ISSN (Online) 2394-6849

International Journal of Engineering Research in Electronics and Communication Engineering (IJERECE)
Vol 4, Issue 12, December 2017

Effective Contrast Based Dehazing By Using Air Light Estimation

[1] Sheeba. D
[1] PG Student, Dept of Electronics and Communication Engineering, IJCE, Keela Vallanadu, Tuticorin

Abstract: - **A comparison with existing method shows that the proposed method performs better in terms of both processing time and quality Haze is a common natural phenomenon in our daily life caused by the atmospheric absorption and scattering. When haze appears, we always capture the photographs with low contrast and lack of clarity. The low-quality images caused by haze usually degrade the performances of various image processing and video analysis algorithms, such as face recognition, object tracking and intelligent surveillance. The dehazing technique can eliminate the bad effect of haze on images and enhance the performances of image/video processing algorithm in the hazy weather. The present project work is to enhance the visibility, saturation, contrast and reduce the noise in a foggy image. I propose a method that uses a single frame for enhancing foggy images using a multilevel transmission map. The method is fast and free from noise or artifacts that generally arise in such enhancement techniques.**

Keywords - Haze image, Image processing, dehazing image, and matching points.

I. INTRODUCTION

Haze or fog is a common natural phenomenon, which is typically caused by fine suspended particles in the air. In foggy weather, a series of reactions, such as scattering, refraction and absorption will occur between these particles and light from the atmosphere, which makes the visibility of the scene degraded. The presence of haze will lead to substantially reduce of the visibility of the image scene, which will become a major problem in many computer vision applications, such as video surveillance, remote sensing, navigation, target identification, etc... Although many image dehazing methods have been proposed, as performing haze removal from a single image is a under-constrained problem, many difficulties are still left to solve. The scene depth information of the degraded image is an important clue to haze removal. Many methods extract depth information from multiple images and extra information. For instance, binary scattering model is used to extract scene information from color images under different weather conditions. Polarization properties of different scattered light are used to restore the depth information through the polarized light in different directions. Although these methods may produce impressive results, they need to use multiple images of the same scene or need user interactions and other extra information, which makes them difficult to meet with real-time requirements of images with changing scenes. I propose an enhanced image refinement technique which is based on air light estimation. The method uses multi level transmission maps using different block sizes followed by cross bilateral filtering for better noise removal and edge enhancement. The proposed method is faster as compared to other existing techniques, real time fog and haze removal is a challenge. A Contextual Regularization de-hazing algorithm is proposed by which to dynamically repair the transmission map and thereby achieve satisfactory visibility restoration. These techniques restore the hazy images based on the estimated transmission (depth) map. Our contribution is a new contextual regularization that enables us to incorporate a filter bank into image de-hazing.

II WEATHER SCENARIOS

Several weather scenarios were tested with the developed dehazer. For each scenario there is a recorded video of the working dehazer on the CD-ROM which was attached to the thesis. The videos can also be reached through the links that are mentioned in the subsequent subsections. The videos show the input image in the top left, the output in the top right and the transmission map on the bottom left of the video. All parameters and evaluation metrics are shown in the bottom right of the video. The CPU usage during the tests was at about 30-40% for each core, depending on the size of the input image and the used patch size. For the tests here, gamma correction was used (no histogram equalisation) and only a simple transmission map (no soft matting or other filtering) to guarantee high frame rates.

ISSN (Online) 2394-6849

International Journal of Engineering Research in Electronics and Communication Engineering (IJERECE)
Vol 4, Issue 12, December 2017

Clear Weather

As a reference a clear weather scenario was tested to show that the dehazing does not lower the quality of an already haze free image. Since there is no big effect in the output this test is only represented by figure.

Figure 1: Clear Weather

The dehazer does not distort the image, however overestimates the tarmac due to its bright colour, which results in an over saturation of the tarmac surfaces. The outlines of objects appear clearer due to the unrefined transmission map (patch size 4x4). In the top left, the sky colour appears also stronger; here the sunlight directly hitting the camera lens causes the CCD sensor to create unnatural colours, which gets amplified by the dehazing algorithm.

Light Haze

This scenario tests the dehazing capabilities when a light haze is present in the scene. As expected, haze is removed easily without introducing any errors to the image, since the dehazer was build with haze as such in mind, unlike the following scenarios. In the output, scene radiance is restored and objects are distinguishable more easily.

