International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 9 **Issue:** III **Month of publication:** March 2021

DOI: https://doi.org/10.22214/ijraset.2021.33168

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue III Mar 2021- Available at www.ijraset.com

Review on Single Image Dehazing Techniques

Himanshu Mahatma[1], Maitreyee Dutta[2]
[1, 2]Department of Electronics & Communication, NITTTR Chandigarh

Abstract: Dehazing is a process of removing suspended haze particles such as haze from images and plays a major role in many photo printing programs. The appearance of external images is often tarnished by the presence of haze, fog, storm and so on. Disadvantages Haze removal also known as dehazing refers to a variety of methods that aim to reduce or eliminate image degradation that has occurred while digital image detection is deteriorating in adverse weather conditions. This paper focuses on previous strategies based on water pollution. The black line from the beginning of the light dew and the color of the pre-applied anointing paint are the two existing methods of the base of the descent. This paper provides comparisons between the different Dark Channel Preduction Strategies Before Empowerment, provides a brief overview of Color Attenuation Pre-Depression and also provides an overview of the pre-color acquisition strategy prior to migration intensity.
Keywords: Dark Channel Prior, Pyramid Fusion, Hybrid Dark Channel, Dehazing, Airlight.

I. INTRODUCTION

The appearance of the external images is severely damaged due to the presence of fog, haze, smog etc. Poor visibility can cause failure of computer viewing applications such as smart navigation systems, tracking systems, object tracking systems, etc. To solve this problem, many imaging techniques have been developed. These processes play an important role in improving the performance of various computer viewing applications. As a result, researchers are drawn to writing techniques. This paper makes several reviews of writing techniques to show that these can work effectively in real life. On the other hand, it encourages researchers to use these methods to remove haze from bad images. Seven advanced classes of drag-and-drop strategy, such as depth measurement, distribution, development, filtering, supervised learning, integration, meta-heuristic strategies and diversity model are addressed. In addition, the paper focuses on mathematical models of writing techniques and their inventions. Finally, other issues are considered in the challenges and scope of the future in the drainage strategy. The presence of eyes in the atmosphere undermines the quality of images captured by the visual camera sensors. Haze removal, also called dehazing, is usually performed under a degenerative model, which requires the solution of a painless underlying problem. To alleviate the difficulty of the alternative problem, it has been given a novel previously called the black channel (DCP) and has received a lot of attention. DCP is based on the example of external nature images that the stiffness value of a single color channel within a local window is close to zero. Based on the DCP, the fractured area is made up of four main steps: air light measurement, transmission map measurement, transmission map filtering and image reconstruction. This step-by-step process makes it possible to provide a step-by-step approach with a complex solution to the problem of internal conflict. This helps us to shed light on the systematic contributions of recent DCP-related research at each stage of the fraud process. Our detailed survey and DCP-based methodology analysis will help students understand the effectiveness of each step of the draw process and will assist in the development of advanced algorithms.

II. LITERATURE REVIEW

K. He et al. [1] proposed a prior based algorithm to calculate depth of scene to remove haze from a single image. He observed that in most of images if a small patch of image is considered at a time there are at least few pixels whose at least one color channel's value is near to zero. T. Cui et al. [2] utilized the normalized luminance matrix to approach the weight map of the atmospheric airlight. pixel-wise rough luminance weight map is refined by guided filter, with an adaptive post processing method. Q. Zhu et al. [3] proposed a linear model for modeling the scene depth of the hazy image by learning the parameters of the model with a supervised learning method, the depth information can be well recovered. B. Cai et al. [4] proposed a trainable end-to-end system called DehazeNet, for medium transmission estimation. DehazeNet adopts convolutional neural network-based deep architecture, whose layers are specially designed to embody the established assumptions/priors in image dehazing. Z. Li et al. [5] presented a novel edge-preserving decomposition-based method by adopting weighted guided image filter to decompose simplified dark channel of the haze image into a base layer. C. Y. Li et al. [6] proposed a underwater Dehazing algorithm by using contrast enhancement and histogram prior to overcome underwater degradation of contrast and colorcast of objects. D. Berman et al. [7] presented a method that proposes an algorithm based on a, non-local prior. Y. T. Peng et al. [8] calculated the difference between the observed intensity and the ambient light in a degraded image scene which is called scene ambient light differential.

