Volume 5, Issue 12, December 2015 ISSN: 2277 128X
International Journal of Advanced Research in Computer Science and Software Engineering
Research Paper
Available online at: www.ijarcsse.com

Visibility Restoration for RGB Component Using Edge Preserving Method with Dark Channel Prior Model

Dhananjay Singh, Ram Naresh Sharma
Dept. of CSE/IT, MPCT Gwalior,
Madhya Pradesh, India

Abstract— In this study, we preserve quality of an image using an edge preservation method with the dark channel prior model. In the Image restoration process which will be used for clear image restoring from a foggy image. In this technique, improve the image appearance. Restoration methods tend to be based on the probabilistic or mathematical models of image degradation. We decrease image noise, maintain detailed, and eliminate artifacts,. In this paper, we propose a simple but effective image prior - edge-preserving smoothing and dark channel prior method to remove haze from a single input image. The experimental results based on gain ratio and execution time.

Keywords— Dark Channel Prior, Edge Preserving, Gain Ratio, Fog Removal

I. INTRODUCTION

The images of outdoor scene are degraded by several reasons, but one source of the reasons is presence of bad weather conditions. Fog is caused by the water droplets in the atmosphere. The effect of outdoor surveillance systems is limited by fog. Under foggy weather conditions, the color and contrast of the images are drastically degraded. This degradation level increased with the distance from the camera to the object. In fog degradation, invisibility is caused by two fundamental phenomena attenuation and airlight. Light beam coming from a scene point, gets attenuated because of scattering by atmospheric particles. This phenomenon is termed as attenuation which decreases contrast in the scene. from the source coming light is scattered towards camera and adds whiteness in the scene. This phenomenon is termed as airlight. Gamma Correction is a process of compensating the non-linearity in order to achieve correct reproduction of relative luminance. This can be obtained simply by using a varying adaptive parameter. [1]

Fog is a collection crystals of ice or droplets of water suspended in air at or near the surface of Earth's. Poor visibility not only degrades the quality of perceptual image but it also affects the computer vision algorithms performance for example tracking, object detection, segmentation and surveillance.

Under foggy viewing conditions, image contrast is often degraded by atmospheric aerosols, which makes it difficult to quickly detect and track moving objects in intelligent transportation systems.

Poor visibility in foggy climate stems from the variety to facilitate particles in atmosphere spread and take in light from the surroundings and light reflected from the scene points. Earlier research industry and inventor proposes a lot of approach and methodology for removal of fog over the foggy images. Various researchers have proposed multiple algorithms and research methodologies to recover the originality of images affected from unwanted atmospheric conditions. As a lot of approaches have already been proposed by researchers to restore the original images. [2]

II. TECHNIQUES USED IN FOG REMOVAL

Dark channel prior method estimates transmission map and air-light to recover original one from foggy image. To estimates the transmission map, it uses the lowest intensity pixel of image in 3 color planes in patch size of different variations, after which soft matting and bilateral filter operation are performed to get final defogged image. [3]

Edge-preserving smoothing method based on weighted least squares (WLS) optimization framework to refine the coarser v(x)and create finer estimate v(x). With the WLS-based smoothing, the signal shape is not significantly distorted, while attaining stronger smoothing in the regions bounded through edges. Further, substituting the atmospheric veil v(x)into [4] yields the medium transmission t(x):

$t(x)=1-v(x)$

III. LITERATURE SURVEY

Sheelu Mishra (2014) et al present that Image restoration and method of Image Enhancement which will be used for clear image restoring from fog degraded image. Restoration of Image is field that deals with increase the image appearance.

Methods of restoration tend to be based on the image degradation probabilistic or mathematical models. Enhancement of Image is an area which deals with increasing the image quality measure. To enhance quality of image, image enhancement can selectively restrain and enhance few knowledge about image. It is a technique which reduce the image noise, maintain details, and eliminate artifacts. Its purpose is to amplify various features of image for analysis, display or diagnosis. The complete objective in this work is to offer an integrated method which will incorporate the nonlinear enhancement method with the correction of gamma and dynamic restoration method. [5]

Shalini Gupta (2014) et al focused in specific on the assessing distances visibility and detecting daytime fog issue; thanks to these efforts, an original technique has been patented, tested and developed. Our technique allows computing the meteorological distances visibility, a measured defined through the International Commission on Illumination (CIE) as the space beyond which an appropriate dimension black object is perceived with less than 5% contrast. Proposed method is an original one, featuring the benefit of using a single camera and necessitating the road and sky in the scene presence. As opposed to other techniques that need the road extraction, this technique provide fewer constraints through virtue of being applicable with no more than the homogeneous surface extraction concluding a road and sky portion within the image. [6]