Figure 2: Light Haze

Light Fog

A light fog scenario is tested. Colours appear more vivid and the haze layer seems to be removed from the image.

Figure 3: Light Fog

Heavy Fog

Here the dehazing algorithm seem to reach its limitations, if there is no information in the input, then no haze layer may be removed and no original colour restored. The input shows heavy fog in the line of sight between the video sensor and the sun, the illumination of the fog particles towards the sun causes the sensor to get flooded by light. This results in huge areas where the pixel value is constantly near maximum white if the sun would not be radiating directly into the image sensor, then the fog could be removed more effectively. However in this case, only the parts of the image where the fog is not so heavily illuminated by the sun seem to be improved in terms of haze layer removal and colour.

Figure 4: Heavy Fog

III SYSTEM DESIGN SPECIFICATION AND IMPLEMENTATION

System Architecture

Implementation is the stage of the project when the theoretical design is turned out into a working system. Thus it can be the considered to be the most critical in achieving a successful new system and in giving the user, confidence that the new system will work and be effective. The implementation stage involves careful planning, investigation of the existing system and it's constraints on implementation, designing of methods to achieve changeover and evaluation of changeover methods.

ISSN (Online) 2394-6849

International Journal of Engineering Research in Electronics and Communication Engineering (IJERECE)
Vol 4, Issue 12, December 2017

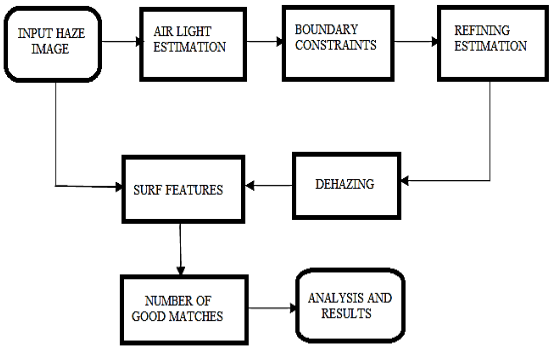

Figure 5: Block Diagram

Software Overview

MATLAB is a high-level language and interactive environment for numerical computation, visualization, and programming. Using MATLAB, Here we can easily analyze data, develop algorithms, and create models and applications. The language, tools, and built-in math functions enable to explore multiple approaches and reach a solution faster than with spreadsheets or traditional programming languages, such as C/C++ or Java. We can use MATLAB for a range of applications, including signal processing and communications, image and video processing, control systems, test and measurement, computational finance, and computational biology. More than a million engineers and scientists in industry and academia use MATLAB, the language of technical computing.

IV. ALGORITHEM

Air Light Estimation

Air light is a phenomenon that acts like a light source, which is caused by scattering of participating media in the atmosphere. The atmospheric vector represents the air light radiance at the infinite distance in a scene, i.e., the color information of air light itself. Therefore, the atmospheric vector does not include any scene radiance information, and it only contains the air light component. The region full of air light is the most opaque area in a hazy image. We follow a seminal method of air light estimation. Also, we assume that the most opaque region is the brightest within an image, and we therefore discard the pixels that are within aforementioned saturated regions. We subsequently average the chosen pixels to reject noise. I implement estimation the air light for each and every region and as well as modelling the air light for each region and the coordinates within the image to generate the air light map. In the case of an image with various depths, the air light execution can be varied according to the region. Estimating the air light can reflect the variation of depth within the particular image. Regions are segmented to estimate the regional contribution of air light.