K. B. Gibson et al.in [9] investigates effects on video and image coding for monitoring systems of the dehazing. W. Wang et al. [10] proposed a fast algorithm based on linear transformation for single image dehazing. N. Baig et al. [11] proposed an enhanced single image dehazing technique which is based on entropy-based weighted contextual regularization and quadtree decomposition. L. Shi et al. [15] presented three improved methods to overcome the problem of colour distortion based on He's method. C. Xiao et al. [20] presented a unique acceleration method using a hierarchical data structure for closed form image and video matting, which achieved an good compromise between speed and quality.

Y. H. Lai et al. [22] recasted the problem of single image dehazing by finding the optimal scene transmission. G. Deng et al. [25] developed the GLIP model and studied a new implementation of the LIP model by correlating it with GVS model. A. Galdran et al. [29] proposed a new image dehazing method based on the minimization of a fusion scheme and two energy functionals and finally combine the result of both optimizations.

J. Y. Chiang et al. [30] proposed a new type of systematic way to improve underwater images by a dehazing algorithm, to countereffect the attenuation problem along the propagation path, and to take the use of the presence of an artifical light source. B. H. Chen et al. [34] proposed a novel haze removing technique for removing haze in images taken under a large range of atmospheric weather conditions. Z. Mi et al. [35] presented a novel multiple scale gradient domain enhancement technique to reduce haziness from a single image. Z. Gao et al. [38] presented a single image dehazing algorithm by application of mean filter, which includes dark and bright channel constraints based on pixels. J. G. Wang et al. [40] presents an novel method by combining the neural network filter and the fuzzy inference system to efficiently perform image dehazing. L. Wang et al. [42] proposed an efficient and new PB-DCP method for dehazing of RS multi spectral pictures. D. Wang et al. [43] proposed a novel variational model to get the transmission optimised. This VM introduces a gradient-preserving term and a smoothness term to remove the false edges and the corrupted sky area in the resultant image.

III. GAPS IN LITERATURE SURVEY

As a result of the significance of the haze removal, different attempts to build the perceivability of the hazed input picture have been done. While going through available literature various flaws have seen which can be given as follows

A. There is not much effort done to use dehazing in real time applications.
B. Noise issues are not taken into account which can be introduced during haze removal.
C. There is lack of masking techniques and combining filters to improve the accuracy of algorithm
D. Irregular contrast and brightness issues are there.
E. Most of the algorithms are prior based.
F. Some algorithms shows color distortions by over dehazing in some areas of images.
G. Accurate estimation of atmospheric light is also required besides of transmission map otherwise halo effects are generated.

IV. DEHAZING METHODS

1) *Polarization Based Methods:* in these methods the fact that in a haze scene at least airlight is partially polarized against the direct transmission of radiance, So two or more pictures of same scenario is taken with changed polarization with the help of polarization filter. These images are then processed to detect the transmission map of the image. Generally this method lacks the fact that direct transmission is also somewhat polarized along with airlight so results are not accurate. Also this method fails when the dynamics of the scene are changing very fast, means if scene changes between changing of polarization the position of elements in different images are changed and the processing of images gets hindered and gets distorted.
2) *Different Weather Conditions:* in these methods multiple images are taken of the same scene in different weather conditions, these images possess different information of the medium in different weather conditions this information is then compared to get actual transmission information from the image by the fact that actual radiance of objects is constant. The main drawback of this method is that it is also a static method and any change in scene dynamics will get the process to fail, also it could not give instant results as it takes much time to get some significant change in weather conditions.
3) *Depth Map Based Method:* in this method some information of location as well as texture from geospatial databases like Google maps or other satellite aerial data is used to find transmission of the scene, this data is usually processed and aligned manually so that aerial 3d information of the database is mapped to horizontal direction image. This gives very accurate results in finding the transmission map and hence gives very good results. But this method has drawback that the procedure involved is not automatic, so user interaction in processing is required and also it is time consuming.

