ISSN: 2454-9940

INTERNATIONAL JOURNAL OF APPLIED SCIENCE ENGINEERING AND MANAGEMENT

E-Mail :
editor.ijasem@gmail.com
editor@ijasem.org

www.ijasem.org

INTERNATIONAL JOURNAL OF APPLIED SCIENCE ENGINEERING AND MANAGEMENT

ISSN2454-9940
www.ijsem.org
Vol 12, Issuse .3 July 2021

A FAST IMAGE DEHAZING ALGORITHM USING MORPHOLOGICALRECONSTRUCTION

Mr.PRASAD RAYI[1], Mr. SRAVANI TEGALAPALLY[2]

ABSTRACT:

Outdoor images are used in a vast number of applications, such as surveillance, remote sensing, and autonomous navigation. The greatest issue with these types of images is the effect of environmental pollution: haze, smog, and fog originating from suspended particles in the air, such as dust, carbon, and water drops, which cause degradation to the image. The elimination of this type of degradation is essential for the input of computer vision systems. Most of the stateof-the-art research in dehazing algorithms is focused on improving the estimation of transmission maps, which are also known as depth maps. The transmission maps are relevant because they have a direct relation to the quality of the image restoration. In this paper, a novel restoration algorithm is proposed using a single image to reduce the environmental pollution effects, and it is based on the dark channel prior and the use of morphological reconstruction for fast computing of transmission maps. The obtained experimental results are evaluated and compared qualitatively and quantitatively with other dehazing algorithms using the metrics of the peak signal-to-noise ratio and structural similarity index; based on these metrics, it is found that the proposed algorithm has improved performance compared with recently introduced approaches.

INTRODUCTION

Image de-hazing improves the visual quality of images in computer vision applications, such as object detection and object tracking; however, haze removal is a challenging problem because of the significant difference between the haze and the unknown scene depth .Haze (fog, mist, dust and other atmospheric phenomena) is a main recession of outdoor images, by affecting both color and contrast. The general definition of fogis a collection of suspended water droplets or ice crystals near the Earth's surface . Fog reduces visibility to less than 1 km [6], and in some cases, to 50 meters or less. Moreover, fog also deforms visual perception, limits contrast and causes many Object accidents each year. Since fog is made of very small water particles suspended in the air, it causes the incident light to scatter after hitting the water particles. When this happens, it leads to loss of contrast and the formation of dense white background [70]. Furthermore, as the water particles become smaller and fog becomes thicker, the fog creates a blanket that covers roadways. Such a blanket can be a cause of many traffic accidents each year. Fog also affects images when they

[1]Associate Professor, International School of Technology and Sciences for Women, Rajanagaram, Andhra Pradesh-533294.
[2]Assistant Professor, International School of Technology and Sciences for Women, Rajanagaram, Andhra Pradesh-533294.

ISSN2454-9940
www.ijsem.org
Vol 12, Issue .3 July 2021

are captured in such foggy weather conditions with poor contrast. As a result, several attempts have been made to device various computer vision algorithms in order to remove fog from images. Under bad weather conditions, the light reaching a camera is severely scattered by the atmosphere. Moreover, the formation of fog is a function of depth; and hence,removal of fog requires several assumptions or prior knowledge about the captured scene. Fog removal algorithms estimate the depth information under various assumptions as will be discussed for the Dark Channel Prior (DCP) technique. The importance of fog removal algorithm is due to its wide application in tracking and navigation, consumer electronics, and entertainment industries [8]. In this work, Dark Channel Prior (DCP) is used as a base line for the proposed fog removal algorithm. Initially, the transmission map is defined using the DCP technique; subsequently, the transmission map is refined with the aid of a Simplified Dark Channel Prior (SDCP) using a set of filters consisting of the Proposed Adaptive Filter and an edge-preserving filter. Next, the refined transmission map is used to modify the scene radiance as the fog is removed.Although, the Dark Channel Prior is an efficient method to remove fog and enhance image contrast, it suffers from lengthy execution time, computational complexity and large memory requirement. The fog removal method proposed here, is fast and has negligible image degradation when used as input for the subsequent stage of Object detection. The quality of the fog-free image is observed using the Sobel operator to ensure that during the enhancement process, the edges and the main features of the Object are clearly visible and are not adversely affected, in order to be able to properly detect the edges and circles.