Shriya Sharma (2015) et al present algorithm of fog removal is to estimation the map of airlight for the provide image and then achieve the required operations on the image in order to overcome the fog in the image and image quality enhance. The dark channel prior for fog removal technique is time-saving and more suitable in real-time systems. In this paper, an effective fog removal method of foggy images based on the genetic algorithm and dark channel prior combination is presented. It is found that the proposed technique is more appropriate for obtaining the improved image quality than the most of the existing approaches. [7]

Rajbeer Kaur (2014) et al present that In The calculating parameter the efficient light intensity also provide the scattering atmospheric light estimates, the combined air-light Laplace is and minimum values provide us the basic map of light spread which is further used in the intensity restoration. The visibility is completely dependent on the color values saturation and not over saturated, which accounts for image quality enhancement. Results on several images demonstrate the power of the proposed algorithm. [8]

Tarun A (2014) et al present that novel technique of fog removal IDCP will be integrate dark channel prior with adaptive gamma correction and CLAHE to fog eliminate from digital images. Fog in image decreases the digital images visibility. bad visibility not only degrades the perceptual quality of image, but it also affects the algorithms of computer vision performance for example segmentation, object detection, surveillance and tracking .Several factors for example fog, haze and mist caused through the droplets of water present in the air at the time of bad weather leads to bad visibility. [9]

IV. PROPOSED METHODOLOGY

This paper deals with the defogging of images by using visibility restoration models and image restoration based algorithms.In this study, we worked on color image. First of all, in the case of the color image, convert an RGB image into Red, Green and Blue format. Estimate atmospheric light using dark channel prior on RGB component. Apply edge preserving method for preserving the edges of an image.To estimate transmission map using dark channel prior on RGB component. The upgrade technique viably enhances the perceivability of mist scene pictures. After that, calculate peak contrast gain ratio and execution time.

Proposed Algorithm

1. Read Color Image
2. Divide Color Image into three components such R, G and B.
3. Take 'n' patch size for minimum intensity
4. Let f be a given image represented as an_r byn. L is the vrious possible intensity values, often 256. Let k indicate the normalized factor of f with a bin for every possible intensity.
   $k_{n=}\frac{number\ \ of\ pixels\ with\ intensity\ \ n}{total\ number\ \ of\ pixels}$ n=2
5. The adaptive histogram equalized image R,G,B will be defined by
   $(R,G,B)_{i,j}=(floor\ (n-1)\sum_{n=0}^{fi,j} kn)/2$
   where floor() rounds down to the nearest integer. This is equal to transform pixel intensisties, k, of f by the function
   $T(k)=(\ floor\ (n-1)\sum_{n=0}^{k} kn)/2$
6. The motivation for this transformation comes from thinking of the intensities of f continuous random variables X,Y on [0,n-1] with Y defined by
   $Y=T(X)=(L=n-1)\int_0^X kx(x)dx$
   where p_X is the probability density function of f. T is the cumulative distributive function of X multiplied by (n − 1). Assume for simplicity that T is differentiable and invertible. It can then be shown that Y defined by T(X) is uniformly distributed on [0, n − 1], namely that kY (y) = 1/n−1
7. Assuming that the transmission in a local patch n is constant the transmission map, *t* is transmission map, w is local patch with minimum value of all components.
8. The transmission map are estimated appropriately can be obtained by solving equation by
   $$t(x) = 1 - \mathrm{wmin}(\min(R, G, B))$$
9. Refine transmission map with a maximum value of omega can be obtained by the equation,

J1(i,j,1) = (R(i,j,1) - Ar)/min(max(K^2/sum((sum((wAr - Ar).^2))'),1) * max(t,t0),1) + Ar
Where J1 is dark channel prior, i, j are row and column of foggy image, R is red component, Ar is max value of atmospheric light of Red component,K is scene depth, wAr is omega of Ar, to is lower bound