4) *Dark Channel Prior:* this method was developed by tan near 2010 in which a prior based on statistical analysis of outdoor images was given on the fact that almost all haze free image contains at least one channel of color which is nearly zero, the calculation of transmission is based on this prior that when a pixel gets affected by haze the dark channel gets more whiter, this whiteness is then removed to theoretically restore the dark channel which in result restores the actual image. This method is actually patch based method in which a small patch is used to get the dark channel information, which in fact produces halo effects in output, also this method uses 0.1% of the brightest pixels in the image to calculate airlight but it fails when a similar object like artificial lights, headlights of vehicles consist a large part of image. Another drawback of this method is that it works on only non sky patches of the image.
5) *Enhancement Based Methods:* in these methods image enhancement based approach is used to improve the image in terms of contrast and colour saturation. These methods mostly rely on histogram processing like histogram equalization, contrast limited adaptive histogram equalization, weighted histogram, modification of bihistogram, contrast maximization etc.
6) *Markov is a Random Field (MRF) and an Independent Component Analysis (ICA):* Fattal (2008) in his statement that land transfers and landfills are not compatible in your area. Therefore, it requires independent elements that vary in purpose. In addition, this approach focuses on self-perception in the local pool. However, when working with images under heavy color mode this method is difficult to obtain reliable restored images. This method is time consuming and cannot be used to handle large images. This method is able to produce a standard non-visual image organized with a deep display map .it is related to physics-science. Dark fog has no colors so the image restoration method is associated with color information. Therefore, we cannot apply the image restoration method to the gray image. This method will not work in dense fog. It will fail. In fact, this method requires enough color detail otherwise, we can't get an actual navigation map.
7) *Based on the color Lines in 2014:* Fattal introduced a different type of color stripping method. There are considerations in this method 1. The poles of the small picture are a different color. 2. Small picture clips have faces of different colors and widths.
8) *Based on the Speculative Process of the Bayesian Probabilistic Nishino et al. (2012):* proposed a probabilistic view of Bayesian dehazing. This approach uses Markov's random field of instruction in both albedos and the depths of a single negative image. This extension produces art objects in the most remote regions. Moreover, the consequences of recovery made in this way often seem vague or impossible. This approach also produces more of improving spatial diversity and distortion.
9) *Multi-scale fusion Ancuti (2013):* introduced a multi-pronged fraud method. Proper description of inputs and weight maps restores such a distorted image, returning the contrast and appearance of a negative image Ancuti used a method based on where the two images come out of the first negative image above the white balance and different enhancement processes.
10) *Based on a Boundary constraint Regularization approach:* Meng et al. (2013) suggest a general approach. This method is built on active border restrictions on the deployment map. However, in this method it exposes color brightness due to an error approaching the brightness of the atmosphere.
11) *Learning-based Method:* Tang et al. (2014) estimated the distribution by combining four types of hive-related objects with the Random Forests (RF) classifier. This method collects a wide variety of objects such as high surface fill, large area difference, dark channel and hue variation with the help of random forest learn the interaction between symbols and transmission. This approach is based on learning. Highly based learning methods rely on a moderate amount of white to light blue color. Their installation decreases rapidly if there are small errors in the blue color approach.
12) *Remove Haze Particles From a single hazy Image by Color Attenuation Prior:* Zhu et al. (2015) suggested a pre-color detection method for a single color hazy image.in coloring color, pre-attenuation and a pre-read-in-color color attenuation parameters provided an in-depth model. This method is used to remove haze spots from a single foggy image. When there are large particles of a product in the image this method is usually unsuccessful. This method will not adequately measure the depth of the radiation or improve the contrast.