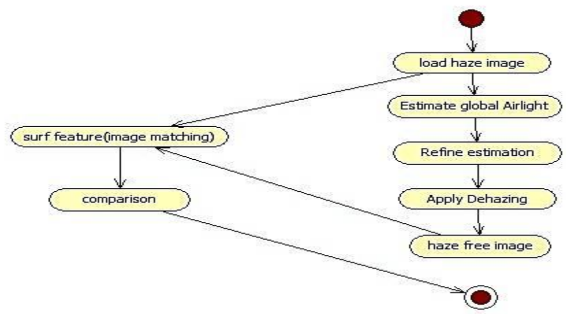

Figure 6: Flow Diagram

Pre-processing

The fog particles absorb light presented region in addition to scatter it. By changing the color space from YCbCr to RGB, can be obtained. Therefore, after the color conversion, histogram equalization is performed as a post processing step. So in this air light map that shapes the relationship between the co-ordinates of the image pixels and the air light. In this paper, since the content of scattering of a visible ray by large particles like fog, haze and smoke are almost identical ,the luminance component is used alone to estimate the air light. In order to restore the good quality image blurred by fog, we need to estimate the air light estimation and subtract the air light from the foggy image to get dehaze image. Before restoration of luminance image, the estimated and processed air light map is subtracted from the degraded image. To correct the blurring, due to edge enhancement is performed. By using Fourier transformation signal, it is filtered by a high pass filter is a constant that determines the strength of enhancement is the de-blurred luminance image.

Transmission Estimation

We first assume that transmission is piecewise smooth. In Equation (1), the portion of haze at a pixel x is determined by the term $(1-t(x))$ that indicates the amount of haze to be removed. We determine the amount of a haze signal from given color signals within a patch. Suppose the given color signals in each patch are linear combinations of two unknown bases, J and A, that form a linear subspace. If we project the given pixels onto the atmospheric vector A, we can estimate the contribution of the haze signal mixed into the input signals in the patch.

Contextual Regularization

In this section, we present our contextual metric learning method. We first present the problem formulation of learning multiple metrics in multi-label settings. Then we

ISSN (Online) 2394-6849

International Journal of Engineering Research in Electronics and Communication Engineering (IJERECE)
Vol 4, Issue 12, December 2017

describe our regularization framework of these metrics using semantic contextual information.

V. RESULTS

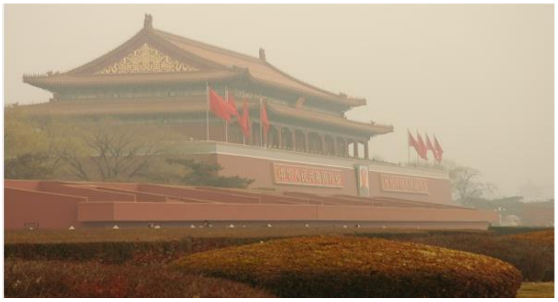

Figure 7: Hazy Image

This algorithm prepares an image for processing and it consists of load a haze image, estimate global air light, calculate boundary constraints, refining estimation, apply dehazing, haze matching points, dehaze matching points, result, and exit options. Lode a haze image is the function used to select the haze image which is similar to the figure 7 then the algorithm is continuous the run function. The second option of the algorithm is to select the global air light estimation. Here we have to select the global air light similar to the figure 8. Here we select the haziest pixel for further processing.

Figure 8: Global Air Light Estimation In Hazy Image

If we not estimate or point the global air light estimation it is considered as a error.

Figure 9: Boundary Constraints Calculation

The above figure 9 is the boundary constraints calculation function. In this function the original image is converted in to the ycbcr image. And then we applied the refining technique. This is a iteration process which is used to fining the image. Finally we applied the dehazing algorithm in a refining image. And then the image is converted in to the RGB function. Figure 10 is the dehazed image of the original or a given input image.

Figure 10: Dehazed Image

Then we must analyze the program functions by calculating the matching points. Figure 11 is described the haze image matching points.

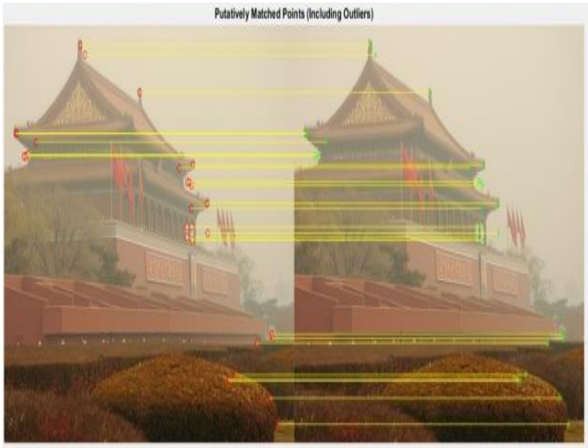

Figure 11: Haze Image Matching Points

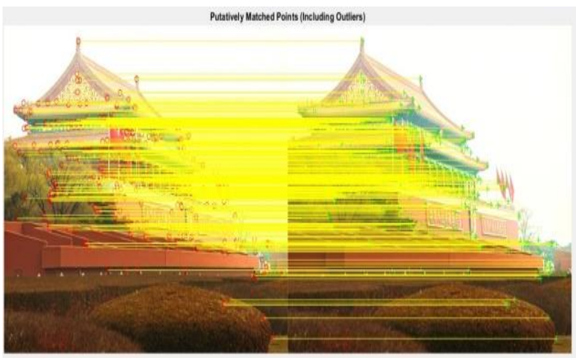

Figure 12: Dehaze Image Matching Points

We also calculate the dehazing matching points to estimate the algorithm. And finally the results are shows in the command window.

