IMPROVISED FAST SINGLE IMAGE HAZE REMOVAL ALGORITHM USING DARK CHANNEL ANALYSIS

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Abstract
Dehazing is a step that attempts to reduce the amount of smog in the overcast image and makes the image degraded in a more sharp manner for clearer images and smooth images. In this article we have studied various quick dehazing techniques and in these methods, Dark Channel Priority (DCP) is one of the most important methods used in this operation. The use of DCP combined with improved techniques to eliminate The droplets from the image describe and compare between DCP and other leaching methods.

In this paper, we are going to present a new method for estimating light transmission in foggy scenes by providing a single input image. Based on this estimate, scattered light is eliminated to increase visibility in the scene and recover conflict in the dark. In this approach, we have defined a pattern of refining patterns used for surface shading. In addition to the transmission function. This will allow us to solve the ambiguity in the data by finding the solution that causes the shading and signaling functions to occur only where there is no statistical relationship. The same principle applies to the color control of smoke. The study demonstrates new ways to eliminate smog layers as well as reliable transactional forecasts that can be applied to additional applications, such as Focus on images and synthesize new.

Keywords: Image restoration, image enhancement, image dehazing, defogging, computational photography.

I. INTRODUCTION

Optimizing images taken under bad weather is highly useful in consumer photography and computer vision applications. Removing fog is a challenging but over the past decade, many researchers have devoted themselves to remove the haze from the images. In almost every situation, light is reflected from the surface scattered in the atmosphere before it reaches the camera. This is due to the presence of aerosols such as dust particles and smoke, which will divert attention away from the original path of spread. In remote shooting or fog scenes, this process will affect the sharpness of the image and the color of the skin will fade. These degraded images often do not have a bright and attractive image, and moreover, these images have poor visual visibility. This effect can be a nuisance to amateur photographers, commercial photographers and the arts, as well as to undermining the quality of underwater and aerial photography. This could be the case for satellite imagery used for a variety of purposes, including mapping and web maps, land use planning, archeology, and environmental education. As we will explain in more detail in this step, the light, which should be spread in a straight line, is scattered and replaced by a previously disrupted light called the airlight [2], which results in loss. The difference in image and the definition of the same light, we will describe the model used to create the image in the fog. In this form, the image decomposes as one factor in the combination of the two components like flight performance and refreshing unknown skin.

Figure 1 Haze Present Image

In this article we are going to present a new method for recovering fog-free images by providing a single image as input. We can do this by translating the image through the model used for surface shading in addition to sending the image. This approach is passive. No need to use multiple scenes, backlighting, polarization based on any light, any image depth data format, or any special sensor or hardware. This approach has the minimal need of a single image taken from a conventional camera. It also does not assume that the smog layer is smooth in that area, i.e. it does not allow continuity in the depth of the scene or medium thickness. As shown in Figure 1, despite the problem, this problem led to a dramatic reduction in the intensity of the airlight and a return to the clarity of the complex scene. We can Calculate the depth of the scene using recovered values. Use these images to get a gruesome image.

II. LITERATURE SURVEY

Image Degradation Model removes the haze by maximizing the local contrast of the restored image. Image Degradation Model makes the assumption that neighboring pixels in a hazy image suffered from the same degradation [2,11]. Fattal [3] for its part considers that the transmission and surface shading are locally different, thus It uses this assumption to estimation the medium transmission. It et al, based on the blackbody radiation use the Dark Channel Prior to estimate the thickness of haze and recover a high quality dehazed image [2]. It is found that, in most of the local regions which do not cover the sky, some pixels (called dark pixels) very often have very low intensity in at least one color (RGB) channel. In hazy images, the intensity of these dark pixels in that channel is mainly contributed by the air light [2,10]. Therefore, these dark pixels can directly gives the information of precise estimation of the haze transmission [2]. It used soft matting method instead of MRF (Markov Random Field) to refine the transmission. we can recovered a high quality haze free image and good transmission map [2,13].

