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Determining and Removing Fog Covered Area in Digital Images using Invisibility Approach

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ABSTRACT

The proposed method is a fog removal from a digital image that are captured during winter season is covered with fog. Poor visibility due to fog is caused by suspended particles in the atmosphere but it also affects the performance of outdoor computer vision applications like video surveillance, long range object detection, recognition, self-navigating ground and air-based vision systems etc. This proposed calculation is planned and actualized in MATLAB utilizing picture preparing tool box. In order to remove fog effect due to recover from this seasonal effect invisibility approach with image processing using mixed CLAHE and bilateral filtering methodology. To denoise and enhance the fog image using denoise algorithm. The comparison analysis has demonstrated that the proposed calculation has indicated very successful outcomes.

Keywords: CLAHE, Bilateral filtering and Fog.

1. INTRODUCTION

The picture quality of open air screen in the mist and cloudiness climate condition is typically debased by the dispersing of a light some time recently achieving the camera because of these extensive amounts of suspended particles (e.g. mist, cloudiness, smoke) in the climate. This strategy can enhance the complexity of dimness picture be that as it may, loses a portion of the data in regards to picture. Picture reclamation firstly concentrates the physical procedure of picture imaging in foggy climate. Finally, the corruption procedure is reversed to produce the haze free picture without the corruption. In this way, the nature of corrupted picture could be improved.

(a) (b)

Fig.1. (a) Original image (b) Proposed image

Visibility restoration refers to different methods that aim to reduce or remove the degradation that have occurred while the digital image was being obtained. The degradation may be due to various factors like relative object-camera motion, blur due to camera mis-focus, relative atmospheric turbulence and others. In this we will be discussing about the degradations due to bad weather such as fog, haze.

2. LITERATURE SURVEY

Chen, et al. (2009) [1] The proposed method is a fog removal from a digital image that are captured during winter season is covered with fog. Poor visibility due to fog is caused by suspended particles in the atmosphere but it also affects the performance of outdoor computer vision applications like video surveillance, long range object detection, recognition, self-navigating ground and air-based vision systems etc. This proposed calculation is planned and actualized in MATLAB utilizing picture preparing tool box. In order to remove fog effect due to recover from this seasonal effect invisibility approach with image processing using mixed CLAHE and bilateral filtering methodology. To denoise and enhance the fog image using denoise algorithm. The comparison analysis has demonstrated that the proposed calculation has indicated very successful outcomes. He has concentrated that in terrible climate, for example, haze and cloudiness can essentially debase the visibility of scene. An iterative calculation to modify the shading effects by higher immersion utilizing worldwide and neighborhood components was proposed. The working of method like picture tangling and image enhancement to treat the comparable pixels of some protest and environmental light contrast was clarified.

Xu, et al. (2009) [2] has inspected that pictures corrupted by haze experience the ill effects of poor difference. With a specific end goal to expel this impact a difference restricted versatile histogram balance (CLAHE) - based strategy was proposed. To cut the histogram this technique builds up a most extreme esteem and redistributes the cut pixels similarly to each dark level. This calculation is performed in three stages; firstly the shading .pictures caught by camera in foggy is changed over from RGB (Red, Green and blue) color space to HSI space

Wang, et al. (2010) [3] has investigated that fog expulsion from the picture rely on the obscure profundity data. This calculation depends on the air scrambling material science based model. In this on chose district a dim channel earlier is connected to acquire a novel estimation of environmental light. This model is constructing upon some perception in

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light of fog free outside image. The force of dull channel calculated gives harsh guess of the thickness of dimness.

Yu, et al. (2011) [4] has proposed a novel quick defogging technique from a solitary picture in light of the disseminating model. A white adjusting is utilized before the scrambling model connected for visibility restoration. Then an edge-saving smoothing approach in light of weighted slightest squares (WLS) advancement system to smooth the edges of picture. Finally backwards scene able do is connected for recuperation process.

Shuai, et al. (2012) [5] talked about issues with respect to the dull channel earlier of shading twisting issue for some light white brilliant zone in picture. A calculation to gauge the media work in the utilization of middle separating in view of the dull channel was proposed. After making media work more precise a wiener sifting is connected. By this haze reclamation issue is changed over into an enhancement issue and by limiting mean square mistake a clearer, at last mist free picture is obtained.

Cheng, et al. (2012) [6] has proposed a least channel earlier for picture mist expulsion. This calculation is rearranged from of dim channel earlier. It depends on a key truth that mist free force in a shading picture is normally a slightest estimation of tri chromatic channels. In dull channel preceding appraisal the transmission demonstrate it executes as a base channel for most minimal intensity. This channel prompts to radiance ancient rarities, particularly in the area of edge pixels. In this calculation rather than least channel they uses correct O(1) reciprocal channel in view of the raised cosines capacity to the weight estimation of neighbor to get haze free picture.

