Single Haze Removal in Dark Channel Prior Using Kalman Filter

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Abstract- **Fog is the natural phenomenon that reasons excessive problems in using & outcomes in predominant accidents. Fog degrades the view of an object and effects in bad visibility. The negative visibility of an item becomes challenge to the motive force to become aware of the item and reveal it. It creates masses of problems in using and monitoring the car. There is a lot of studies on the subject but nonetheless the problem has no longer solved to the desired end result. There exist numerous types of surroundings variations that make the foggy picture enhancement more hard. Therefore an green set of rules is required to manage up with several demanding situations springing up from the character of visibility enhancement of foggy photographs.**

1. INTRODUCTION

Fog is the visible aggregation of a remarkable amount of water droplets and ice crystals which are suspended in the atmosphere close to the floor. These droplets and ice crystals reduces the visibility and assessment of the picture which leads to blurring of part information and make the item identity very difficult. In the remote sensing gadget, surveillance, and smart automobiles, the photo look is difficulty to climate situation and as a result tormented by smoke, haze and fog.[19] There are execs and cons of dense fog: as an example, dense fog is good for tea production and increase of rubber timber however dense fog could be very dangerous for aircraft landing and take-off,

toll road driving and navigation. In the past few many years, significant efforts inside the area of picture enhancement were done to cope with terrible climate situations, in order that Advance Driver Assistance Systems (ADAS), Visual Navigation Systems (VNS) and Intelligent Transport System (ITS) can be made extra dependable, robust and green. The effect of fog at the luminance of item is modeled by way of Koschmieder's law with the assist of following relation:

L(u, v) = L0 (u, v)e −kd(u,v) + LS(1 − e −kd(u,v))…....……………… (1)

Where d (u, v) is the distance of the object at pixel (u, v) and Ls is the luminance of the sky. As defined via (1), fog has two effects: first is an exponential decay e−kd(u,v)of the intrinsic luminance L0(u, v), and 2nd is the addition of the luminance of the atmospheric veil Ls(1−e−kd(u,v)), that's an increasing feature of the item distance d(u,v). The meteorological visibility distance is defined as dm= -ln (zero.05)/okay.

Methods which restore the contrast of pictures grabbed onboard a moving vehicle under bad climate conditions are rarely encountered in the literature. Indeed, some strategies require earlier data about the scene [5]. Others require dedicated hardware so as to estimate the weather situations [6]. Some strategies rely on pictures with special fog intensities and make the most the atmospheric scattering to correctly repair the assessment [7]. Techniques based totally on polarization also can be used to lessen haziness inside the photo [8]. Unfortunately, those methods require differently filtered images of the identical scene. Finally, Narasimhan and Nayar [9] proposed to restore the assessment of more complex scenes. However, the user need to manually specify a place for sky region, vanishing point and an approximation of distance distribution inside the picture. Recently, distinct methods had been proposed which rely simplest on a single photo as input and is probably used onboard a moving vehicle. Hautière et al. [10] first estimate the climate situations and approximate a three-D geometrical model of the scene, that's inferred a priori and delicate at some stage in the restoration technique. The method is dedicated to in-vehicle packages. Tan [11] restores image contrasts with the aid of maximizing the contrasts of the direct transmission at the same time as assuming a easy layer of airlight. Fattal [12] estimates the transmission in hazy scenes, counting on the belief that the transmission and surface shading are locally uncorrelated. These methods are computationally costly: 5 to seven mins with a 600×400 picture on a double Pentium 4 PC for Tan [11] and 35 seconds with a 512×512 image on a dual core processor for Fattal [12]. Based at the principle proposed in Tan [11], i.E. The inference of the atmospheric veil, He et al. [13] as well as Tarel and Hautière [14] have proposed improved algorithms; the latter [14] is rapid sufficient for use in real-time programs. The hassle of those methods is that the depth map produced by way of their atmospheric veil inference can be faulty due to the paradox between white gadgets and fog. A novel method combining fog detection and contrast healing is proposed in [15] which is applied to the enhancement of driver help systems. Finally, a comparison healing technique capable of cope with the presence of heterogeneous fog is proposed in [16].

