

## FOREGROUND EXTRACTION BASED ON COLOR IMAGES OF DEPTH MAP BY USING CLAHE

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**ABSTRACT** *An atmospheric condition like mist as well as vapor significantly degrades image eminence in open-air surveillances. For that reason a tough surroundings it's become a need to have dependable dehazing method which improve the visibility of foggy images. To process white balanced images is derived from original hazy image to retain normal interpretation of images by removal color cast that are caused by special color. To protect the region with superior visibility, vital features are extracted by computing salient feature extraction map & foreground region conservation map and then improve visibility in misty regions by subtracting average luminance from original foggy image then contrast improving approach CLAHE(Contrast Limited Adaptive Histogram Equalization) is used to increase the local contrast of the image.*

**Keywords:** Depth map, CLAHE, enhancement, mist

### INTRODUCTION

Remote supervision is the process of observance the close looks on the apprehensive activities of the object or target public for the purpose of analysis or protecting them. This can include surveillance from a distance with the use of CCTV cameras and UAV. Although many times weather situation such as mist or Fog have an effect on the image quality of captured image. Due to the little visible images aim of surveillance cannot accomplish. Hence, there is a need of improvement techniques that improves the visibility of low contrast images, mostly captured in outside surveillance.

Image Enhancement is a procedure of the input image in such a mode that the output image is more appropriate for analysis by the public as well as by technology [1]. The principal objective of image enhancement is to process a given image so that the result is more suitable than the original image for a specific application. It sharpens the image features such as edges, boundaries, or contrast to make a graphic display more helpful for display and analysis. It doesn't increase the inherent information content of the data, but it increases the dynamic range of the chosen features so that they can be detected easily. The greatest difficulty in image enhancement is quantifying the criterion for enhancement and, therefore, a large number of image enhancement techniques are empirical and require interactive procedures to obtain satisfactory results. Image enhancement can be either spatial or frequency domain techniques. Spatial domain techniques are performed to the image plane itself and they are based on direct manipulation of pixels in an image. The operation can be formulated as

$$g(x, y) = T[f(x, y)] \quad (1)$$

where  $g$  is the output,  $f$  is the input image and  $T$  is an operation on  $f$  defined over some neighborhood of  $(x, y)$ . it

can be further divided into 2 categories: Point operations and spatial operations (including linear and non-linear operations). Frequency domain techniques are performed an image  $f(x, y)$  by convoluting the image with a linear, position invariant operator.

The rest of this paper is structured as follows. Part II presents Related Work. Part III information methodology in which image dehazing process is planned. Part IV reports presentation of the method based on indicators, and Part V concludes the issue.

### RELATED WORK

#### Multiple Images of Dehazing Based on Climatic Conditions

Multiple images [2][3] captured in various weather circumstances. The thought after this method is to take the contrast of multiple images of the related scene. These images carry numerous properties of the background scenes. This technique can get better visibility, but difficulty is it has to wait until the environmental light changes in the scene. So, this approach fails to afford the outcomes instantly.

**Depth Map method**

The authors [4] eliminate fog using depth data. This approach uses a single image and 3D geometrical [5] replica of the view is implicit. The unique image is collaborating with 3D model to obtain the scene depth data. This approach needs user support to collaborate 3D model with the scene and it gives proper results. The disadvantage of this method is it needs user support.



**(a)Haze Image**



**(b) 3D Model**



**(c) Dehaze Image**

**Fig 1 : Depth Method**

### Polarization

The authors [6] [7] utilize numerous pictures of the scene yet polarization channel is distinctive each time. This approach takes numerous pictures of the scene by changing degrees of polarization, which can be gotten by moving a polarizing channel fitted to the camera. The downside of this approach is that it can't be utilized with movement scenes since scene changes snappier than channel pivot and it additionally require polarizer channel.

