operator has been tested on a large dataset of different natural hazy images. Haze due to dust, smoke and other dry particles reduces visibility for distant regions by causing a distinctive gray hue in the captured images.

For the problem, fog has a similar impact as haze, but technically it appears as a dense cloud of water droplets close to the ground when night conditions are clear but cold, and the heat released by the ground is absorbed during the day. Assume that the input hazy/foggy images are color images and the images may contain achromatic objects.

There is a time delay will consume less, color contrast adjustment is high, When producing output images time will reduce. Haze reduce and get accuracy output images. Complex techniques are reduce.

VII. CONCLUSION

The fusion-based approach can be used to effectively enhance hazy and foggy images. To the best of our knowledge, this is the first fusion- based strategy that is able to solve such problems using only one degraded image. By choosing appropriated weight maps and inputs, a multi-scale fusion strategy can be used to effectively dehaze images. The technique has been tested on a large data set of natural hazy images. The method is faster than existing single image dehazing strategies and yields accurate results.

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