Recently, significant progress has been made in eliminating the haze from the single image. The dayto-day presumably the haze-free image has a higher contrast than the overcast image. However, the effect of Tan's algorithm tends to compensate for the reduced contrast, which affects the Fattal radii. [20] It also provides a credible assessment of the smoke scene. However, this method may not be able to recover noiseless images when the hypothesis is broken. Tarel and Hautiere [21] have proposed a new algorithm for median reconstruction of the filter to maintain both edges and angles. It's very fast because of its complexity, it's just a linear function of the number of pixels in the image, and it can achieve the same result, and sometimes it makes color images and grayscale better. Only Kim and Al [22] define a cost function that consists of the opposite term and the data loss duration. The proposed algorithms will improve clarity and provide the best information before reducing costs. [23] For images degraded by weather based on the stability of the response rate of the sensor. Dehazing is a challenging and highly demanding technology in computer vision applications. The traditional nonphysical algorithms include the uniformity of histogram and variance [5], [6] which is the most prevalent nonphysical algorithm. Retinex [7] [10] Picture based on specific needs. It does not show the mechanism of image degradation. The advantages of these nonphysical algorithms are simple. But the results are not satisfactory. There are also improvements from physical models that can analyze image deterioration mechanisms by modeling new scenarios. In recent years, some image-based algorithms have been proposed based on prior knowledge or fog images when entering data. [11] - [18] In-depth map methods [11] - [13] need to provide some insights from user input or 3D models known as dehazing images. In addition, polarization methods are used. [14] - [18] to minimize the effects of fog & Two or more images with different polarities. However, taking multiple photos in the same scene is often not possible in many real applications.

Tarel and Hautiere [21] have proposed a new algorithm for median reconstruction of the filter to maintain both edges and angles. It's very fast because of its complexity, it's just a linear function of the number of pixels in the image, and it can achieve the same result, and sometimes it makes color images and grayscale better.

Kim and Al [22] define a cost function that consists of the opposite term and the data loss duration. The proposed algorithms will improve clarity and provide the best information before reducing costs. [23] For images degraded by weather based on the stability of the response rate of the sensor. RGB cameras improve visibility, sharpness and color in images without the need for early data on visual content and low computing time.

III. HAZY IMAGE FORMATION

Under unfavorable weather conditions such as fog, haze or fog, the contrast and color of the image will be noticeably reduced. In computer vision, the equations below are used to describe the formation of foggy or foggy images. In case I (x) is a dark image, J (x) is a new fog image, A is light. Airborne [2,13] t (x) is transmitted through the transmission of t (x), called a portion of light that is not scattered and comes to the camera. It is also part of the survival light and comes to the camera.

IV. FAST DEHAZING TECHNIQUES

The quality of images taken under poor visibility is always disrupted by fog, haze or fog. Because the atmosphere is affected, the sharpness of the image is greatly reduced. Dehazing is the process of removing the smog from the picture taken. Over the past decade, many researchers have devoted themselves to the problem of finding high quality images. This section will be a multi-dehazing approach.

A. Image Degradation Model's method

Image Degradation Model uses a sharpening technique to remove fog from the image. Suppose the embarrassing image must be high resolution. Image deterioration methods Most image formats are based on two basic observations: On the one hand, images taken under clear weather have increased visibility and higher color contrast. Taken under obscurity, such as foggy weather.

On the other hand, the airlight, which forms most depends on the distance of the object, the viewer tends to be smooth. Based on these two observations and the assumption that neighboring pixels are damaged by the same degradation Image Degradation Model eliminates smog by increasing the local sharpness of the restored image. This method does not intend to recover the original color of the whole scene. Its purpose is to increase the sharpness of the image. This will make the image imperfect.

Unfortunately, this method is not physically accurate, and thus dehazing of the Image Degradation Model does not accurately color. Figure 1 is a fog image, and Figure 2 is a corresponding dehazing effect using the Image Degradation method. Model in Figure 2. We can clearly see that the color of the picture is too saturated and the color of the swan after turning red instead of white. Contrary to reality, the method of degradation model affects the accuracy of color.

B. The Dark Channel Prior

The black theory can be understood as a theoretical object that absorbs 100% of the radiation that affects the radiation and does not reflect the radiation and appears completely black. That is, in this case pixels of the image are called dark pixels, and their values must be close to zero. In the DCP calculation method, soft mud instead of MRF (Markov Random Field) is used to refine the map transmission. This method is physically accurate and can be performed on distant objects in very foggy images. As with any approach that uses strong assumptions, their approach is limited. These assumptions sometimes do not work well without the black stuff in some patches. In other words, a dark channel will not be accurate when the scene is similar to the light. (E.g., snow-covered or white walls) over large local areas and no shadows are thrown down even if their approach works well for overcast images. But it does not happen in some cases. This is a profitable situation because in this situation, smog is not important because smog is rarely seen. This method is divided mainly Six parts, according to that we can easily remove the haze from image. It is based upon the statics that outdoor haze free images.

