International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2013): 6.14 | Impact Factor (2015): 6.391

Survey on Edge-Preserving Decomposition-Based Single Image Haze Removal

Neha Beegam P E[1], Sunena Aboobakar[2]

[1]M.Tech KMEA Computer Science and Engineering, Mahatma Gandhi University, Kerala, India,

[2]Assistant Professor, KMEA Computer Science and Engineering, Mahatma Gandhi University, Kerala, India

Abstract: ***Driven by computational photography and computer vision application is applicable for various haze removal techniques. It is the main degradation of outdoor images like haze, fog, mist and other atmospheric phenomena. Air is added some unwanted particles. These particles are scattered around the reflected light. These scattered events generated by air light and attenuation. This paper focusing on the different methods are effectively eliminating haze from single images.***

Keywords: De-hazing, Dark channel prior, Multi-scale approach, Multi-resolution approach, Visibility

1. Introduction

Haze is the atmospheric phenomena. It is main degradation of outdoor images and weakening of both color and contract images. The bad weather conditions may demeans the quality of the images of outdoor scene. This Problem is used for a photographer to capture the images. These results are used for changing color and blurring images. These atmospheric conditions are used to blur the captured scene. The air is added some misted particles. Which are scattered around the reflected light is also scattered. These scattered events mainly classified into two types such as attenuation and air light. Haze removal methods are classified into two types: 1) Image segmentation and 2) Image restoration. Image segmentation is a process of segregation of digital images into multiple segments. Image restoration is the process of taking a corrupted image.

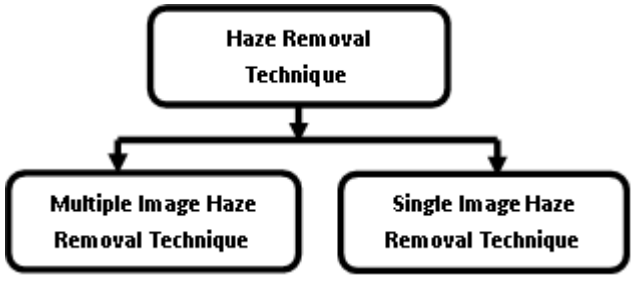

Figure 1: Haze removal Techniques.

2. Literature Review

Haze removal techniques mainly classified into two type: 1) Multiple image methods and 2) Single image methods. In this case for multiple image methods are performing to two or more images are using in same scene. In case for single image methods are performing to single input images. There have been several important techniques are using in this systems such as: De-hazing, Dark channel prior, Multi-Scale fusion, Multi-Resolution approach, Visibility.

Fattal, Raanan [1] proposed a Single image de-hazing method. These methods are calculating the optical transmission of image. After the estimation the dispersed light is removed and it increases image visibility. After that refines image model is formulated by transmission function i.e.; surface shading. Resulting transmission functions and shading functions are statically uncorrelated.

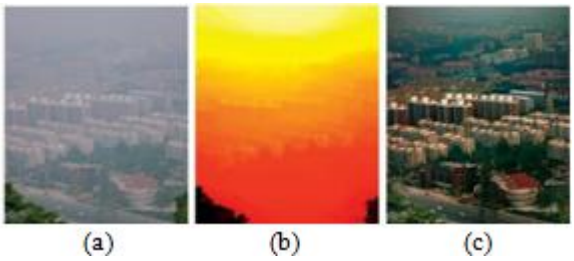

Figure 2: (a) Hazy Image (b) Recovered Depth map (c) Haze-free image. De-hazing based on a single input image and the corresponding depth estimate.

Kaiming, Jian Sun and Xiaoou Tang [2] proposed a single image haze removal. It mainly using to dark channel prior based on prior assumption. First we have to observed local region which do not cover the sky. In this case some pixel have very low intensity values of color channel i.e.; dark channel. These pixels are used to estimate the haze transmission. After the estimation we have generate transmission map for each pixel. Then combining haze image model and soft matting technique to recover a high quality of images.

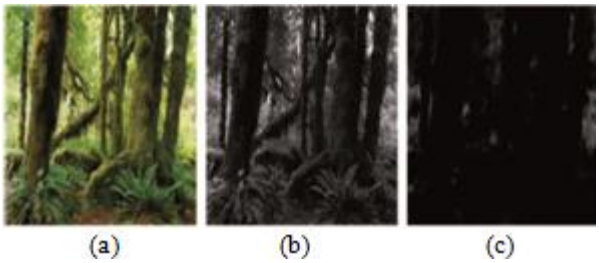

Figure 3: Calculation of a dark channel. (a) An arbitrary image J. (b) For each pixel, we calculate the minimum of its (r, g, b) values. (c) A minimum filter is performed on (b).

