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A SURVEY ON IMAGE DEHAZING METHODOLOGY

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Abstract- **Now, a day's images play an important role in real world, images is used for describing the changes in environment and also used for traffic analysis. This paper is the survey and analysis of fog removal with two different algorithms. Removal of fog is otherwise known as visibility restoration. By this method the digital image is enchanted and restores to get the clear fog free image. Hence, fog dehazing method needs more information about the depth and distance of the image. Fog removal algorithms calculate the depth of the image with the camera calibration and the angular distance. The applications like tracking and navigation, in the region of electronics, and entertainment industries are indeed of fog removal technique. The overall objective of this survey is to find the two algorithms advantage and its disadvantage in removal of haze in the digital images.**

Key words: Air light, Image Dehazing, Contrast enhancement, Polarization, visibility restoration.

I. INTRODUCTION:

The quality of the image is based on condition of weather. FOG is the main worst weather condition which leads to many accidents because the image obtained in a fog weather has less clarity and low in contrast which affects recognisation of certain objects. The camera is scattered from the atmospheric light under bad weather condition.

The less light reaching the driver's eye with lower contrast would reduce visibility. To restore the visibility in bad weather is the main problem to the engineers. In worldwide various methods are carried out to observe and model the effects of weather conditions on vision systems.

Fog removal is basic need in the field of computer vision and in the navigational applications. The input image should be fog free image and then it may used for navigation and in many surveillance process. In many computer vision algorithms recently they have problem based on the low- contrast scene radiance. Everybody thinks that the input image taken from the camera have clear visibility. But the fact is its not used in real applications. Because it depends on unknown depth. The fog removal problem is the basic problem in the various field.

II. RELATED WORKS

Manoj Alwani and Anil Kumar Tiwaria presented the paper about the contrast enhancement algorithm for restoring the color images. For the

restoration of contrast of the color image by four processing technique. The input image such as RGB is converted into gray scale to get the brightness of the image. The death of the image cannot be changed by the global enhancement method. It changes only the local scene depth and process the image on the block by block basis. In this paper, the block by block basis of the enhancement of the image is more efficient using the global enhancement algorithm.

S. G. Narasimham and S. K. Nayar, have explains a physics-based model that gives the information about the scenes in bad weather conditions. In this paper, air light and attenuated light is calculated. The method used to restore the contrast of the image is obtained using depth segmentation of scene. The brightness of the pixels is taken from the monochrome camera. The total brightness variation is calculated using the contrast stretching technique to restore the degraded image.

K. He, J. Sun, and X. Tang, proposed effective image prior dark channel prior method to remove fog image from the fog input image. The outdoor haze –free image has the dark channel as the prior technique. In this paper, they directly evaluated the thickness of the fog image using the haze dehazing method. The high quality hazy image is the outcome of this paper.

J. P. Tarel and N. Hautiere have demonstrated algorithm for visibility restoration from a single image that is based on a filtering approach. Based on the linear algorithm, the various parameters are estimated from the hazed image. The main advantage of this paper is speed. This process is used in the real time application of dehazing because of method speedy visibility restoration. The main drawback is the restored image has many discontinuities in scene depth.

Robby T. Tan (2008) has introduced an automated method that only requires a single input image. The method has two remarks. First, is the image obtained in the clear sky has more contrast than the image taken in the bad weather. Secondly, the air light is mostly variant depends upon the distance from the object to the observer. In this paper, Markov random process is used to overcome the above remarks. The final result is higher in saturation and contents holds at death discontinuities.

In the above papers, they have used different algorithm to get the fog –free image and used different filter to find the depth of the foggy image. In this paper, the new algorithm is used to find out the depth of the original image and the fog free image. And to restore the contrast and to enhance the quality of the image. By using NBPC and NBPC+PA algorithm to get the fog free image.

III. ALGORITHM USED:

In this paper, the NBPC+PA and NBPC algorithm are used to restore the contrast of the haze image.