EXISTING SYSTEM

Independent component analysis (ICA) is a computational method for separating a multivariate signal into additive subcomponents. This is done by assuming that the subcomponents are non-Gaussian signals and that they are statistically independent from each other In the model, the data variables are assumed to be linear mixtures of some unknown latent variables, and the mixing system is also unknown. The latent variables are assumed non gaussian and mutually independent, and they are called the independent components of the observed data. These independent components, also called sources or factors, can be found by ICA.

DARK CHANNEL PRIOR

He et al. proposed an effective "dark channel prior" to remove haze froma single input image. The dark channel prior makes use of statistical information of outdoor haze-free images. Mainly, this technique is based on a key observation, that the most local patches in outdoor haze-free images contain a few pixels whose intensity is very low in at least one color channel. Thus, haze thickness estimation using dark channel prior with haze imaging model lead to recovering high quality haze free images. Furthermore, a high quality depth map could also be obtained as a by-product of haze removal.

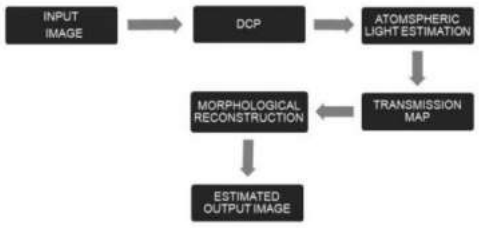
He et al. were able to find that air-light is the main contributor to the intensityof the dark pixels in one channel. According, they were able to estimate the transmission map of the haze. Combining a haze imaging model and a soft matting interpolation method, they were able to recover a high-quality haze-free image and

ISSN2454-9940
www.ijsem.org
Vol 12, Issue .3 July 2021

produce a good depth map. Moreover, this lead to the need for finding a different filter that could give the transmission map faster as compared to the soft matting followed by producing the depth scene of the desired output. The approach makes use of strong assumptions, and hence, the approach also suffers from certain limitations. It can be said that depending on the assumptions, the dark channel prior will sometimes be invalid, especially, when the scene object is naturally similar to the airlight over a large local region when no shadow is cast on the object. Although, the approach worked well, it may fail in some extreme cases.

PROPOSED SYSTEM

Compared to our previous work , this method (i) is generic removing selective scheme between two modules and (ii) presents a substantial improvement in terms of image quality due to fewer artifacts by using multiband fusion. Overall, the proposed method includes four key features. First, the decomposition of hazy images secures intensity and gradient information. Without any prior information, intensity restoration on the base layer ensures consistent ambient light and robust transmission estimation. Secondly, gradient information in hazy regions is restored by a Laplacian module through nonlinear mapping. Thirdly, the proposed method is applicable for both color and grayscale images without user intervention. Lastly, the method was not only evaluated through image comparisons with quality metrics, but also with widely used computer vision applications.