2. LITERATURE REVIEW

Jean- Philippe et al. In [1] proposed a brand new scheme for rating visibility enhancement algorithms based at the addition of several forms of generated fog on artificial and digital camera images. Zhiynan Xu et al. In [2] supplied a Contrast Limited Adaptative Histogram Equalization (CLAHE). Each time an image is obtained, window and stage parameters should be adjusted to maximise evaluation and structure visibility. CLAHE turned into firstly developed for clinical imaging and has proven to achieve success for enhancement of low-contrast snap shots along with portal movies. Cheng Lei et al .In [3] supplied a fast dynamic histogram equalization (FDHE) set of rules. FDHE improved the image grey distribution, balanced the grey-scale distribution and processed velocity to meet actual-time requirement.

Yan Feng et al. In [4] proposed a way for foggy photo enhancement that integrates multilevel wavelet decomposition, the automobile-adapted LUM filter out, soft threshold and so forth. Firstly, keep on the multilevel wavelet decomposition to the photograph, and then attain the low-frequency factor and excessive-frequency components of image. Chen Xianqiao et al .In [5] supplied a new set of rules for foggy image recovery in visitors, which is based totally on histogram equalization. The beneficial facts in low brightness region is preserved and the histogram of the sky place is translated and narrowed down. The enhancement region of beneficial information is enlarged and its computational complexity is low in comparison with the degraded version. J.-P. Tarel et al. In [6] proposed a novel set of rules and variations for visibility recovery from a unmarried photo.

The most important advantage of the proposed set of rules in comparison with other is its speed: its complexity is a linear characteristic of the wide variety of photograph pixels most effective. This pace lets in visibility recuperation to be implemented for the first time within actual-time processing packages together with signal, lane-marking and obstacle detection from an in-automobile camera. N. Hautiere, J.-P.Tarel, and D. Aubert in [7] supplied a brand new algorithm. According to the set of rules Fog density is first estimated and then used to repair the comparison using a flat-world assumption on the segmented free area in the front of a shifting car.

A scene structure is predicted and used to refine the restoration process S. G. Narashiman and S. K. Nayar in [8] proposed an automatic technique based totally on physical version and maximum entropy to eliminate climate effects the usage of most effective a unmarried photo. First, section the sky location via finest expected regular distribution and pick the bottom factor of the sky region as the vanishing factor. Then, take advantage of the physics-primarily based version to eliminate weather effects from the image. At last, to conquer the illness of a unmarried image lacking precise atmospheric facts, an algorithm is proposed primarily based on most entropy to pick out the optimal scattering coefficient of the atmosphere. N. Hautière, J.-P. Tarel, and D. Aubert in [9] proposed a new scheme. Weather situations are first anticipated and then used to repair the comparison according to a scene structure that's inferred a priori and refined throughout the recuperation method. Based on the aimed software, distinct algorithms with increasing complexities are proposed. R. Tan, N. Pettersson, and L. Petersson in [10] develop a technique that requires completely a single picture taken from normal digital cameras, without any extra hardware. The method basically uses coloration and intensity facts. It complements the visibility after estimating the shade of skylight and the values of airtight. The experimental outcomes on real pics show the effectiveness of the technique.

3. PROPOSED SCHEME

KALMAN IMAGE FILTERING: In[6], Dr.He proposes a noval dehazing algorithm based on the dark channel prior. The DCP is based on the assumption that the most of the non-sky patches of outdoor hazefree image contain some pixels which have very low intensities in at least one color channel.

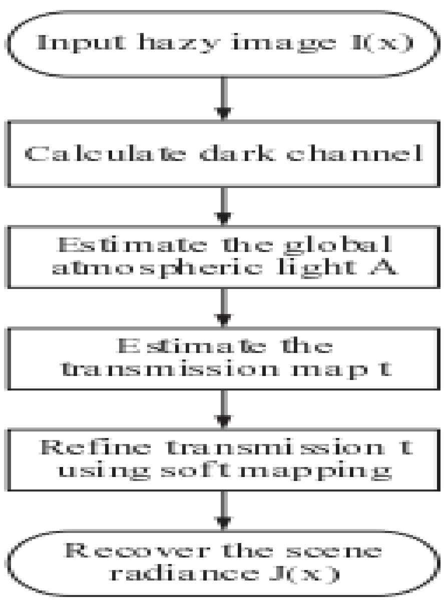

Fig. 1. Flow chart of dark channel prior scheme

Fig.1 indicates the manner of DCP scheme. Generally, we will get exceptional dehazing consequences with the aid of the DCP scheme. Whereas, there are two issues inside the scheme: the price of computing the transmission map the use of gentle mapping is excessive and atmospheric light is over-publicity while a brilliant region is shown in image.