A) Load haze Image

First of all we need to load the image which contains haze. Haze is an atmospheric phenomenon where dust, smoke and other dry particle obscure the clarity of sky. so due to that blurred image is formed[28].

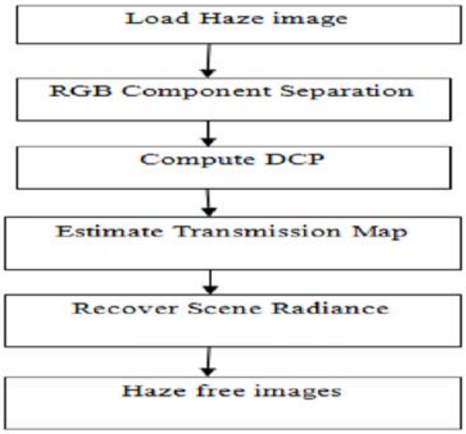

Figure 2(a): Dark Channel Prior Architecture

B) RGB Component Separation

The image will be analyzed in primary color components that Red, Green, Blue so called RGB color. Thus in an image encoded in RGB, the white color corresponding to the Presence of three color simultaneously. and the black color corresponding to the absence of these three color.

C) Compute Dark Channel Prior

Calculating three minimum components Red, Green ,Blue for each and every pixel in the image and applying minimum filter upon it so that the dark channel computation is by means of minimum operator upon a matrix. Estimating Transmission Map With the help of imaging model that is haze imaging model equation and by the assumption of atmospheric light we can easily estimate the transmission map.

D) Recover Scene Radiance

In the haze imaging model equation we have to apply DCP values and then transmission map and remaining one variable is nothing but scene radiance that will be easily computed.

C. Proposed Architecture

In this section we present the single dehazing algorithm presented in Section 3.1. It offers a brightness map that reflects the brightness data and the ability to reflect the light of the smoke-free scene. We also provide a mathematical relationship between the luminance map and the DCP in Section 3.2. Using some fusion strategy, we get the correct mapping data based on the brightness map and DCP. Transmitted with a multi-layer filter and adaptive atmospheric exposure in section 3.3. Finally, after recovering the image brightness, the developed UM algorithm is used. This may improve the contrast of the image. The details of the proposed dehazing methodology are described in the following subsections.

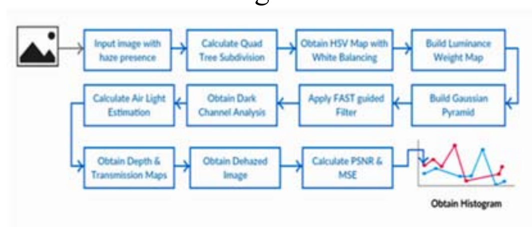

Figure 2(b): Proposed Architecture

3.1 Air Light Radiance Map

When the subject in the scene is similar to the ambient light and no shadow on the DCP image is incorrect, it may cause an unreliable estimate of the resulting inaccurate color rendering. Invention of the radius and effect of the block In order to solve this problem, we conducted the following research.

We noticed that at least one of the most exposed outdoor / fog images in a local area had at least one color channel, with very high pixels indicating light intensity and reflectivity of the region. In this way we get a new map, which is called The "Brightness Map" is used for arbitrary drunken J shots. The brightness map J is displayed (x). We find that the intensity of a high brightness map is due to two factors: a) Bright or bright objects, such as snow, white clouds and colorful flowers. B) Gray objects or textures. White or gray buildings, gray skies, or light blue, etc. However, DCP is not available in those situations. So we can use the strategy to compensate for DCP using a brightness map.

3.2 Accurate Estimation of the Transmission

Here we choose one fog image with sky space for simulated experiments. According to He's method [24], we first select the brightest 0.1 percent pixel in the dark box. In these pixels, the strongest pixel in the input image is chosen as the ambient light estimate.

Based on the analysis of Section 3.1, based on the approximation of the transit map ~ TD (x) and brightness I'B (x), consider the probability of pixel values in areas corresponding to DCP. In this way, the brightness map effectively compensates for DCP when the DCP is incorrect and to obtain a more accurate approximation of the data.

If ~ tD (x) ≥ thD, the brightness is usually not as bright as the ambient light.