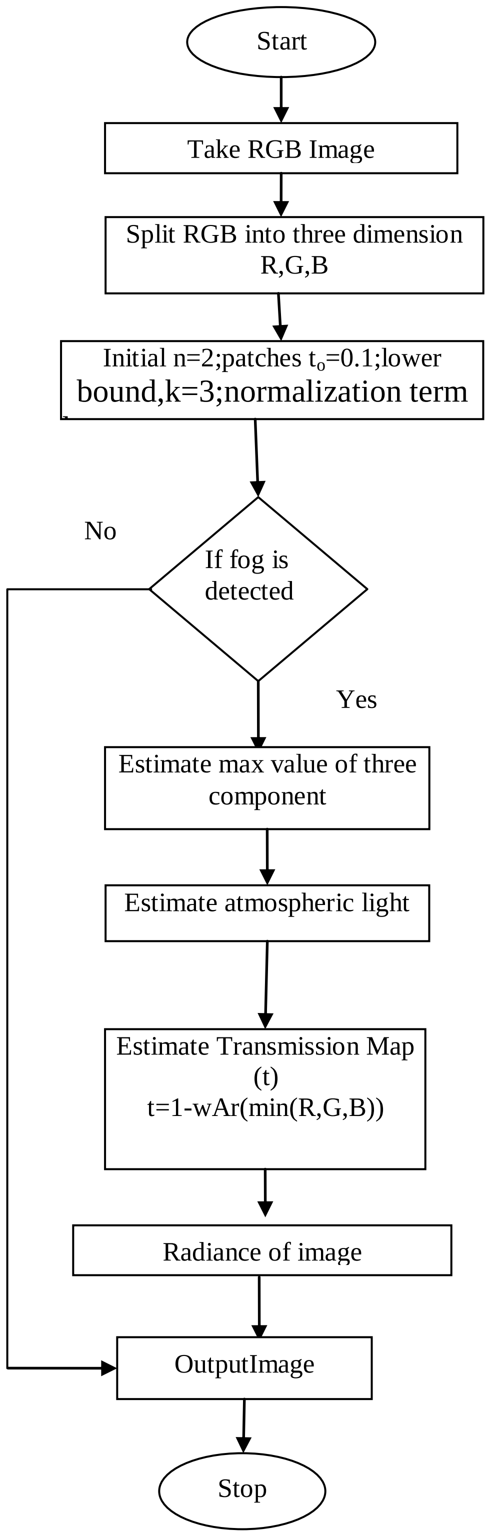
10. The airlight and the transmission map are estimated appropriately, the scene radiance can be obtained by this formula:

$$J(R,G,B) = \frac{I(R,G,B) - A(R,G,B)}{\max(t(R,G,B), t0)} + A(R,G,B)$$

11. Calculate gain contrast for defog to fog image can be obtained by this formula:

$$Cgain = CIdefog = CIfog$$

Where, *CIde f og* and *CI fog* are the mean contrast of the defoggy a foggy images respectively.