V. CONCLUSIONS

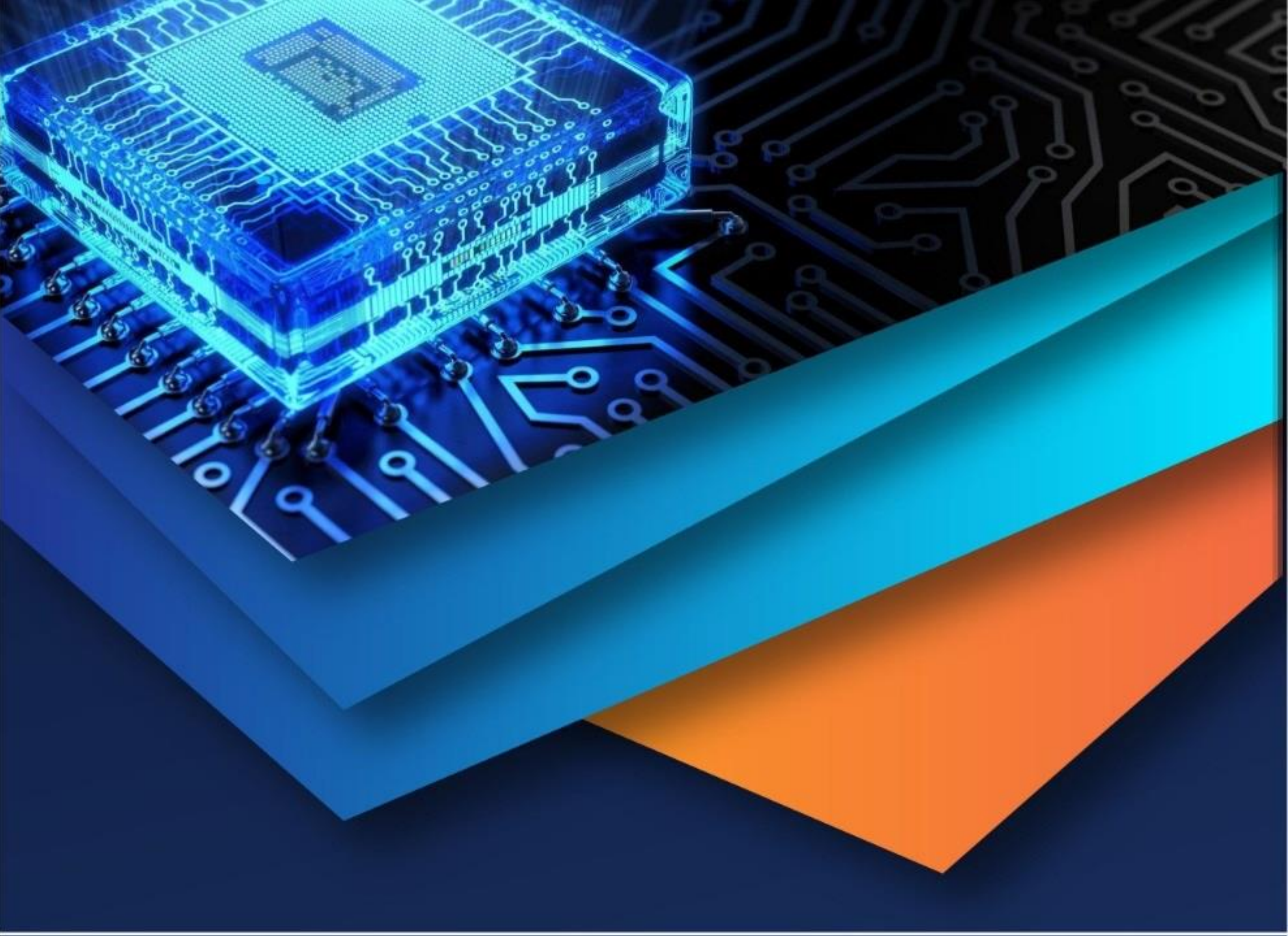
The importance of Haze removal algorithm is increasing day by day. With the increase in pollution, fog and animation in In our environment, the vision needs to be developed with MATLAB technologies that are not yet ready for that best for any weather. Ignorance of the concept of direct or almost direct measurement of the current haze or mist in any environment it undermines research on drowning. The survey showed activity and not about fog removal of algorithms so that the view on the cars is correct and sound-free. The concept of windows extended once DCP improved a lot with the right amount of light and mixing of the transmission map. Color-coded pre-painted with healthier levels gives better firmness results and improves image contrast well compared to other previous center-based techniques and this dewy technique can be improved by adding an attenuation function to the edge to achieve a better stone access effect.