If I ~ B (x) ≥ US and ~ tD (x) <THD shows the local image is not in line with DCP, the scene clarity is usually brighter than ambient light and the transmission will be evaluated. Therefore, the assessment of transmission should increase. In this case, the delivery map and the brightness map are very different, so we use the weighted average of both maps to get accurate map estimates. To prevent excessive values, we add the beta δ to the constant and use δ = 0.1, r=15, beta =1.0, esp 10^-3, gimfilTR = 60

3.3 Transmission Refinement and Estimation of Atmospheric Light

In the above section, we assume that all pixels in the patch have the same transmission value. The depth of the scene is not constant at all in patches, which give rise to some halo artifacts. Therefore, an edge filter is used at the filter name [25] to obtain an estimate of the transmission. When we adjusted the transmission map using the recommended filter radius r of a larger window, the recommended image would receive an average linear output over a wider range, resulting in more rich edges and detail. Image transition is smoother, to avoid the effects of blocks and radial artifacts. When the value of r is too large, it tends to have a saturation phenomenon. When the value of r a small edge of the image is blurred and the contrast is not clear. Therefore, for a detailed image, the recommended filters based on a single scale will not be affected. As a result, we used a multi-step filter to refine the delivery map, which allowed for highfrequency isolation, resulting in different unit sizes and details, under different visions, reducing the impact of blocking and Add image details.

V. RESULTS

In order to verify the effectiveness of the proposed dehazing method, we test it on various hazy images and compare with He et al.'s , Tarel et al.'s, Nishino et al.'s , and Meng et al.'s methods. But the color of the picture is blurred, especially in the sky.

i) Calculating PSNR

The PSNR block computes the peak signal-to-noise ratio, in decibels, between two images. This ratio is often used as a quality measurement between the original and a compressed image. The higher the PSNR, the better the quality of the compressed or reconstructed image[30].

$$PSNR = 10log10(\frac{R^2}{MSE}) \quad ....(1)$$

ii) Calculating MSE

The Mean Square Error (MSE) and the Peak Signal to Noise Ratio (PSNR) are the two error metrics used to compare image compression quality. The MSE represents the cumulative squared error between the compressed and the original image, whereas PSNR represents a measure of the peak error. The lower the value of MSE, the lower the error[29]. To compute the PSNR, the block first calculates the mean-squared error using the following equation.

$$MSE = \sum \frac{(I1(m,n) - I2(m,n))^2}{M * N} \quad ..... (2)$$

Table 1.0 Resultant Values of PSNR and MSE of DCP method

Name of image	MSE	PSNR
Doll	**0.59**	**0.87**
Cone	**0.41**	**0.85**
Stadium	**0.45**	**0.82**
Forest	**0.56**	**0.92**

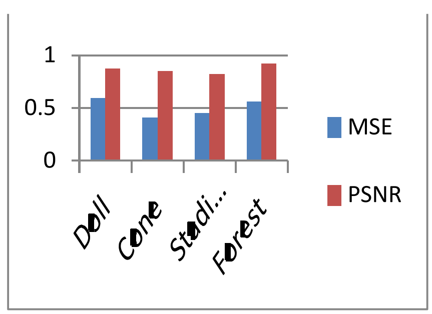

Fig 3 (a) MSE and PSNR of Different algorithms of DCP method

Table 2.0 Resultant Values of PSNR and MSE of IFSMHRA method

Name of image	MSE	PSNR
Stadium	0.029744	63.39677
City 1	0.042810	61.8153
Cones	0.02085	64.9382
Lakes	0.03644	62.51391
Pumpkins	0.02756	63.72688

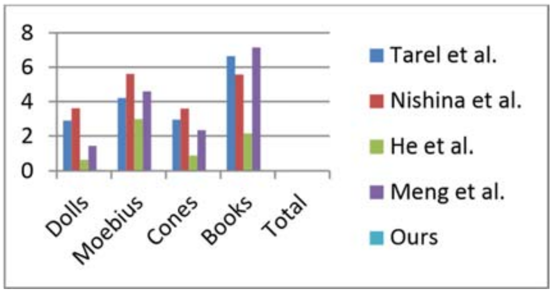

Fig 3 (b) Mean Square Error(MSE) of Different algorithms

Fig. 4(a) Position of Atmospheric Light

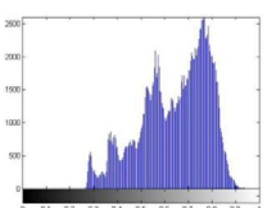

Fig. 4(b)

