International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 05 Issue: 04 | April - 2021 ISSN: 2582-3930

IMAGE DEFOGGING AND IMAGE ENHANCEMENT IN ROBUST SKY DETECTION

Akshaya S R, Nithyashree S, Gayathri J

Department of Electronics and Communication Engineering

Prince Shri Venkateshwara Padmavathy Engineering College, Chennai

Abstract - Environmental factors such as fog and haze affect the image quality and make it unsuitable for automated systems, such as, intelligent vehicles, surveillance and outdoor object recognition, which require images with clear visibility for processing and decision making. In general, reconstruction of fog-free image from a single input image is quite challenging. Dark channel prior (DCP) method is used to estimate atmospheric light for the purpose of image defogging. This paper presents a DCP based image defogging method with improved transmission map to avoid blocking artifacts. The transmission maps are computed for RGB color spaces. After that the haze removed image is divided into three transmission maps called R, G, and B channels are separated utilized to compute an enhancement process. After the separation, compute the enhancement process for these three color maps separately. Finally combine all these three enhanced color maps and computes the final enhancement. The proposed method achieved better results with lower fog effect, similarity index, degradation score and achievedhigher enhancement quality. Reconstructed image has better contrast and luminance which is perceptually more appealing to the human visual system.

Key words- Dark channel prior, defogging, image enhancement, single image dehazing, sky detection.

1. INTRODUCTION

The term digital image refers to processing of a two dimensionalpicture by a digital computer. In a broader context, it implies digital processingof any two-dimensional data. A digital image is an array of real or complexnumbers represented by a finite number of bits. An image given in the form of atransparency, slide, photograph or an X-ray is first digitized and stored as amatrix of binary digits in computer memory. This digitized image can be processed or displayed on a high-resolution televisionmonitor. For display, the image is stored in a rapid-access buffer memory, which refreshes the monitor in order to produce visually continuous display. Digital image processing has a broad spectrum of applications such as remote sensing via satellitesand other spacecrafts. In medical applications is concerned with processing of chest X-rays and other medical images occur in radiology and ultrasonic scanning. The image enhancement operations improve the quality of an image like improving theimage contrast and brightness characteristics, reducing its noise content or sharpen the details. This just enhances the image andreveals the same information in more understandable image. It does not add any information to it. Image compression anddecompression reduce the data content necessary to describe an image. Most of the images contain lot of redundantinformation, compression removes all the redundancies. Because of the compression size is reduced, so efficiently stored ortransported. The reconstruction of fog free image from a single input image is quite challenging. DCP based image defoggingmethod for the improvement of enhancement. This method is achieved with better results with lower fog effect, similarityindex, degradation score and higher enhancement quality. Reconstructed image has better contrast and luminance which isperceptually more appealing to the human visual system.

2. LITERATURE REVIEW

A system focused on dehazing daytime and night-timeimages by utilizing chromatic properties to remove haze from images. Theproposed method treats fog as a specular pixel of dual consistency and physicalproperties, and the dehazing reflection model is suitable for parallelimplementation to efficiently detect fog pixels [1].Using partial median filters to smooth the corners can avoid keeping a certainamount of fog around small objects and keep the edge of the corner of thebuilding. This makes the result more robust[2].The qualitative and quantitative analysis is applied for theassessment of defogged images obtained from the proposed methodologyto establish its superiority and to preserve sharp details whereas maintaining the colorquality[3]Image filtering is the technique of removing or reducing noisefrom a contaminated image.

There are various image filters which have beensuccessfully implemented on software tools. Each filter focuses on reducing aparticular type of noise from the image[4].To filter raw depth maps using a RGB-D guided filtering in a two-stage framework,not only has a faster computational time than bilateral filter but also avoids theproblem of over-texture transfer and to fill holes in the depth maps whichcan effectively prevents depth bleeding artifacts[5].In the classical bilateral filter, a fixed Gaussian range kernelis used along with a spatial kernel for edge-preserving smoothing[6].To relieve the difficulty of the inverse problem, a novel prior called dark channel prior(DCP)was proposed inorder to remove the haze through four major steps to the complex solution of ill-posed inverse problem.[7]