Xu, et al. (2012) [7] has prescribed a model in light of the physical procedure of imaging in foggy weather. In this model a quick cloudiness evacuation calculation which is in view of a quick two-sided separating with dim channel earlier is clarified. Firstly, the barometrical dissipating model is utilized to portray the development of murkiness picture. is diminish after the utilization of dim channel earlier is watched and a transmission delineate is proposed to reestablish the shading and complexity of the image.

Kang, et al. (2012) [8] has proposed a solitary picture based rain expulsion outline work by appropriately planning precipitation evacuation as a picture decay issue in view of MCA (morphological part examination). Before applying a proposed technique picture is deteriorated into low and high - recurrence parts utilizing a reciprocal channel. By utilizing m eager coding and word reference learning calculations the high recurrence part is deteriorated into rain segment and non-rain segment.

Tripathi, et al. (2012) [9] has concentrated that haze arrangement is because of air - light and constriction. Air light expands the whiteness and lessening builds the complexity in the scene. So a strategy is proposed which utilize respective channel to recoup scene differentiate and for the estimation of light. In this calculation both pre and post handling steps are performed. Tripathi has proposed a calculation which utilize anisotropic diffusion or estimation of air - light. For shading picture RGB (red, green and blue) and HSI (hue, saturation and intensity) models are used.

Wei, et al. (2013) [11] has proposed a quick single picture de-hazing of passage calculation in light of the barometrical scrambling model. The proposed calculation utilize numerical adjustment for the marvel. Firstly a dim channel wonder is connected by means of optical strategy, and approach for settling the parameter in climatic dispersing is determined. Also a dim scale opening operation and quick joint reciprocal systems, to compute the worldwide climatic light is utilized.

3. EXISTING SYSTEM

In existing method, the dark channel prior is to estimate scene depth in a single image and it is estimated through get at least one color channel with very low intensity value regard to the patches of an image. The transmission map will be estimated through atmospheric light estimation. The key to the dark channel prior is the observation that natural haze-free outdoor images are generally well textured, and contain a variety of colorful objects. As a consequence, most patches will contain one or more pixels with very low intensity in at least one of the color channels. These dark pixels can be attributed to dark objects, shadows, or objects that are primarily a combination of only one or two of the RGB color channels.

4. PROPOSED SYSTEM

In our proposed method the haze removal was done using visibility restoration of single hazy images using color analysis and depth estimation with CLAHE and bilateral filtering technique. The hazy removal technique divided into three categories such additional information approaches, multiple image approaches, single-image approaches. Single image approach is used for this de-hazing process because of its flexibility and low cost. The restoration model is proposed with utilization of median filter and adaptive gamma correction technique. This approach overcomes the problems such as color distortion, artifacts and insufficient depth information.

Table 1. Experimental images

Name	Format	Size (KB)
1	.jpg	45.2
2	.jpg	78.0
3	.jpg	58.8
4	.jpg	73.0
5	.jpg	23.8
6	.jpg	918
7	.jpg	350
8	.jpg	650
9	.jpg	612
10	.jpg	450

5. SIMULATION RESULT

In order to implement the proposed algorithm design and implementation has been done in MATLAB using image

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processing toolbox. In order to do cross validation we have also implement the histogram equalization and nonlinear enhancement technique.

Table 1 is showing the various images which are used in this research work. Images are given along with their formats. All the images are of different kind and each image has different kind of the light i.e. more or less in some images.

Fig.2. Proposed Image

It has been clearly shown that the fog has been removed more efficiently than image. Figure 2 to show the improvisation of the proposed algorithm over the other techniques. The input image for experimental purpose. It has been clearly shown that the image contains a foggy image so the image is a foggy image, so the main objective is to remove it.

Table 2. Mean Square Error comparison

Image	Proposed	CLAHE
1	2250	7750
2	3625	9750
3	3550	3750
4	250	1350
5	220	650
6	170	380
7	120	920
8	160	1400
9	70	430
10	260	4650

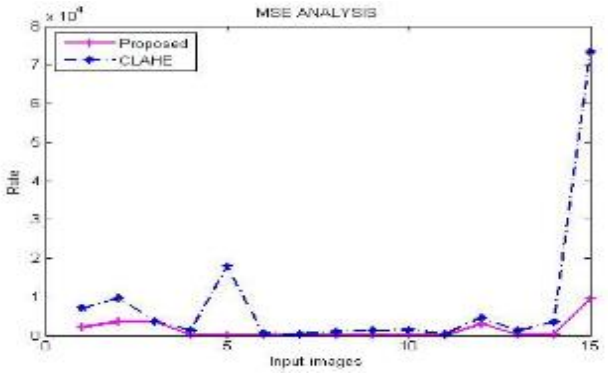

Fig.3. Mean Square Error comparison

6. PERFORMANCE ANALYSIS

This section contains the cross validation between existing and proposed techniques. Some well-known image performance parameters for digital images have been selected to prove that the performance of the proposed algorithm is quite better than the available methods.

