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HAZE REMOVAL BASED ON FUSION OF LOCAL AND NONLOCAL STATISTICS

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ABSTRACT - Fog and haze degrade the contrast in the majority of outdoor photos. For the estimation of scene configurations and the restoration of scene albedo, two statistical frameworks have been suggested in recent years that take advantage of the local (dark channel prior) and non-local (haze-lines) properties of hazy images. We suggest a novel de-hazing technique in this paper that combines the benefits of local and non-local de-hazing techniques. We use the local characteristics to control the estimation of non-local haze-lines for a better final restoration at difficult places by utilizing their complimentary statistical qualities. Results from both quantitative and qualitative studies support our suggested method's superior performance to cutting-edge frameworks.

KEY WORDS: non-local, dark channel prior, haze line.

1 INTRODUCTION

Most of the outdoor images suffer from contrast degradation caused by fog and haze. Two statistical frame works have been proposed in recent years that exploit local (dark channel prior) and non-local (haze-lines) characteristics of hazy images for the estimation of scene configurations and the restoration of scene albedo. Both frameworks show intrinsic limitations due to the basic assumptions they rely on. In this paper we propose a novel de-hazing method that combines the advantages of local and non-local de-hazing methods. Exploiting their complementary statistical properties, we use the local features to regulate the estimation of non-local haze-lines for a better final restoration at challenging regions. Both quantitative and qualitative results the effectiveness of our proposed method over state-of-the-art framework

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2 LITERATURE SURVEY

[1] “Contrast restoration of weather degraded images,” was proposed by S. G. Narasimhan and S. K. Nayar Pictures of outdoor scenes captured in bad weather suffer from the negative consequences of inadequate contrast. When the weather is bad, the air substantially scatters the light that a camera captures. On the other hand, the ensuing decay varies across the scene and is exponential in the depths of scene focuses. As a result, traditional space invariant picture preparation techniques are insufficient to exclude climate affects from photos.

[2] “Color constancy using natural image statistics and scene semantics”, A. Gijsenij and T. Gevers The foundation of all current shading consistency algorithms is explicit supposition, such as the spatial and ghostly characteristics of images. Therefore, no calculation can be regarded as complete. Despite this, the choice of the approach that works best for a particular photograph must be made using the great variety of techniques that are readily available.

[3] H. Lu, Y. Li, S. Nakashima, H. Kim, and S. Serikawa, and proposed **[3]** "Underwater

3 EXISTING METHOD

Image Enhancement

Taking the any input image, the image is then specify application preprocessing method will be performed on those image after this method the image quality is increased.

- Input Image: In this first an image will be

image super-resolution by de-scattering and fusion", Low complexity and shading bending result from dissipation and retention, which degrade submerged images. This research proposes a revolutionary self-similitude based de-scattering and super goals (SR) technique for submerged photos.

[4] “De-hazing and defogging”, proposed by R. T. Tan [5] The visibility of a scene can be considerably reduced by unfavourable weather conditions like fog and haze. Optically, this is caused by the atmosphere's significant concentration of light-absorbing and -scattering particles. The absorption and scattering processes are frequently represented in computer vision by a linear combination of direct attenuation and air-light.

[5] “A nonnegative factor model with optimal utilization of error estimates of data values”, proposed by P. Paatero and U. Tapper The fundamental tenet of source-receptor relationships is that mass preservation can be anticipated and that a mass parity analysis can be used to identify and distribute the sources of the climate's airborne particle problem.

Fig-3.1. shows that the basic steps of image enhancement, if we are

taken as an input. These images can be medical images, blur images, remote sensing images machine vision, the military applications etc.

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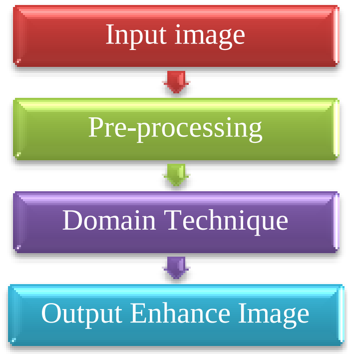

Fig 3.1: Steps of Image Enhancement

- Perform Pre-processing on the Image: Images that will be taken as input can be blur image or noisy image so the various pre-processing methods will be performed on those images before applying enhancement technique.
- Applying Domain Techniques: After applying pre-processing method on input images then image quality will be enhanced by using Image enhancement domain techniques such as spatial or transformation.
- Output Enhanced Image: In this the output image will be get which is an enhanced image

4 PROPOSED METHOD

The proposed method is composed of four main modules
(i) Multi-band decomposition
(ii) Intensity module
(iii) Laplacian module
(iv) Reconstruction and Correction

(i). Multi-Band Decomposition

The input image is first decomposed using multi-scale guided filters [16]. For computational efficiency, common values were reused and parameters that are related to smoothing scales = {1, 2, n } were recursively updated. The level of smoothing increases as the subscription number increases.