3. PROPOSED METHOD

The proposed system is a modification ofDCP based image defogging method withimproved transmission map is used to avoid blocking artifacts. The transmissionmaps are computed for RGB colour spaces. After that the haze removed imageis divided into three transmission maps called R, G, and B channels areseparated utilized to compute an enhancement process. After the separation, itcomputes the enhancement process for these three colour maps separately.Finally combine all these three enhanced colour maps and computes the finalenhancement. The proposed method achieved better results with lower fogeffect, similarity index, degradation score and higher enhancement quality.Reconstructed image has better contrast and luminance which is perceptuallymore appealing to the human visual system.**RGB2NTSC**: Converts the red,green, and blue values of an RGB image to luminance and chrominance values of an NTSC image.**NTSC2RGB**: This converts the luminance and chrominance values of NTSC image to red, green, and blue values of an RGB IMAGE.The DCP algorithm used for the image defogging id discussed below.

3.1 DCP Algorithm

Dark Channel Prior based image defogging method with improved transmission map to avoid blocking artifacts. The transmission maps are computed for RGB colour spaces. After that the haze removed image is divided into three transmission maps called R, G, and B channels are separated utilized to compute an enhancement process. After the separation, it computes the enhancement process for these three colour maps separately. Finally combine all these three enhanced colour maps and computes the final enhancement. The proposed method achieved better results with lower fog effects, similarity index, degradation score and higher enhancement quality.

Algorithm

STEP 1: Read the input images from the dataset

STEP 2:Remove the haze by using HAZE REDUCTION ALGORITHM

STEP 3:Separate the three colour channels.

STEP 4: To enhance the contrast of the three channels.

STEP 5: Check the dimension of red, green, blue channel.

STEP 6: To adjust the image

STEP 7: To calculate the V_MAX AND V_MIN values.

STEP 8: Combine the output of red, green, blue channel.

STEP 9: Enhance the combined image by checking the dimension and adjust the image and calculating V_ M AX and V_MIN values

STEP 10: Final output image.

With the algorithm being implemented, the fogged image can be converted into a crystal clear image. The following figure shows the input hazed image and output dehazed image with our proposed system.

Figure 1 Input hazed and the output dehazed image obtained with our proposed method

4. RESULTS AND DISCUSSION

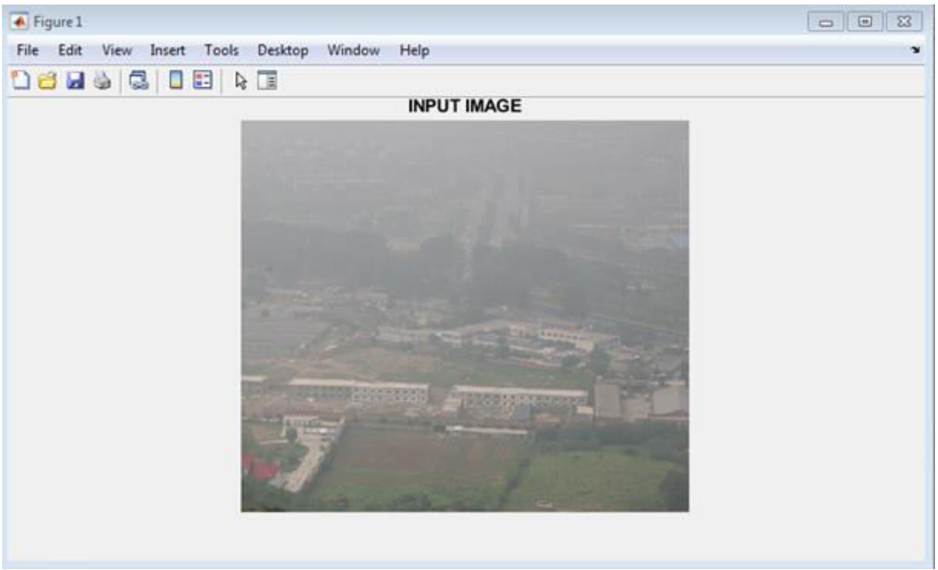

Figure 2 Input image which is completely unprocessed.