Table 2 has shown the quantized analysis of the mean square error.

Figure 3 has shown the quantized analysis of the mean square error. As mean square error need to be reduced therefore the proposed algorithm is showing the better results than the available methods as mean square error is less in every case.

Table 3. Peak Signal to Noise Ratio comparison

Image	Proposed	CLAHE
1	29.65	21.57
2	16.7306	13.407
3	18.726	15.573
4	30.9342	18.872
5	30.172	12.329
6	32.829	22.942
7	39.2062	20.098
8	16.1642	15.0187
9	28.7890	13.4581
10	55.302	18.5902

Table 3 has shown the quantized analysis of the Peak signal to noise ratio (PSNR).

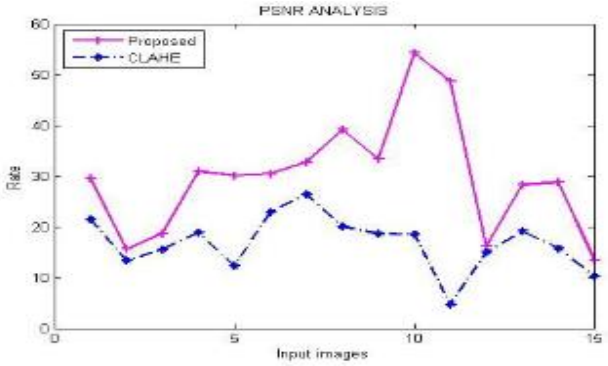

Fig.4. Peak Signal to Noise Ratio comparison

Table 4. Standard Deviation

Image	Proposed	CLAHE
1	0.0079	0.0098
2	0.0095	0.0098
3	0.0099	0.0100
4	0.0084	0.0098
5	0.0058	0.0096
6	0.0055	0.0085
7	0.0055	0.0079
8	0.0020	0.0037
9	0.0066	0.0091
10	0.0094	0.0098

Figure 4 has shown the quantized analysis of the Peak signal to noise ratio (PSNR). As PSNR need to be maximized therefore the proposed algorithm is showing the better results

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than the available methods as PSNR is more in the case of bilateral filter.

Table 4 has shown the quantized analysis of the standard Deviation evaluation. As it need to be maximized therefore the proposed algorithm has shown the improved results than the available methods as standard Deviation is either equal or more in that every case.

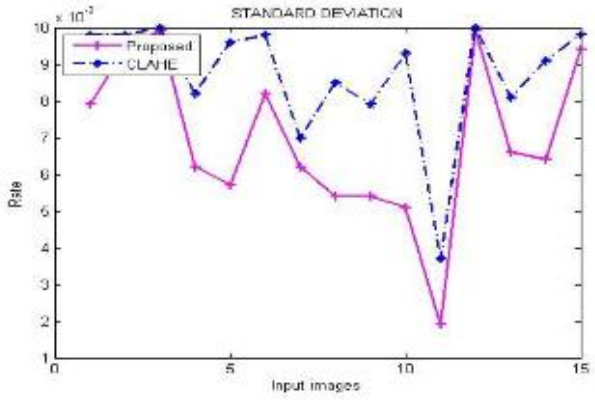

Fig.5. Standard Deviation

Figure 5 has shown the analysis of the standard deviation. It is required to be minimized. It has also shown significant improvement because in the most of the cases the proposed algorithm has minimized standard deviation.

7. CONCLUSION

Mist expulsion calculations turn out to be more helpful for numerous vision applications. It is found that the majority of the existing specialists have ignored many issues; i.e. no system is better for various sorts of conditions. The current techniques have ignored the utilization of gamma restoration and histogram stretching to lessen the clamor problem which will be displayed in the yield picture of the current fog removal calculations. To lessen the issues of existing writing another coordinated calculation has been proposed that has incorporated the dull channel earlier with CLAHE to improve the outcomes facilitate The proposed calculation is outlined and executed in MATLAB utilizing picture preparing tool kit. The examination among CLAHE, the proposed calculation is likewise drawn based upon certain execution parameters. The examination investigation has demonstrated that the proposed calculation has appeared very compelling outcomes. The principle extent of the proposed calculation is to enhance the exactness of the Intelligent Transportation Framework (ITF) particularly at the point when path location sorts of use come in activity in VANETs. In this manner the proposed calculation will turn out to be more helpful into keeping the road accidents as growing rate is developing step by step due to poor driving and more activity.

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