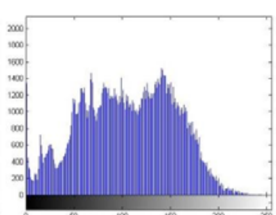

Fig. 4(c)

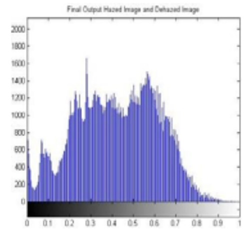

Fig. 4(d)

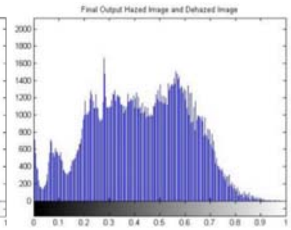

Fig. 4(e)

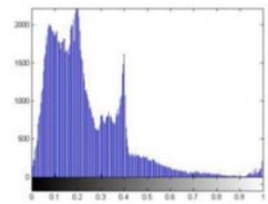

Fig. 4(f)

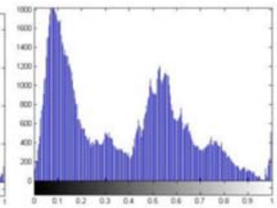

Fig. 4(g)

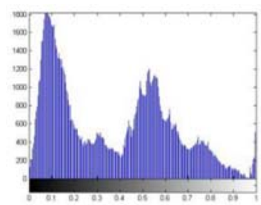

Fig. 4(h)

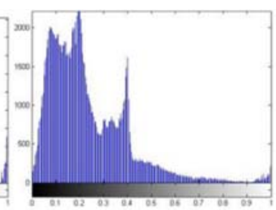

Fig. 4(i)

Fig. 4(a) Atmospheric Light Presence Fig. 4(b) Optimal Transmission, Fig. 4(c) Noise Presence after Post Processing, Fig. 4(d) Air Light Estimation, Fig. 4(e) Luminance Map, Fig. 4(f) Gaussian Pyramid Fusion, Fig. 4(g) Fast Guided Filter, Fig. 4(h) Chromatic Weight Map, Fig. 4(i) Dehazed Image Histogram. In addition, the proposed algorithms can also be applied to eliminate smog and haze due to the image. Here we select the image of unequal haze (Fig. 4(a)) and compare it with the Fattal algorithm. but the Fattal algorithm [23] can be eliminated. The sky is too bright and the color of the area is too white (Fig. 5). Our algorithms use a brightness map and DCP, which maps the data more precisely and fogs.

Our algorithm employs the brightness map and DCP, which gets estimation of the transmission map more accurately and keep a very small amount of haze suitably, resulting in more natural recovery of image as shown in Fig 5. In our experiments, the DCP algorithm was implemented using Matlab (R2012a) on Windows 8, CPU 2.5 GHz Core IM5 processor, 6GB system memory, 64 bits. We first conducted the experiment on several tests images (Toys, Cones, Mountains, Buildings). To further validate the validity of the Improvised FSIHR DCA we took many outdoor images and we simulate haze by using equation above (1). We then remove the artificial haze by using the DCP proposed by Kaiming It. The experimental results are shown in Fig. 5 underneath.

Figure 5 Output Image Compared with Haze Presence Image

VI. COMPARISON BETWEEN DIFFERENT TECHNIQUES

In this section, we have compared the fast dehazing techniques in terms of the number of arithmetic operations, computation time, dehazing in case of haze existence, and the accuracy of the DCP algorithm will be stated. The DCP algorithm is quite simple, very accurate and so easy to implement. It is very fast and gives a better result than other dehazing algorithms.From the stated facts in the pictures above, it is clear that the DCP proposed by Kaiming It, gives the best result and lowest execution time. It brings highest results in a lowest execution time even with the image degraded with dense haze. But its fault is it performs poorly when the haze is very heavy especially in the sky region.

CONCLUSION

This paper gives the knowledge, of fast image dehazing techniques. Likewise, this paper has found to be the Improvised Fast Single Image Haze Removal Dark Channel Analysis Algorithms work dramatically even when haze is high. It only one obstacle is the sky region. The Dark Channel Prior fails to remove haze in the sky region. At all it doesn't matter because the sky region is already like a haze which is a profitable situation. In terms of hazy image, the IFSIHRDCA algorithm is a superior solution because it is very fast, accurate and easy to implement. Moreover, experiment results also confirm that IFSIHRDCA algorithm is relevant choice.

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