A. NBPC+PA ALGORITHM (No Black Pixel Constraint + Planer road Assumption):

This method is proposed by Tarel in 2009. PA Algorithms preserve a good reconstruction at small distances (road surface) this algorithm proposed is able to detect the presence of fog and to estimate the visibility distance which is directly related to k in Koschmieder's law. The inflexion point algorithm is also given as koschemier,s algorithm depends on three main assumptions: homogeneous fog,

That assumed to be a planar and homogeneous fog

Knowing the planar road surface assumption (PA) and approximate calibration of camera with respect to the road surface , it is possible to find the height and distance d of the region.

$$d=\lambda v-vh \quad (1)$$

where vh is the vertical position of the line in the image and λ depends on different parameters of the camera. The main advantage of this method is the speed of the restoration and it can be applied to the any type of fog image and in gray scale image and colour image it is achieved by the koschemier's law. This model is followed with the series of steps for smoothing of noise amplification and tone mapping. This algorithm results in good restoration but it only applied to the angular distance not to entire image.

B. NBPC ALGORITHM (No Black Pixel Constraint)

NBPC algorithm is based on the values of PSNR and MSE. Output of the NBPC is more efficient than (WCID) Wavelength compensation and image dehazing approach. The correct difference between the depths of the original image to the fog image is obtained by this algorithm.

This algorithm depends on the local regularization to the distance for the restoration. The main objective of this algorithm is that visibility enhancement of the fog image by referring the intensity of its atmospheric veil.

Fig: 3.1 Original and fog free image using nbpc.

$$V(u,v)=Is(1-e-kd(u,v)) \quad (2)$$

Most of the time, the intensity of the sky Is corresponds to the maximum intensity in the image, and thus Is can be set to 1 without loss of generality, assuming the input image normalized. After substitution of V in (1) and with Is = 1.

From the above method, there are 6 process which is called number of argument in (nargin), this is called FUNCTION is performed.

6 process are : orig sv, p, balance, smax, gfactor

a. orig means fog reduced or removed image.
b. Sv =floor to find maximum size of the white objects in the image (Round toward negative infinity).
c. P means percentage of image restoration .
d. Balance means white balance in an image.
e. Smax=floor to find the maximum window size for the adaptive filtering.

f.Gfactor means gamma correction needed if nargin value is lessthan6.

if nargin value is 6 then fog removed and image restored using NBPC but still may have some error.

IV. RESULTS

The proposed algorithm NBPC and NBPC+PA will results in the good restoration of on camera images on both color images and gray scale .

Table 1: comparison of original image (fog image) with fog removed image.

Fog image	MSE=196.84
Fog free image (by NBPC)	MSE= 185.32
MSE difference of both	MSE= 184.90
PSNR of original image (fog image)	PSNR: 25.2236887 dB
PSNR of reconstructed image (NBPC)	PSNR: 25.4856584 dB
PSNR of difference between the image	PSNR: 25.4953861 dB

The comparison between the original fog image and with the reconstructed fog free image is calculated based on the different parameters. Mean square error, peak signal to noise ratio, white and black pixels and resolution are the parameters analyzed in this paper.

For PSNR and MSE always compare with two images . Take original image and modified same image with same size is must, so that we can find the noise ratio and mean square error in that, don't take two different image, here for example you can take original fog image and NBPC or nbpc+pa, but caution both image size should be the same.

M=original, N=NBPC,

MSEdifferenceofboth=

sum(sum((InputImageReconstructedImage).^2))/(M*N) (3)

PSNR=10*log10(256*256/MSE) (4)

Only the NBPC+PA algorithm is dedicated to road images since it includes the flat road constraint. The results obtained with the proposed algorithm are better restored and the drawback of this method is that traffic light and nameplate is not visible. However, remote areas are better smoothed and some thin objects are better restored.

Problems based on lack of visibility are resolved by the two algorithms (NBPC + PA and NBPC).

These algorithm performed better in certain situations such as, cars, and buildings but the image is little darker compare to the fog image without fog. Disadvantage of this above algorithm are also calculated.

V.CONCLUSION AND FUTURE WORK

In this paper, the two image enchancement algorithm is executed and analysis the advantage and its disadvantage. In fog images the exponential decay are estimated between the two algorithms. The algorithms are mainly related to the Koschmieder's law and restore the image by estimating the atmospheric veil and the

depth of the image. Based on my results and analysis the algorithms produce the better result compare to the FSS and clake method. The proposed algorithm is tested with the various images in both colour and gray scale in all types of fog. In future the problem is detailed with the advanced algorithm ADAS. Measuring the visibility distance in all situations and informing the driver about the maximum speed that they should travel on the given road segment are done by using this algorithm.

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