(ii). Intensity Module

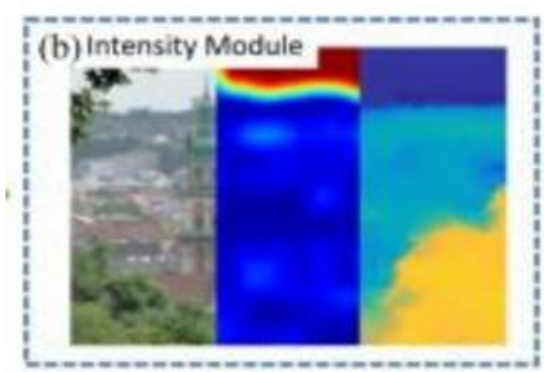

Fig: 4.1. Intensity Module

The suggested solution uses locally targeted de-hazing to restore intensity levels. To quickly estimate ambient light, we first create an ambient map. Each block's initial transmission is optimized while taking information loss considerations into account.

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The transmission is further refined at the pixel level using previously computed guided filter values after block-based transmission estimation is finished

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(iii). Laplacian Module

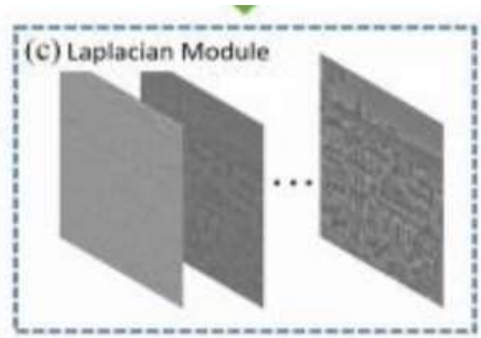

Fig: 4.2. Laplacian Module

To restore intensity levels, the suggested technique employs locally targeted dehazing. We initially generate an ambient map in order to easily assess ambient light. The first transmission of each block is optimized while taking into account information loss. After block-based transmission estimate is accomplished, the transmission is further honed at the pixel level using previously computed guided filter values.

(iv). Reconstruction and Correction

The reconstruction procedure is explained in this section. The final enhanced photos can be recreated after processing the multi-band layers. A color-corrected de-hazing operation is the first step in the finishing process. The hue of many damaged photos is distorted. The amount of distortion can be calculated using the predicted ambient light. Color distortion emerges as biased ambient light in the base layer. We discovered that observing the color channels for variations in ambient light gives us information about whether the color is skewed.

5 RESULT

The removal of Haze in an image is considered as a blind noise which is nothing but light snow type noise. To decreasing the Haze effect in the image we have taken an image as input which is shown in below

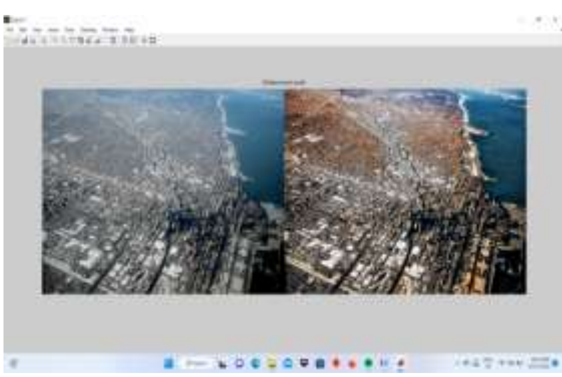

Fig 5.1: Input image

Fig 5.2: Histogram Equalization

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In the above figure we can observe the Histogram of the image nothing but Graphical Representation and also the lines of the Histogram is called as Histogram Equalization.

In the above figure both the Histogram and Histogram Equalization has shown.

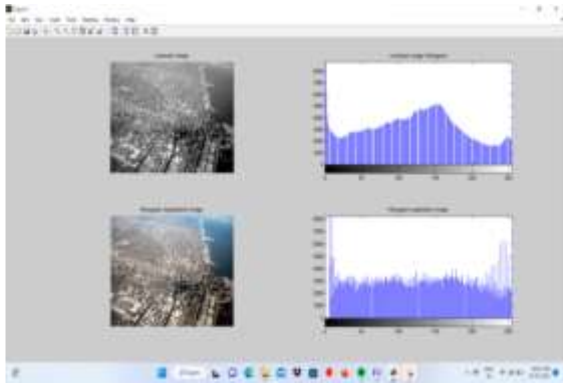

Fig 5.3: Clache image

The figure which is pointed in the above 4 figures is the Original image, cache image, and de-hazed image. We can observe every single detail in the image

Fig 5.4: Final Output

which The Blind noise called haze is eliminated in the above image. Image is important because it contains some amount of important data. If image contains this type of noise. The data which is important can't be visible.

6 CONCLUSION

Our innovative de-hazing technique combines the benefits of local and non-local de-hazing techniques. We leverage the local characteristics to control the estimation of non-local haze-lines for a better final restoration by taking advantage of their complimentary statistical aspects. Results from both quantitative and qualitative studies support our suggested method's superior performance to cutting-edge frameworks. Our approach is particularly effective in recovering features and contrast for distant and heavily hazy objects. Additionally, our method is more resistant to additive noise than existing methods. All of

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these benefits are advantageous for real-world applications.

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