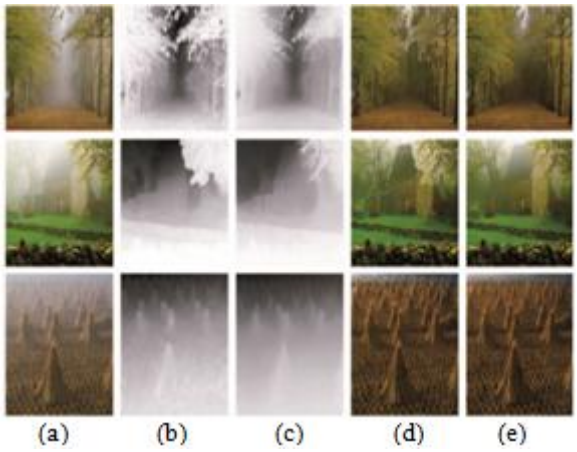

Figure 4: Haze removal. (a) Input hazy images. (b) Estimated transmission maps before soft matting. (c) Refined transmission maps after soft matting. (d), (e) Recovered images using (b) and (c), respectively.

Codruta, Orniana Ancuti and Cosmin Ancuti [3] proposed a single image de-hazing. It mainly used to multi-scale fusion. In this approach is used for fusion strategy. First we have to applied white balance and contrast enhancing procedure from original image. The fusion enhancement techniques used for estimate weight maps. After the estimation of weight maps for each input image and finally obtaining a result.

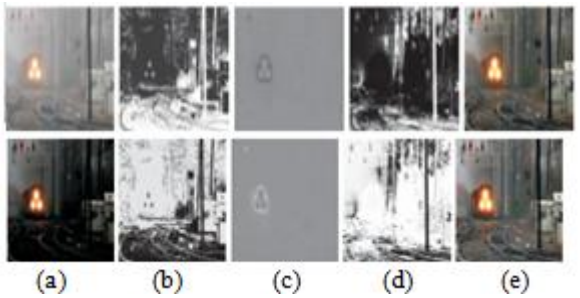

Figure 5: (a) Derived input image, (b) Luminance map, (c) Chromatic map, (d) Saliency map, (e) Our result.

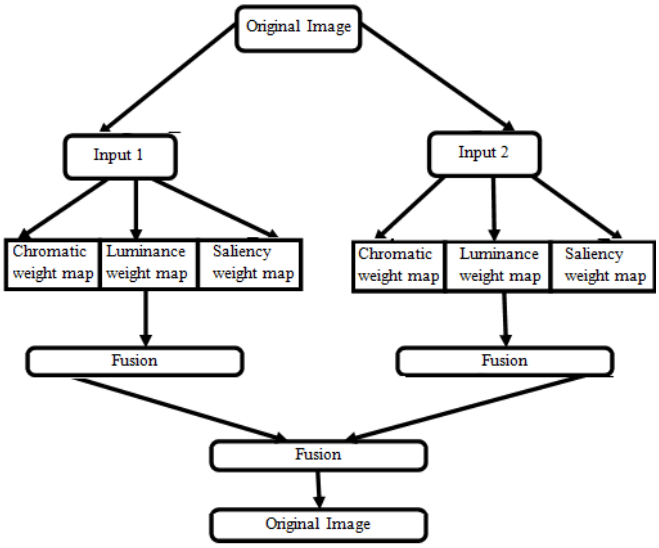

Figure 6: Algorithm for fusion based strategy.

In these methods we have using different weight maps like luminance, chromaticity and saliency (Figure 5, Figure 6). These weight maps are using to minimize the artifacts. The multi-scale approach are using to laplacian pyramid. It is used for combination with Gaussian pyramids of normalized weights. This approach is used for minimize the artifacts and improve the performance. To recover this problem we have using to patch based method. It performs to contrast air light in patch.

Schaul, Lex, Clément Fredembach, and Sabine Susstrunk [4] proposed a color image de-hazing based on the near-infrared. In this method we have using multi-resolution approach. It mainly focused on outdoor photography. The distant object is appeared from blurred and loses its color and visibility due to degradation level affected by atmospheric haze.