1. Take Image Dataset of Color Image

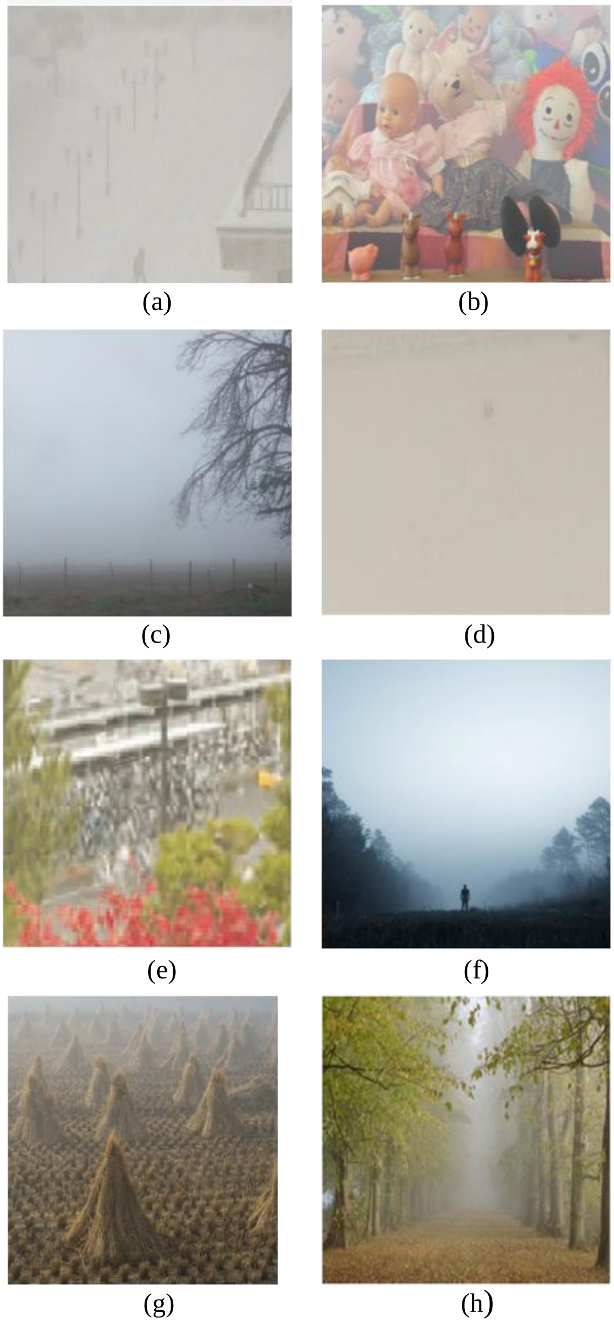


Fig1. Image Dataset Of Color Foggy Image

2. Show Foggy Image,Base Defog Image and Proposed Defog Image

Fig2. Proposed GUI

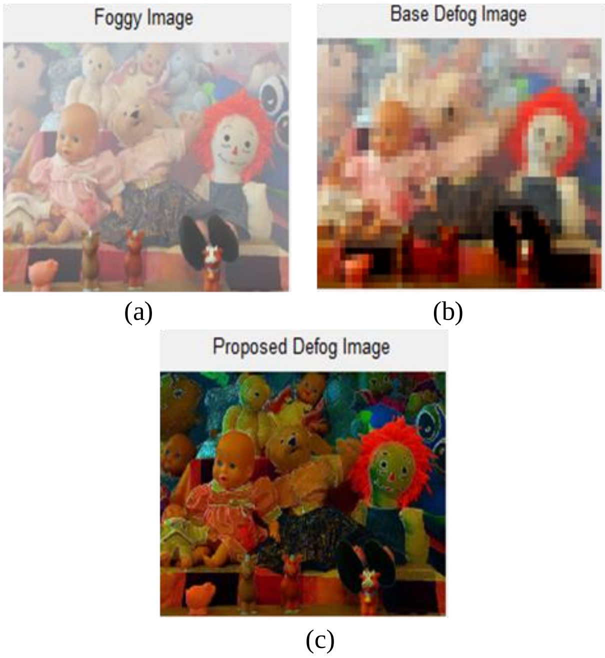


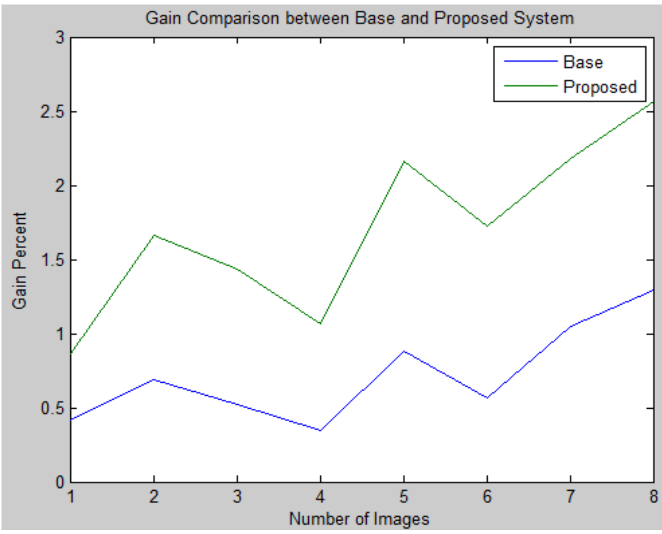
Fig3. (a)Foggy Image (b) Previous System Result (c)Our Proposed Result