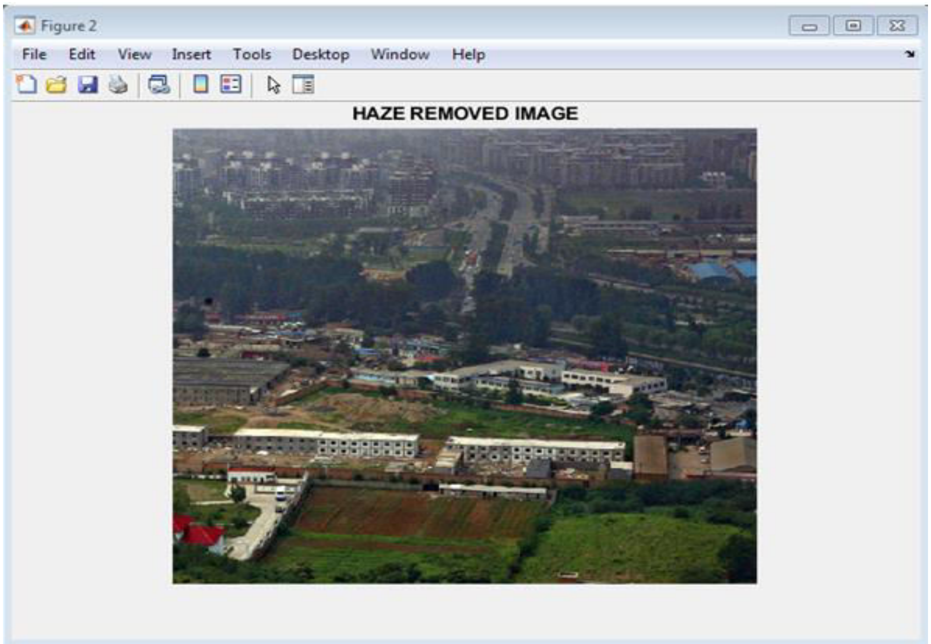

Figure3 Haze removal image which is removed by haze removal algorithm(Dark Channel Prior)