### Geometric based Single Image Dehazing

It perform actual based single picture dehazing. [8][9] Decomposed the picture into two parts in the first place, brilliance (reflected light) and second, shading. At that point by considering shading and protest profundity are locally uncorrelated gauge the scene brilliance in light of Independent Component Analysis (ICA). The weakness of this approach is that it neglects to deal with substantial haze scenes.

#### 2.5 Contrast based Single Image Dehazing

It performs the differentiate based single picture dehazing. [10] Noted that a deazy pictures has considerably more differentiation than that of dim picture and in this manner killed the dimness by expanding the neighborhood difference of the reestablished picture. Tans [11] strategy experiences shading loyalty.



(a) Haze Image

(b) Haze free Image

Fig 2 : Contrast based Single Image Dehazing

### METHODOLOGY

Figure 3 generates white balances images from the foggy image by using white balancing algorithm. To maintain the region with excellent visibility, extract their significant feature by computing numerous maps like salient feature extraction map & foreground region [12] conservation map. Then subtract the average luminance value of entire image from the unique misty image then contrast enhancing approach CLAHE (block based contrast enhancement) is used to improve the local contrast of the image

### White balanced Image

White balance is the overall adjustment of the intensities of the primary colors (R, G, B). Intensity adjustment is performed to provide specific colors, predominantly neutral colors and sometimes it is called as gray balance, neutral balance or color balance. In this step, we focus for the normal rendering of images by removal of chromatic [14] casts that are created by the distinctive color. In the history of few years, various white balancing algorithms have been proposed. We choose shades of gray color reliability technique of Trezzi and Finlayson [15]. The most important idea of white balancing algorithm is to recognize the illuminant color  $e(\lambda)$  on the RGB.

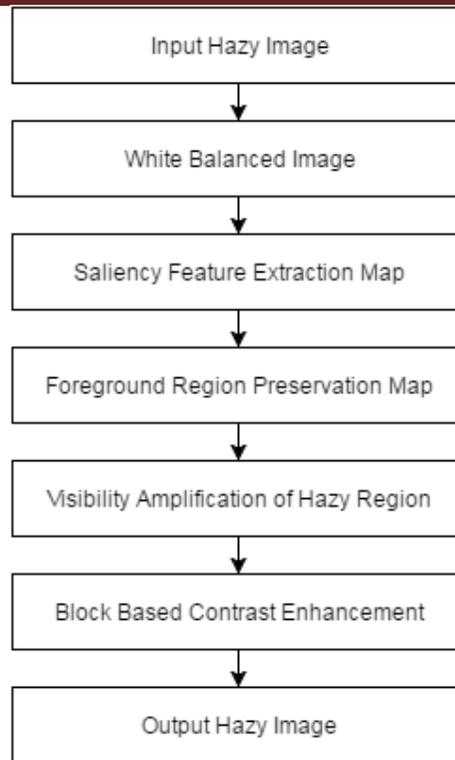
According to Lambertian surface, the intensity of an image  $f$  can be defined as

$$f(x) = \int e(\lambda)s(\lambda, x)c(\lambda)d\lambda \tag{2}$$

Where  $e(\lambda)$  is the radiance given by the light source,  $\lambda$  is the wavelength,  $s(\lambda, x)$  represents the surface reflectance,

$c(\lambda)$  denotes the sensitivity. The illuminant  $e$ , is expresses as

$$e = (R, G, B) = \int e(\lambda)c(\lambda)d\lambda \tag{3}$$



**Fig 3: Proposed Methodology**

### Feature Extraction Map

The evaluation identifies the degree of visible regions with respect to the neighborhood regions. In this method Saliency algorithm of Achanta et al[16] is used to classify the salient regions. It uses the biological perception of center surround contrast. The feature extraction map at pixel position  $(x, y)$  of input is defined as:

$$E_f(x, y) = \|J_k(x) - J_{sk}\| \quad (4)$$

Where  $J_{sk}$  represents the arithmetic mean pixel value of the input  $J_k$  (a constant value) while  $J_{sk}$  is the blurred version of the same input that aims to remove high frequency such as noise.  $J_k$  is obtained by employing a small binomial kernel using the Gaussian filter. After computing the parameters, the saliency is obtained in a per pixel fashion. This map is to produce well-defined boundaries and uniformly highlighted salient regions. As a result, the effect of this gain is to enhance the global and local contrast appearance.