V. SIMULATION RESULT

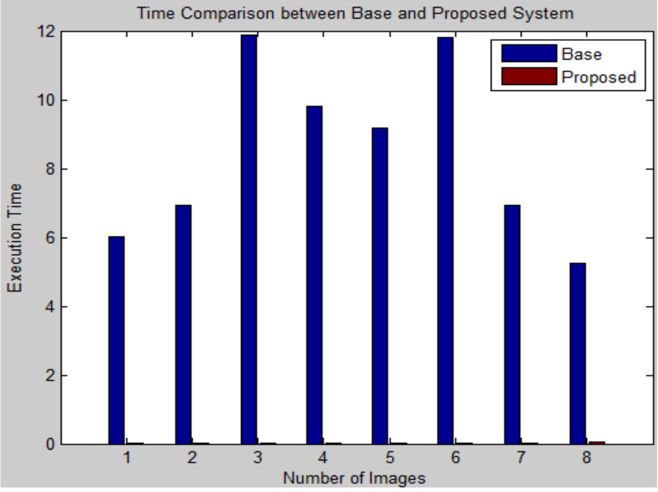
In this part, the simulation results obtained using the proposed algorithm which is analyzed and compared with the outcomes of gamma transformation and median filtering [1] to improve the transmission map. The experimental outcomes were done using MATLAB R2012b. In table1, the computational complexity of proposed technique and median filtering are computed for the image size M x N. The computational complexity of our method is O(MN) time. The important term of defogging process is time for achieving the real time defogging the images. Moreover, the contrast gain is greater when using the proposed method and also time is also comparatively less.

Table 1. Time and Gain Comparison between Base [1] and Proposed Method

Image	Base Time	Proposed Time	Base Gain Ratio	Proposed Gain Ratio
(a)	6.003	0.016	0.417	0.866
(b)	6.914	0.018	0.689	1.661
(c)	11.878	0.026	0.523	1.431
(d)	9.814	0.024	0.350	1.070
(e)	9.172	0.022	0.885	2.165
(f)	11.82	0.027	0.568	1.728
(g)	6.913	0.017	1.051	2.179
(h)	5.248	0.040	1.294	2.567



Graph 1. Gain Comparison Graph between Base [1] and Proposed Method



Graph 2. Time Comparison Graph between Base [1] and Proposed Method

In Graph1 and Graph2 shows that comparison between base and proposed method. The execution time is less as compared to base algorithm. And contrast gain is higer as compared to base algorithm.

VI. CONCLUSIONS

The version of this template is V2. Most of the formatting instructions in this document have been compiled by Causal Productions from the IEEE LaTeX style files. Causal Productions offersboth A4 templates and US Letter templatesfor LaTeX and Microsoft Word.The LaTeX templates depend on the officialIEEEtran.cls and IEEEtran.bst files, whereas the MicrosoftWord templatesare self-contained. Causal Productions has used its best efforts to ensure that the templates have the same appearance.

REFERENCES

[1] Apurva Kumari, Philip Joseph Thomas and S.K.Sahoo," Single Image Fog Removal Using Gamma transformation and median filtering", 2014 Annual IEEE India Conference.

[2] Priyanka Soni and Amit Garg," Analysis to Defog The Foggy Images", INDIAN JOURNAL OF APPLIED RESEARCH, Volume : 5 | Issue : 5 | May 2015, pp:732-734.

[3] Atul Gujral1 , Shailender Gupta2 and Bharat Bhushan3," A Novel Defogging Technique for Dehazing Images", International Journal of Hybrid Information Technology Vol.7, No.4 (2014), pp.235-248

[4] Jing Yu, Qingmin Liao," FAST SINGLE IMAGE FOG REMOVAL USING EDGE-PRESERVING SMOOTHING", 2011 IEEE, pp: 1245- 1248.

[5] Sheelu Mishra and, Mrs. Tripti Sharma," Image Restoration Technique for Fog Degraded Image", International Journal of Computer Trends and Technology (IJCTT) – Volume 18 Number 5 – Dec 2014, pp: 208-213.

[6] Shalini Gupta, Vijay Prakash Singh and Ashutosh Gupta," Improved Perceptibility of Road Scene Images under Homogeneous and Heterogeneous Fog", IPASJ International Journal of Electronics & Communication (IIJEC), Volume 2, Issue 3, March 2014, pp:10-16

[7] Shriya Sharma and Sakshi Bhalla," Improved Haze Removal of Underwater Images using Particle Swarm Optimization", International Journal of Computer Applications (0975 – 8887) Volume 122 – No.4, July 2015

[8] Rajbeer Kaur and Er. Aman Saini," Removing atmosphric noise using channel selective processing for visual correction", The International Journal Of Engineering And Science (IJES), Pages 16-21, 2014.

[9] Tarun A. Arora, Gurpadam B. Singh and Mandeep C. Kaur," Evaluation of a New Integrated Fog Removal Algorithm IDCP with Airlight", I.J. Image, Graphics and Signal Processing, 2014, 8, 12-18