Dehazing algorithms are very useful for many computer vision applications. It turns out that most of the existing re-investigators ignored many issues; process i.e. accurate for certain types of situations. Negative visibility caused by space events also results in failures in computer vision applications, such as external detection systems, obstacle detection systems, video surveillance systems, and intelligent navigation systems. To address this problem, retrieval techniques have been developed and play a major role in many computer-assisted viewing programs.

REFERENCES

[1] K. He, J. Sun, and X. Tang, “Single Image Haze Removal using Dark Channel Prior,” IEEE Transactions on Pattern Analysis and Machine Intelligence, Vol. 33, No. 12, pp. 2341–2353, 2011.
[2] T. Cui, L. Qu, J. Tian and Y. Tang, "Single Image Haze Removal based on Lluminance Weight Prior," 2016 IEEE International Conference on Cyber Technology in Automation, Control, and Intelligent Systems, pp. 332-336, 2016.
[3] Q. Zhu, J. Mai, and L. Shao, “A Fast Single Image Haze Removal Algorithm using Color Attenuation Prior,” IEEE Transactions on Image Processing, Vol. 24, No. 11, pp. 3522–3533, Nov 2015.
[4] B. Cai, X. Xu, K. Jia, and C. Qing, “DehazeNet : An End-to-End System for Single Image Dehazing” IEEE Transactions on Image Processing, Vol. 25, No. 11, pp. 1–13, Nov 2007.
[5] Z. Li and J. Zheng, “Edge-Preserving Decomposition-Based Single Image Haze Removal,” IEEE Transactions on Image Processing., Vol. 24, No. 12, pp. 5432–5441, Dec 2015.
[6] C. Y. Li, J. C. Guo, R. M. Cong, Y. W. Pang, and Bo Wang, “Underwater Image Enhancement by Dehazing with Minimum Information Loss and Histogram Distribution Prior,” IEEE Transactions on Image Processing., Vol. 25, No. 12, pp. 5664–5677, Dec 2016.
[7] D. Berman, T. Treibitz and S. Avidan, "Non-local Image Dehazing," 2016 IEEE Conference on Computer Vision and Pattern Recognition, pp. 1674-1682, Jan 2016.
[8] Y. T. Peng and P. C. Cosman, "Single Image Restoration using Scene Ambient Light Differential," 2016 IEEE International Conference on Image Processing, pp. 1953-1957, Nov 2016.
[9] K. B. Gibson, D. T. Vo and T. Q. Nguyen, "An Investigation of Dehazing Effects on Image and Video Coding," in IEEE Transactions on Image Processing, Vol. 21, No. 2, pp. 662-673, Feb. 2012.
[10] W. Wang; X. Yuan; X. Wu; Y. Liu, "Fast Image Dehazing Method Based on Linear Transformation," in IEEE Transactions on Multimedia , Vol. PP, No. 99, pp.1-1, 2017
[11] N. Baig, M. M. Riaz, A. Ghafoor and A. M. Siddiqui, "Image Dehazing using Quadtree Decomposition and Entropy-Based Contextual Regularization," IEEE Signal Processing Letters, Vol. 23, No. 6, pp. 853-857, Jun 2016.
[12] Q. Zhang, Y. Nie, L. Zhang and C. Xiao, "Underexposed Video Enhancement via Perception-Driven Progressive Fusion," in IEEE Transactions on Visualization and Computer Graphics, Vol. 22, No. 6, pp. 1773-1785, Jun 2016.