### Foreground Region of Preservation Map

In this proposed technique, this measure is utilized to evacuate little specularities and surface variances in the picture. It recognizes a picture with a small scale example or course of action called organizing component. The organizing component [17] is a framework that can have any subjective shape and size. The organizing component is situated at all accessible areas in the picture and it is contrasted and the comparative neighborhood of pixels. This task is performed on the saliency outline  $E_f(x, y)$  to save closer view areas. The articles that are littler than the organizing component will vanish and bigger structures will stay, spoke to it as  $M_s$ . Subtract the foundation picture  $M_s$  from each channel of the white adjusted picture  $V_i$ , to make a more uniform foundation ( $V_C$ ).

$$V_C = V_i - M_s \quad (5)$$

### Visibility Amplification of misty Region

Dimness has more impact in the dim pictures, it is acknowledged that the dim part would have great effect over the normal of the picture. Considering the air light increments straightly with the separation, so the luminance of these areas is accepted to intensify with the separation. In light of these perceptions we can subtract the normal luminance (AL) estimation of I from the information picture I, to improve those areas that have low complexity. The below mentioned formula is

$$V_A = \gamma(I(x) - I_{AL}) \quad (6)$$

The default value of  $\gamma$  is 2.5, gamma is a factor that increases the luminance linearly. The value of gamma gives excellent outcome for most of the cases, but there are few exceptions. So we modify the value of gamma, that is correlated with the average luminance of the image.

### Block Based Contrast Enhancement

To make the best use of the local variation in the image CLAHE(contrast limited adaptive histogram equalization) algorithm is used . CLAHE separates the image into a number of blocks, and then boost the contrast of each block. The nearby blocks are then joined, by applying bilinear interpolation to ignore false boundaries. The contrast, exclusively in uniform areas, is limited by avoiding the augmentation of noise that might be present in the image. We optimize the technique by adjusting the number of blocks, count of histogram bins and the clip limit. Contrast limiting is adjusted for all neighbors, from which a transformation [18] function is derived. This is directly proportional to the CDF (Cumulative Distribution Function) of intensity values. CLAHE edge the amplification by clipping the histogram at a pre-ordained value before calculating the CDF. The value at which the histogram is clipped, called clip limit. As the number of blocks increases, we can differentiate small features from the background of the image. The count of histogram bins influence the smoothness of the image. The clipping level trims the distribution at the user defined limit, to modify contrast.

### EXPERIMENTAL RESULTS

This method is tested with a vast number of foggy images, and experimental that, this method creates enhanced outcomes for misty images. Quality assessment approach consists in computing the ratio between the gradients of the image before and after restoration. In this measure three indicators, e, r and  $\Sigma$  are used. e represents edges newly detectable after restoration, r represents the mean ratio of the gradients at visible edges and  $\Sigma$  - represents the percentage of pixels which become ultimately black or ultimately white after restoration Based on the results in the Table 1 we can analyze that,  $\Sigma$  indicator produces small values as well as Indicator r produces small values and positive values for the indicator e for our results.

E	R	$\Sigma$
1.1432	1.0142	0.0002702

Table 1 : Quality Assessment Approach



(a)



(b)



(c)



(d)

**Fig. 4: (a), (c) are Haze Images and (b), (d) are Dehaze Images**

## CONCLUSION

Remote exploration framework experiences low perceivability due to dimness and mist. Proposed strategy make utilization of white adjusting, saliency include extraction outline, foreground region preservation, and contrast improving methodology CLAHE appeal to remove mist and improve the image. Experimental analysis shows proposed strategy gives better qualities for all the execution parameters for picture improvement. In future, this strategy can be utilized for dehazing video effectively.

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