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Fusion Based Strategies to Combine Hazy Images Into Single Image

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ABSTRACT

One of the major problems in image processing is the restoration of images corrupted by various types of degradations. Images of outdoor scenes often contain atmospheric degradation, such as haze and fog caused by particles in the atmospheric medium absorbing and scattering light as it travels to the observer. Although, this effect may be desirable from an artistic stand point, for a variety of reasons one may need to restore an image corrupted by these effects, a process generally referred to as haze removal. This paper introduces improved haze removal technique based on fusion strategy that combines two derived images from original image. These images can be obtain by performing white balancing and contrast enhancement operation. These derived images are weighted by specific weight map followed by Laplacian pyramid representations to reduce artifacts introduce due to weight maps. Unlike other techniques this approach requires only original degraded image to remove haze which makes it simple, straightforward and effective.

Keywords: Single image strategy, degraded image, fusion based, weight maps, multi-scale, per-pixel.

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I. INTRODUCTION

Images of outdoor scenes often contain atmospheric degradation, such as haze and fog caused by particles in the atmospheric medium absorbing and scattering light as it travels to the observer.This paper introduces improved haze removal technique based on fusion strategy that combines two derived images from original image. These images can be obtain by performing white balancing and contrast enhancement operation. These derived images are weighted by specific weight map followed by Laplacian and Gaussian pyramid representations to reduce artifacts introduce due to weight maps. Furthermore, the fusion enhancement technique approximations for every single pixel the desired perceptual established attributes (called weight maps) that commands the contribution of every input to the final outcome. In order to derive the images that fulfill the visibility assumptions required for the fusion process. When photographs are taken in underwater conditions the visibility of the scene is degraded significantly. This is due to the fact that the radiance of a point in the scene is directly influenced by the medium scattering. Practically, distant objects and part of the scene suffers from poor visibility, loss of contrast and faded colors. Recovering of such degraded visual information is important for applications such as oceanic engineering, mapping, and research in marine biology, archeology, and surveillance. The main idea behind fusion based dehazing technique is to combine images derived from degrade image. Two images are derived by performing white balance and contrast enhancement operation on original degraded image. This ensures the visibility in hazy and haze free region of image and also eliminate unrealistic color cast introduced due to atmospheric color. In fusion framework the derived inputs are weighted by three weight maps i.e. luminance, chromatic and saliency weight maps. These weight maps ensure to preserve regions with good visibility.

II. EXISTING SYSTEM

In the existing system of single dehazed images following steps are follows:

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1. Derive two input images from the original input with the aim of recovering the visibility for every region of the scene in at least one of them.

2. First input will be obtained by applying white balancing.

3. Second input will be obtained by applying contrast enhancement technique.

4. Compute 3 weight maps such as luminance, chromaticity and saliency and weight the derived inputs by 3 normalized weight maps.

5. Apply multi-scale fusion, utilizing a Laplacian pyramid delegation of inputs blended along with Gaussian pyramids of normalized weights to obtain the haze free image.

These steps are carried out for cloudy and outdoor images whose clearity was not so good.

III. PROPOSED WORK

We propose a simple but effective strategy built on a multi-scale fusion technique. By defining properly several inputs and weights we demonstrate the utility of our fusion-based approach to enhance the underwater images.

The first input is defined by the white balanced version of the image. To obtain the color corrected image the algorithm searches to equalize the median values of the basic color channels. This step is important since the input color channels of the underwater images
are rarely balanced.

The second input is obtained by applying the classical global minmax windowing method that aims to enhance the image appearance in the selected intensity window. This simple technique exploit effectively the object coherence by enhancing the contrast within a subrange of the intensity values at the expense of the remaining intensity values.

The weights of our algorithm are defined as following:

Luminance weight map
Controls the luminance gain in the final result.As a photograph is visually degraded, the general appearance tends to become flat. The weight values represents the standard deviation between every R,G and B color channels and the lightness of the original input image.

Contrast weight map
Yields high values to image elements such as edges and texture. To generate this map we rely on an effective contrast indicator built on the Laplacian filter computed on the grayscale of each image input.

Chromatic weight map
Is designed to control the saturation gain of the result. This map is a simple saturation indicator and computes for every pixel the distance between the saturation value and the maximum of the saturation range using a Gauss curve.

Saliency weight map
Is a quality map that estimates the degree of conspicuousness with respect to the neighborhood regions. This value is effectively computed.

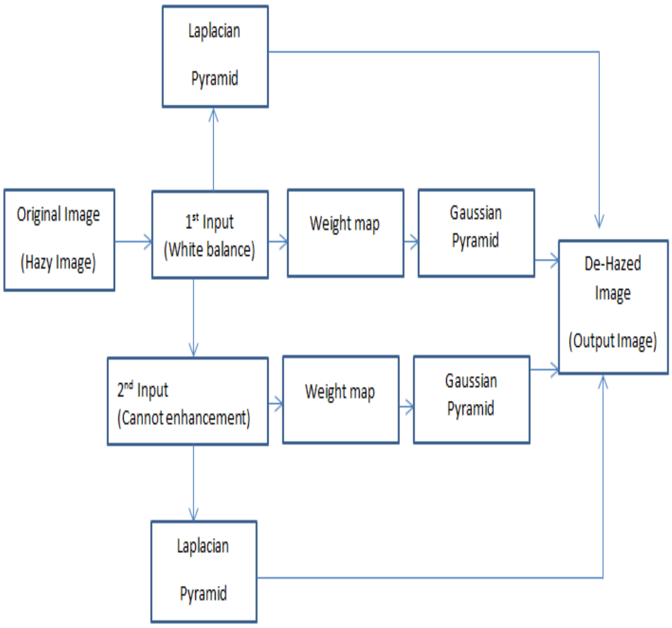

Fig 1. System Architecture

Once the weight is obtained, we employed the normalized weight values by constraining that the sum at each pixel location of the weight maps to equal one. In the final step the inputs and the weights are merged by a multi-scale fusion process. To avoid haloing artifacts we opted for the widely-used multi-scale Laplacian pyramid decomposition. Practically, the final restored image is obtained mixing between the Laplacian inputs and Gaussian normalized weights at each scale level independently.

System Applications:

- Image refocusing and novel view synthesis.
- Underwater photography are also prone to scattering artifacts.
- Remote sensing
- Overlaying with geographic information.
- Haze-free long-distance
- Improved consumer photography.
- Military and security applications.

IV. CONCLUSION

The fusion based dehazing approach disussed in this paper can effectively restore image color balance and remove haze.This technique is based on selection of appropriate weight maps and inputs, a fusion approach can be used to obtain dehazed version of hazy images. Moreover, it has been observed that this approach outperform the other single

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image based dehazing techniques. The method is faster than existing single image dehazing strategies and yields accurate results. 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. Finally, our process is designed in a multi-resolution fashion.In future work we would like to test this approach on videos.

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