[13] Y. Gong and I. F. Sbalzarini, "A Natural-Scene Gradient Distribution Prior and its Application in Light-Microscopy Image Processing," in IEEE Journal of Selected Topics in Signal Processing, Vol. 10, No. 1, pp. 99-114, Feb 2016.
[14] B. H. Chen, S. C. Huang and F. C. Cheng, "A High-Efficiency and High-Speed Gain Intervention Refinement Filter for Haze Removal," in Journal of Display Technology, Vol. 12, No. 7, pp. 753-759, Jul 2016.
[15] L. Shi, L. Yang, X. Cui, Z. Gai, S. Chu and J. Shi, "Image Dehazing using Dark Channel Prior and the Corrected Transmission Map," 2016 2nd International Conference on Control, Automation and Robotics, pp. 331-334, 2016.
[16] L. Wang, L. Xiao and Z. Wei, "Image Dehazing using Two-Dimensional Canonical Correlation Analysis," in IET Computer Vision, Vol. 9, No. 6, pp. 903-913, Dec 2015.
[17] H. J. Ahn, D. W. Jang and R. H. Park, "Single Image Dehazing with Wavelength-Dependent Transmissions using Inter-Channel Correlations of a Colour Image," in Electronics Letters, Vol. 51, No. 22, pp. 1786-1787, Oct 2015.
[18] L. K. Choi, J. You and A. C. Bovik, "Referenceless Prediction of Perceptual Fog Density and Perceptual Image Defogging," in IEEE Transactions on Image Processing, Vol. 24, No. 11, pp. 3888-3901, Nov 2015.
[19] O. Kwon, "Single Image Dehazing based on Hidden Markov Random Field and Expectation-Maximisation," in Electronics Letters, Vol. 50, No. 20, pp. 1442-1444, Sep 2014.
[20] [20] C. Xiao, M. Liu, D. Xiao, Z. Dong and K. L. Ma, "Fast Closed-Form Matting Using a Hierarchical Data Structure," in IEEE Transactions on Circuits and Systems for Video Technology, Vol. 24, No. 1, pp. 49-62, Jan 2014.
[21] K. B. Gibson and T. Q. Nguyen, "An Analysis and Method for Contrast Enhancement Turbulence Mitigation," in IEEE Transactions on Image Processing, Vol. 23, No. 7, pp. 3179-3190, Jul 2014.
[22] Y. H. Lai, Y. L. Chen, C. J. Chiou and C. T. Hsu, "Single-Image Dehazing via Optimal Transmission Map Under Scene Priors," in IEEE Transactions on Circuits and Systems for Video Technology, Vol. 25, No. 1, pp. 1-14, Jan. 2015.
[23] C.O. Ancuti and C.Ancuti, "Single Image Dehazing by Multi-Scale Fusion," in IEEE Transactions on Image Processing, Vol. 22, No. 8, pp. 3271-3282, Aug. 2013.
[24] K. He, J. Sun and X. Tang, "Guided Image Filtering," in IEEE Transactions on Pattern Analysis and Machine Intelligence, Vol. 35, No. 6, pp. 1397-1409, June 2013.
[25] G. Deng, "A Generalized Logarithmic Image Processing Model Based on the Gigavision Sensor Model," in IEEE Transactions on Image Processing, Vol. 21, No. 3, pp. 1406-1414, March 2012.
[26] C. Donald Ahrens, “Meteorology Today: An Introduction to Weather, Climate, and the Environment”, 10th edition, Brooks/Cole, pp 116-123, 2013.
[27] Peter Hobbs, Adarsh Deepak, “Clouds Their Formation, Optical Properties, And Effects”, 1st edition, Academic Press, pp 190-195, 1981.
[28] T. Cui, J. Tian, E. Wang and Y. Tang, "Single Image Dehazing by Latent Region-Segmentation based Transmission Estimation and Weighted L1-Norm Regularisation," in IET Image Processing, Vol. 11, No. 2, pp. 145-154, 2 2017.