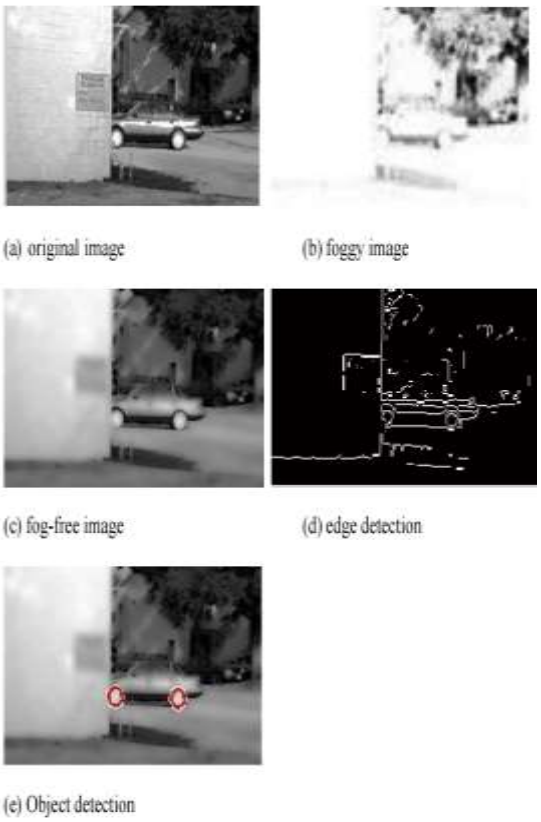
Digital image processing, the manipulation of images by computer, is relatively recent development in terms of man's ancient fascination with visual stimuli. In its short history, it has been applied to practically every type of images with varying degree of success. The subjective appeal of pictorial displays attracts perhaps a disproportionate amount of attention from the scientists and also from the layman. Digital image processing like other glamour fields, suffers from myths, mis-connect ions, mis-understandings and mis-information. It is vast umbrella under which fall diverse aspect of optics, electronics, mathematics, photography graphics and computer technology. It is truly multidisciplinary endeavor ploughed with imprecise jargon. Several factor combine to indicate a lively future for digital image processing. A major factor is the declining cost of computer equipment. Several new technological trends promise to further promote digital image processing. These include parallel processing mode practical by low cost microprocessors, and the use of charge coupled devices (CCDs) for digitizing, storage during processing and display and large low cost of image storage arrays.

RESULTS EXPLANATION

Fog is a serious problem as it is one of the main factors of traffic accidents each year. Many accidents, including fatal ones involving multiple Objects, occur during winter, especially when fog reduces visibility to near or less than 50 meters. The fog removal and Object detection

ISSN2454-9940
www.ijsem.org
Vol 12, Issue .3 July 2021

methodology developed in this thesis can assist traffic management systems to identify areas with incidents or heavy traffic in areas with existing cameras. In the proposed system, the time required to remove fog from an image is approximately 30% of the entire time of executing the complete system (both stages combined). Fog removal is a crucial part of this work, as the failure rate to detect Objects can reach up to about 30%, when circle detection is performed without fog removal. When the input (foggy image) enters the proposed system, the simplified dark channel prior technique is applied first to estimate the depth of the channel before performing any fog removal which occurs independently of the fog density and without any user intervention. A new (proposed) and fast visibility restoration method is implemented that is performed on a single image, based on adaptive filtering and edge-preserving operator. Its main advantage is its speed compared to other methods, especially giventhat its complexity is only a linear function of the input image size. Indeed, there is a big difference in the execution time of the two techniques, which highlights the acceleration rate achieved.



(a) original image (b) foggy image

(c) fog-free image (d) edge detection

(e) Object detection

Due to the subjective nature of contrast enhancements, there has not been an established state-of-the-art method for single image defogging. The proposed work inthis thesis is compared with the Dark Channel Prior (DCP) method proposed by He et al. [3] because it is the most common method for single image defogging. TheDCP method, however, is complex and takes several seconds to minutes to process and is not considered a fast algorithm. Table-1 illustrates that the proposed SDCP Defogging method not only is extremely fast, but is subjectively comparable to the DCP method.

ISSN2454-9940
www.ijsem.org
Vol 12, Issue .3 July 2021

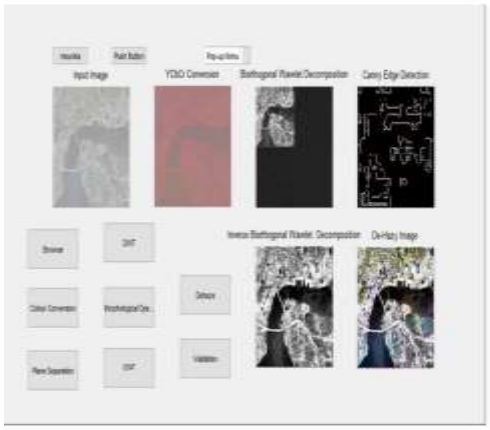


Fig.2. output results.