A singular specific photograph filter out called guided filter that's broadly applicable in computer imaginative and prescient and pix. The easy concept is to estimate the clear out output q based totally on guided photo I and filter input p. Of route it is able to be used to refine the transmission t. The key assumption of the guided clear out is a local linear version between the guidance I and the filter out output q. Q is a linear remodel of I in a window ωk focused on the pixel okay: qi = ak ∗ Ik + bk∀i ∈ ωk (7) where (ak, bk) are a few linear coefficients assumed to be constant in a window ωk. To confirm the linear coefficients (ak, bk),we need to set a few constraint situations from the clear out enter p. And the output q have to subtract some unwanted additives n like noise/textures from the input p and decrease the difference between q and p whilst maintaining the linear version in Equation (7) at the identical time.

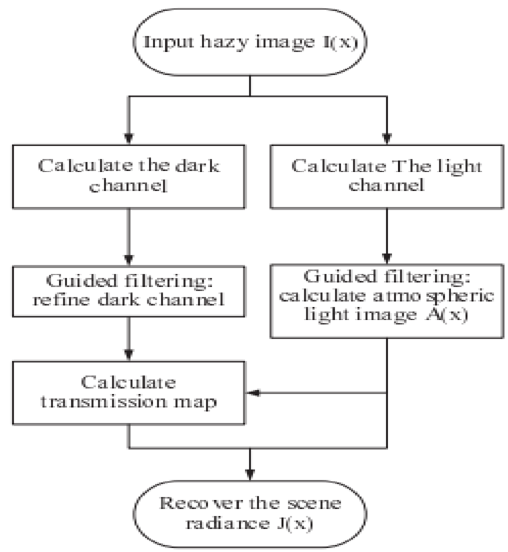

Fig. 2. Flow chart of the proposed scheme

Almost in every algorithm of hazy removal, the atmospheric light A is think as the global atmospheric light which means the atmospheric light in each pixel is same. However by observing the image, we can't come to the conclusion that the atmospheric light in a light pixel is the same as it is in a dark pixel. Similar to DCP, we propose a novel prior-light channel prior-for single image haze removal. The light channel prior is based on the statistics of outdoor hazy images. The light channel prior is based on the assumption that the most hazy image patches contain some pixels which have very bright intensities in at least one color channel.

It can be seen in Fig.1, light channel image calculated by Equation(17) of hazy image is more ambiguous and contains the block effect as the initial dark channel image. As the dark channel image can be refined by guided filtering, we can also refine the bright channel. Fig.2 is the flow chart of the proposed algorithm. In our algorithm, double thread is applied to process both light channel and dark channel because they are independent before calculating the transmission map. Moreover we greatly save a part of the time in this way. Fig.6 is the refined results of Fig.4b. As we can see, the halo and block effects are suppressed, and the atmospheric light is different at different pixel.

4. SIMULATION RESULT

input image

dark channel

haze free image

radiance image

transmission estimate

Above figure shows the hazy image, the atmospheric light image, the transmission map. It is clear that our method has a good effect on the hazy removal and does not need to consider the effect of the brighter area, although the effect is better than existing methods. Comparing our method with existing method, we can find that our dehazing effect is better than his in visual sensor. It is mainly because the atmospheric light is not a single value but an image consisting of a series of values.

5 CONCLUSION

A solution was proposed to discover the unfastened area area in foggy road scenes way to a assessment recovery approach. First, the method estimates concurrently the density of fog and the placement of the horizon line inside the photo, which improves notably the kingdom of the art in this area. A especially powerful fog ROI segmentation approach based totally on geodesic maps computation is proposed in addition to a novel joint fog density and horizon line estimation procedure. Thanks to a easy contrast recuperation approach, the proposed method is then able to restore the contrast of the road and at the equal time to phase the vertical items. Indeed, these objects are falsely restored and on this way effortlessly segmented. An experimental validation lets in figuring out the capability of the method. Results on sample photographs extracted from video sequences acquired from an in-vehicle digital camera are shown and mentioned. In the destiny, we would like to integrate those works in prototypes and test intensively the technique, with the intention to pick out some eventual new problems which can appear.

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