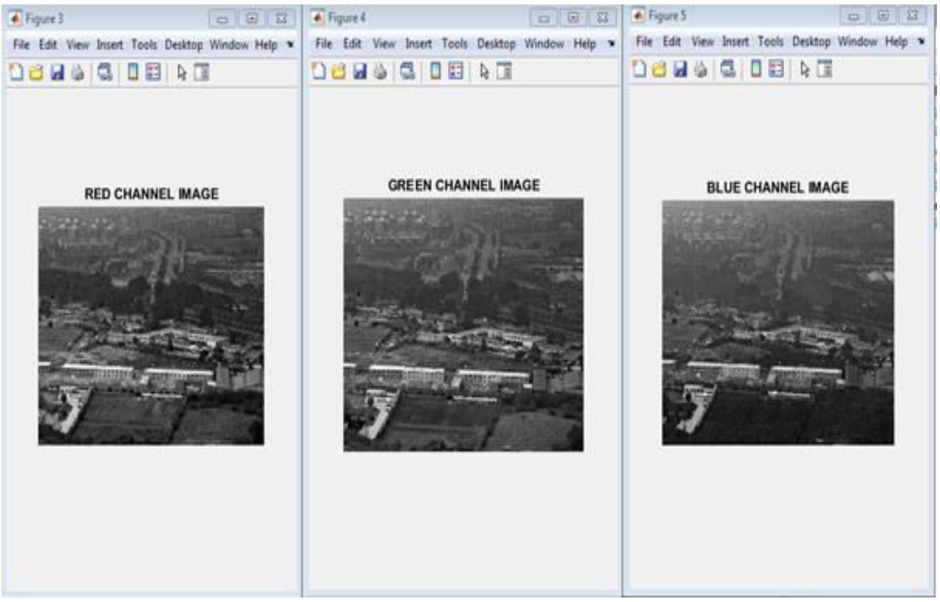

Figure 4 Colour space separation

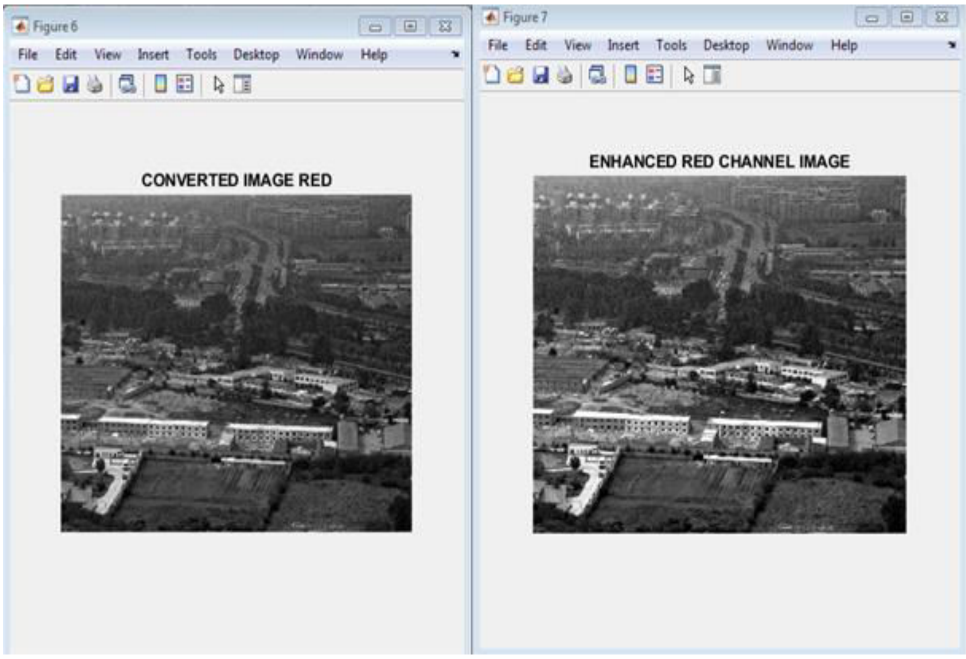

Figure 5 This figure shows the image enhancement of a RGB channel.

For many input pictures, the values of PSNR, SSIM, NIQE have been calculated. The following table shows the difference of these values in the existing and the proposed system.

Table 1 Values of PSNR,SSIM and NIQE

IMAGE	PSNR	SSIM	NIQE	PSNR	SSIM	NIQE
Canon	11.1439	0.3335	3.0934	15.2125	0.5358	2.8997
City_1	15.7916	0.5818	2.5146	20.2432	0.8589	3.0014
City_2	18.0191	0.5800	3.6601	20.6009	0.8798	3.4492

Cones	16.0489	0.5788	5.8138	21.6452	0.8001	5.2166
Mountain	17.5272	0.4296	3.4098	22.6577	0.8967	3.1281

Various parameters such as Peak Signal-to-Noise Ratio (PSNR), Structural Similarity Index (SSIM) and Natural Image Quality Evaluator (NIQE) are compared for existing and proposed defogging methods. Different input images are taken into account. From the Table 1,it is to be noted that the values of PSNR, SSIM and NIQE are higher in proposed system than in the existing system. Therefore, a better quality contrast of the image is obtained using the proposed system.

5. CONCLUSION

In this work, image defogging method has been proposed based on the dark channel prior (DCP). Existing state-of-the-art image defogging methods using DCP fail to show optimal performance for the task of image defogging. Their results are either low in contrast or compromised by artifacts. We have proposed a DCP based image defogging method with improved transmission map to avoid blocking artifacts. The transmission maps are computed for RGB colour spaces. After that the haze removed image is divided into three transmission maps called R, G, and B channels are separated utilized to compute an enhancement process. After the separation, it computes the enhancement process for these three colour maps separately. Finally combine all these three enhanced colour maps and computes the final enhancement. The proposed method achieved better results with lower fog effects, similarity index, degradation score and higher enhancement quality. Experimental results show that the proposed method estimates fog more accurately and the reconstructed images have better colour contrast. In future, with more time and with more comprehensive research the proposed system can be made more accurate. Also new image enhancement algorithms can be added so as to give the better results.

REFERENCES

[1] “A novel image defogging algorithm based on improved bilateral filtering aim in lexicon” by GONG LI CHINA

[2] “Vision enhancement through single image fog removal” byImtiyaz Anwar, ArunKhosla.

[3] “Comparative analysis of image filtering techniques “by Jasvinder Singh; NavinRajpal

[4] “A review on dark channel prior based image dehazing algorithms” by Sungmin Lee, Seokmin Yun, Ju-Hun Nam, Chee Sun WonSeung-Won Jung

[5] “Depth enhancement using RGB-D guided filtering” by Tak-WaiHui; King NgiNgan

[6] “An efficient haze removal algorithm using chromatic properties” by Yao Wang; Fangfa Fu; Weizhe Xu; Jinjin Shi; Jinxiang Wang