These methods are used to fusion of visible and near-infrared image. Multi-resolution approach is used for edge preserving filter to minimize the artifacts. It also producing the de-hazing process.

Figure 7: Example of a scene containing haze. Note the higher contrast and sharpness in the near-infrared image and the de-hazed image using our method compared to the visible image.

R. T. Tan [5] proposed a visibility in bad weather from a single image. It mainly two observations:
1) Images with enhanced visibility in bad weather condition
2) Atmosphere-light depend on the distance objects.

In this case we have to develop a cost function. These functions are used for markov random fields. It can be efficiently optimized in other techniques. In this method does not require the geometrical information. It only applicable to color and gray images.

(a) (b)

Figure 8: (a) Top: input image, Middle: the direct attenuation, Bottom: the airlight. (b) Top: input image, Middle: the direct attenuation, Bottom: the air light

3. Comparison Study

There have been several related studies are using in haze removal techniques. These studies are applicable to computer vision programs. (Table 1).

Table 1: Comparison study

Sl No:	Year	Paper	ADVANTAGES	DISADVANTAGES
1	2014	Single image dehazing	• To solve the ambiguities of information by searching for the solution.	• Require user interaction. • Not automatic. • Needs an estimation of more parameters • Surface shading and the transmission function are statically uncorrelated.
2	2014	Single image haze removal using dark channel prior	• To recover high quality image by using haze image model and soft matting technique.	• The performance of vision algorithms suffering from low contrast.
3	2013	single image de-hazing by multi- scale fusion	• Used to multi–scale approach.	• To minimize the artifacts per pixel based has a greater improvement.
4	2015	Color image de-hazing using the near-infrared	• Focused on outdoor photography. • Used to muti-resolution approach.	• Degradation level affected by atmospheric haze.
5	2014	Visibility in bad weather from a single image	• Applicable for both color and gray images. • Air light whose variations depending on the distance of objects.	• It is not applicable to dynamic scene. • Does not furnish better results. • Does not require the geometrical information of the input image

4. Conclusion

Many applications applying different haze removal techniques are used. The presented method has ignored to diminish the problem. The bad weather condition to capture the haze image. It is depending on depth of image. In several methods haze can be estimated from the captured hazy images. After the estimation we can calculating depth map and applying various de-hazing methods are used. The presented method used to better and improved haze free images can be recovered and to get good quality of images without estimating depth. It is known what are the consequences of a bad estimate for the transmission. In this case haze is not completely removed, or it is removed where there is no haze (Figure 9).

(a) (b) (c)

Figure 9: Failure case. Left: input image, Middle: our result, Right: our transmission app. The transmission of the marble is underestimated.

References

[1] Zhengguo Li, Senior Member, IEEE, and Jinghong Zheng, Member, IEEE. "Edge-Preserving Decomposition-Based Single Image Haze Removal",IEEE Transactions on Image Processing,vol.24,no.12,December 2015.
[2] Fattal, Raanan. "Single image dehazing." In ACM Transactions on Graphics (TOG), vol. 27, no. 3, p. 72, 2014.
[3] Kaiming, Jian Sun and Xiaoou Tang, "Single image haze removal using dark channel prior.", IEEE Transactions on Pattern Analysis and Machine Intelligence, vol.33, no. 12, pp. 2341-2353, 2014.
[4] Codruta, Orniana Ancuti and Cosmin Ancuti "single image dehazing by multi- scale fusion" ieee transactions on image processing, vol. 22, no. 8, august 2013.
[5] Schaul, Lex, Clément Fredembach, and Sabine Susstrunk. "Color image dehazing using the near-infrared." International Conference on Image Processing (ICIP), 2015 16th IEEE International Conference on. IEEE, 2015.
[6] R. T. Tan, "Visibility in bad weather from a single image," in a Proc. IEEE Conf. Comput. Vis. Pattern Recognit., Jun. 2014, pp. 1-8.

Author Profile

Neha Beegam P E received the Bachelor of Technology degree in Computer Science and Engineering from Jai Bharath College of Management and Engineering Technology, Vengola in 2014 and currently doing Master of Technology in Computer Science and Engineering from KMEA Engineering College, Edathala.

Sunena Aboobakar received the Bachelor of Technology degree in Computer Science and Engineering from SCMS School of Engineering and Technology, Karukutty in 2006 and Master of Technology in Computer Science and Engineering from Jayam College of Engineering, Salem in 2013. She is currently working as Assistant professor in Computer Science Department, KMEA Engineering College, Edathala.