VI. ADVANTAGES

- Fog is removed without any change in original scene.
- Our method can recover rich details of images with colour information in the haze regions.
- Hazes in the images are not homogeneous. Our method dehazes successfully in these types of images.
- Moreover, some significant halo artefacts usually appear around the recovered sharp edges (e.g., trees). In comparison, our method can improve the visuality of image structures in very dense haze regions while restoring the faithful colors. The halo artefacts in our results are also quite small.
- Used for the driver assistance

VII. CONCLUSION

In foggy conditions, images become distorted due to the presence of air light that is produced by scattering light by fog. In this paper, we propose fast and effective method to correct the degraded image by subtracting the estimated air light map from the degraded image. The air light map is produced by using multiple linear regressions, which models the relationship between regional air light and the coordinates of the image pixels. Air light can then be estimated but based on the human visual model, wherein a human is not more sensitive to variations of the luminance in bright regions than in dark regions. For this objective, the luminance image is employed for air light estimation.

VIII. ACKNOWLEDGEMENT

I would like to express my deepest appreciation to all those who provided the possibility to complete this project. A special gratitude to my guide Mrs.A.Ahila, M.E and our supervisor Mrs.R.Kavitha, M.E whose contribution in stimulating suggestions and encouragement, helped me to coordinate my project, especially in writing this paper.

REFERENCE

[1] Ms. Ghorpade, Dr. Shah S. KP.V; ‘‘Single Image Haze Removal Algorithm Using Edge Detection’’; IJECS ISSN: 2319-7242 Volume 3 Issue 7 July,2014 Page No. 7218-7322.

[2] A.Abiraha, E.Moogambiga, T.Mathubala, Ms. S.Archana; ‘‘AN EFFECTIVE HAZE REMOVAL ALGORITHM USING COLOR ATTENUATION PRIOR MODEL’’; ICEETS-2016 ISSN : 2348-8549 Page No 387-392.

[3] Divya Makkar, Mohinder Malhotra; ‘’REVIEW ON SINGLE IMAGE HAZE REMOVAL USING DARK CHANNEL PRIOR’’; IJECET Volume 6, Issue 12, Dec 2015, pp. 39-42.

[4] Krati Katiyar, Neha Verma; ‘‘SINGLE IMAGE HAZE REMOVAL ALGORITHM USING COLOR ATTENUATION PRIOR AND MULTI-SCALE FUSION’’; IJCA (0975-8887) Volume 141-No, 10,May 2016.

[5] Kaiming He, Jian Sun, and Xiaoou Tang, Fellow, IEEE;’’SINGLE IMAGE HAZE REMOVAL USING DARK CHANNEL PRIOR’’; IEEETPAMI, Volume, 33 No. 12, December 2011.

[6] Arun Eldho Alias, Rini Varghese.P, Thomas George, Jimson Varghese; ‘‘IMAGE QUALITY ENHANCEMENT BY AIRLIGHT ESTIMATION TECHNIQUE’’; IJAREEIE ISO 3297:2007 Volume 4, Special Issue 1, March 2015.

ISSN (Online) 2394-6849

International Journal of Engineering Research in Electronics and Communication Engineering (IJERECE)
Vol 4, Issue 12, December 2017

[7] Rupinder Kaur and Dr. Sandeep Singh Kang; ''A REVIEW ON AIR LIGHT ESTIMATION HAZE REMOVAL ALGORITHEMS''; IRJET Volume: 04 Issue: 08 August 2017.

[8] MISS.Mayuri V. Badhe, PROF. Prabhakar L. Ramteke; ''A SURVEY ON HAZE REMOVAL USING IMAGE VISIBILITY RESTORATION TECHNIQUE''; IJCSMC, Volume 5, Issue 2, February 2016, Page No 96-101.