CONCLUSION

Outdoor images are exposed to adverse weather conditions such as haze, which reduces the visibility of details in a captured scene. Hence, several research works have focused on diminishing haze effects in images by designing and applying dehazing algorithms. In this regard, most of the recently proposed algorithms combine DCP with different techniques that look for fast computation of accurate transmission maps, aiming to preserve the image quality at the cost of long computation times. Therefore, in this work, a novel fast algorithm for lessening haze effects using DCP and a newly introduced approach was compared qualitatively and quantitatively against stateof-the-art techniques; morphological reconstruction is utilized to preserve important structures of the image in all stages. The reviewed literature about the subject involves image reconstruction performance (utilizing PSNR and SSIM index), computation time and memory utilization. From the obtained results, the performance superiority of the proposed method for diminishing haze effects during image reconstruction is clear, as is its highspeed processing time that surpasses all other techniques in the reviewed literature from one to four orders of magnitude with less memory utilization. Therefore, the proposed methodology for image dehazing introduced in this work offers a fast, high-performance dehazing technique suitable for online vision system applications.

REFERANCES

[1] Al Taher, Nada. "Thick Fog Leads to 114-object Pile-up, 20 Hurt on AbuDhabi-Dubai Road." Gulf News, 8 Jan. 2015. Web. 13 Sept. 2015. <http://gulfnews.com/news/uae/thick-fog-leads-to-114-object-pile-up-20-hurt-on-abudhabi-dubai-road-1.1438511>.

[2] Ruiz, Ramona. "Fog-related Road Accidents across the UAE | The National." TheNational News |UAE, 10 Mar. 2014. Web. 13 Sept. 2015. <http://www.thenational.ae/uae/transport/fog-related-road-accidents-across-the-uae>.

[3] He, K., et al. (2011). "Single image haze removal using dark channel prior." Pattern Analysis and Machine Intelligence, IEEE Transactions on 33(12):2341-2353. [4] "Sobel Operator." Wikipedia. Wikimedia Foundation. Web. 24 Apr. 2015. <https://en.wikipedia.org/wiki/Sobel_operator>.

[5] Gultepe, Ismail. "Fog and Boundary Layer Clouds: Fog Visibility and Forecasting." Google Books. Springer Science, 2007. Web. 13 Sept. 2015. <https://books.google.ae/books?id=QwzHZ-wVAC&printsec=frontcover&dq=Ismail Gultepe, “Fog and Boundary Layer Clouds: Fog Visibility and Forecasting ”&hl=en&sa=X&ved=0ahUKEwjtrdPTqbTJAhWJCBoKHTLjBrEQ6AEIGj AA#v=onepage&q=Ismail Gultepe,%2>.

[6] "Federal Meteorological Handbook Number 1: Chapter 8 – Present Weather."Office of the Federal Coordinator for Meteorology, 2005.

ISSN2454-9940
www.ijsem.org
Vol 12, Issuse .3 July 2021

Web. 13 Sept. 2015. <http://www.ofcm.gov/fmh-1/pdf/H-CH8.pdf>.

[7] Kaiming, H., et al. (2009). Single image haze removal using dark channel prior.Computer Vision and Pattern Recognition, 2009. CVPR 2009. IEEE Conference on.

[8] Shrivastava, A., et al. (2013) "Review on Single Image Fog Removal", International Journal of Advanced Research in Computer Science and Software Engineering (IJARCSSE) on 3(8): 423 – 427.

[9] Hautière, N., et al. (2008). "Experimental validation of dedicated methods to in- object estimation of atmospheric visibility distance." Instrumentation and Measurement, IEEE Transactions on 57(10): 2218-2225.

[10] Gonzalez, R. C. (2009). Digital image processing, Pearson Education India.