[29] A. Galdran, J. Vazquez-Corral, D. Pardo and M. Bertalmío, "Fusion-Based Variational Image Dehazing," in IEEE Signal Processing Letters, Vol. 24, No. 2, pp. 151-155, Feb. 2017.
[30] J. Y. Chiang, Y. C. Chen, "Underwater Image Enhancement by Wavelength Compensation and Dehazing," in IEEE Transactions on Image Processing, Vol. 21, No. 4, pp. 1756-1769, April 2012.
[31] J. Long, Z. Shi, W. Tang and C. Zhang, "Single Remote Sensing Image Dehazing," in IEEE Geoscience and Remote Sensing Letters, Vol. 11, No. 1, pp. 59-63, Jan. 2014.
[32] Y. Y. Schechner and Y. Averbuch, "Regularized Image Recovery in Scattering Media," in IEEE Transactions on Pattern Analysis and Machine Intelligence, Vol. 29, No. 9, pp. 1655-1660, Sept. 2007.
[33] H. Yuan; C. Liu; Z. Guo; Z. Sun, "A Region-Wised Medium Transmission Based Image Dehazing Method," in IEEE Access, Vol.PP, No.99, pp.1-1
[34] B. H. Chen and S. C. Huang, "Edge Collapse-Based Dehazing Algorithm for Visibility Restoration in Real Scenes," in Journal of Display Technology, Vol. 12, No. 9, pp. 964-970, Sept. 2016.
[35] Z. Mi, H. Zhou, Y. Zheng and M. Wang, "Single Image Dehazing via Multi-Scale Gradient Domain Contrast Enhancement," in IET Image Processing, Vol. 10, No. 3, pp. 206-214, 3 2016.
[36] L. Zeng and Y. Dai, "Single Image Dehazing Based on Combining Dark Channel Prior and Scene Radiance Constraint," in Chinese Journal of Electronics, Vol. 25, No. 6, pp. 1114-1120, 11 2016.
[37] W. Wang, X. Yuan, X. Wu, Y. Liu and S. Ghanbarzadeh, "An Efficient Method for Image Dehazing," 2016 IEEE International Conference on Image Processing (ICIP), Phoenix, AZ, 2016, pp. 2241-2245.
[38] Z. Gao and Y. Bai, "Single Image Haze Removal Algorithm using Pixel-Based Airlight Constraints," 2016 22nd International Conference on Automation and Computing (ICAC), Colchester, 2016, pp. 267-272.
[39] B. H. Chen, S. C. Huang and F. C. Cheng, "A High-Efficiency and High-Speed Gain Intervention Refinement Filter for Haze Removal," in Journal of Display Technology, Vol. 12, No. 7, pp. 753-759, July 2016.
[40] J. G. Wang, S. C. Tai, C. L. Lee, C. J. Lin and T. H. Lin, "Using a Hybrid of Fuzzy Theory and Neural Network Filter for Image Dehazing Applications," 2016 International Joint Conference on Neural Networks (IJCNN), Vancouver, BC, 2016, pp. 692-697.
[41] Z. Fu, Y. Yang, C. Shu, Y. Li, H. Wu and J. Xu, "Improved Single Image Dehazing using Dark Channel Prior," in Journal of Systems Engineering and Electronics, Vol. 26, No. 5, pp. 1070-1079, Oct. 2015.
[42] L. Wang, W. Xie and J. Pei, "Patch-Based Dark Channel Prior Dehazing for RS Multi-spectral Image," in Chinese Journal of Electronics, Vol. 24, No. 3, pp. 573-578, 07 2015.
[43] D. Wang and J. Zhu, "Fast Smoothing Technique with Edge Preservation for Single Image Dehazing," in IET Computer Vision, Vol. 9, No. 6, pp. 950-959, 12 2015.
[44] R. Fattal, “Single image dehazing,” ACM Transaction Graph., vol. 27, no. 3, pp. 72, Aug 2008.
[45] G. F. Meng, Y. Wang, J. Duan, S. Xiang, and C. Pan, “Efficient image dehazing with boundary constraint and contextual regularization,” in Proc. IEEE Int. Conf. Comput. Vis. (ICCV), pp. 617–624, Dec. 2013.
[46] Tarel, J.-P., Hautiere, N.: ‘Fast visibility restoration from a single color or gray level image’. IEEE 12th International Conference on Computer Vision, pp.2201–2208, 2009.



10.22214/IJRASET

45.98

IMPACT FACTOR:
7.129

IMPACT FACTOR:
7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY