Remove Strong Light and Atomized Algorithms for Digital Image

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Abstract--**In this study using dark channel prior for single image remove strong light and atomized. The method used to dark channel estimate transfer and Soft Matting transmittance, of a method for thinning processing, obtain a depth map image of strong light. the light reflected from the scene is affected surface of airborne particles, which leads to a decrease in image contrast, while the ambient scene light will be scattered in the air suspended particles, the scattered light into the imaging device and will cause the image color drift, the overall look of the image becomes blurred images and details of the contents illegible gray color bias. Image of outdoor scenes are degraded by the medium. Can be effective remove strong light, so that the overall image contrast in natural.**

Keywords — ***Strong light; Dark channel prior； Soft Matting transmittance； image color drift.***

I. INTRODUCTION

Often, since the light reflected from the scene is affected surface of airborne particles or Aerosol, which leads to a decrease in image contrast, while the ambient scene light will be scattered in the air suspended particles, the scattered light into the imaging device and will cause the image color drift, the overall look of the image becomes blurred images and details of the contents illegible gray color bias.

Image of outdoor scenes are degraded by the medium. In such cases, the light from the medium and the particles by the refraction, reflection and scattering phenomena in the atmosphere that image imaging will caused by overdose cases. The irradiance received by the camera from the scene point is attenuated along the line of sight. Furthermore, the incoming light is blended with the airlight [1], ambient light reflected into the line of sight by atmospheric particles. Since the emergence of strong light depends on the angle of light and the amount of light from the lens to capture all the light refraction and reflection between images, the last light into the images.

Remove strong light is desires in both computational photography and computer vision applications. Remove strong light can increase the visibility of the scene and correct the color shift caused by the airlight. In order to improve the visual quality of the input image shooting in dynamic illumination environments, luminance and color information is characterized in terms of the spatial frequency [2]. This characteristic leads complexity performance trade-offs between the global and the local in the spatial perspective. Especially, the transfer function design that improves the visual perception is an important key to perform the image enhancement. Strong light image is not visually pleasing. The computer vision algorithms are from low-level image to high-level analysis and recognition. The performance of vision algorithms (e.g., filtering, and photometric analysis) will low-contrast scene radiance.

Histogram equalization (HE) technique makes use of the probability distribution of the input intensity to remap into the defined gray levels. [3][4]. According to the entire remapping, the HE shows the acceptable performance under uniform illumination. The suitability separated HE was reported to preserve the brightness and improve the contrast [5]. Power function is RGB (Red, Greed, Blue) turn into HSI(Hue, Saturation, Intensity) converting three different components take of Intensity enhancement components made to improve over-dark and over-light in the environment light.

In this paper use dark channel prior [6], for single image remove strong light. We find that, in most of the local regions which do not cover the sky, have very low intensity in at least one color (RGB) channel we can call the dark pixels. The intensity of these dark pixels in that channel is mainly contributed by the airlight. The method used to dark channel estimate transfer and Soft Matting transmittance of a method for thinning processing, obtain a depth map image of strong light.

This method has the physical effectiveness, when the scene approximate blackbody target dark channel does not exist, the method will fail. But for us can be effective remove strong light, so that the overall image contrast in natural.

II. DARK CHANNEL PRIOR

Image imaging with a physical model of haze: Based on the Koschmieder's [7] proposed the reflected light reaches the observer causing poor visibility. The formation of a haze image as:

$$\mathrm{I(x)} = \mathcal{T}(\mathrm{x})\mathrm{t(x)} + \mathrm{A}(1 - \mathrm{t(x)}) \qquad (2\text{-}1)$$

Where I is the light intensity, $\mathcal{T}$ is the scene radiance, A is the global atmospheric and t is the describe scene radiance of transmission process is not scattering of

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transmittance of the atmosphere. When the atmosphere is homogenous, the transmittance t can be express as:

$$t(x) = e^{-\beta d(x)} \quad (2\text{-}2)$$

Where β parameter is the scattering coefficient of the atmosphere and d is scene depth.

(1) Dark channel prior：

This algorithm is based on the observation outdoor scene image: in the non-sky patches at least one color channel have very low intensity at some pixels. The minimum intensity in anyway a patch has a very low value, express as:

$$\mathcal{J}^{dark}(x) = \min_{c\in\{r,g,b\}}\left(\min_{y\in\Omega(x)}\left(\mathcal{J}^{c}(y)\right)\right) \quad (2\text{-}3)$$

Where $\mathcal{J}^{c}$ is a color channel of J and Ω(x) is a local patch centered at x.

(2) Estimating the transmission

Image is directly to estimate atmospheric transmission transmittance. In order to record image while having a sense of depth perspective, in formula (2-4) adding a parameter $\omega(0 < \omega < 1)$, reserved small amount of haze, express as:

$$\tilde{t}(x) = 1 - \omega * \min_{c}[\min_{y\in\Omega(x)}(\frac{I^{c}(y)}{A^{c}})] \quad (2\text{-}4)$$

(3) Estimate atmospheric light

Extracting the dark channel of the brightest band of 0.1% a pixel and their corresponding maximum brightness values in the original image as an estimate atmospheric light.

(4) Recover the scene radiance

The computed distribution of atmospheric light and transmittance can restore the scene radiation, express as:

$$\mathcal{J}(x) = \frac{I(x)-A}{\max[t(x),t_0]} + A \quad (2\text{-}5)$$

When t_0 close to zero, the recovered image will contain noise of the direct, so set a threshold to reserve amount of haze.

III. Implementation and Experimental Result

This study use two image processing algorithm that are Histogram equalization (HE) and Power function objective way to compare with dark channel prior obtained image quality.

Our method estimate the transmission by the parameters ω, adjustment some factors (e.g. light, haze and atomization), avoid excessive removal of non-natural phenomena. We can see figure 3-1 different parameters showing image, remove strong light effect is different. We found figure 3-2 that the parameter values closer to 1, the better to remove strong light, the value of right move slowly to the left, to eventually be distributed throughout the middle, not too high or too low. Figure 3-3 show three method the compare you can found (b) and (c) the light have reduce but (c) better the (b) that contrast and light but this method have a defect that oversaturated.

IV. Conclusion

In the experimental results, the dark channel prior can be effectively removing strong light, but the saturation will appear oversaturated. When white and dark situation (e.g. shadow, black and white marble surface) in discrimination may be error, classified into light inside, so this is after we have to overcome. On the whole, our method removes strong light problems brought to us, nor excessive remover light of retained some of the light, so that image is become to natural.

References

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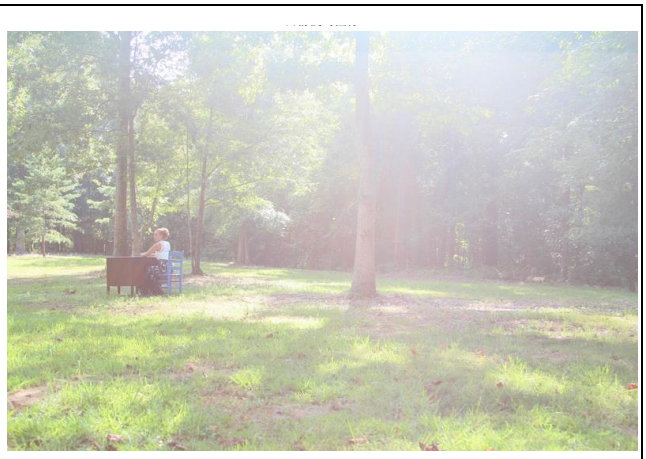
(a) Original image

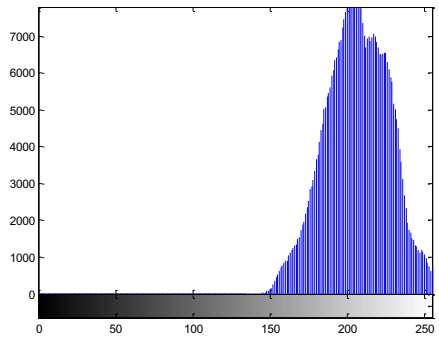


(b) Using dark channel prior ω is 0.2.

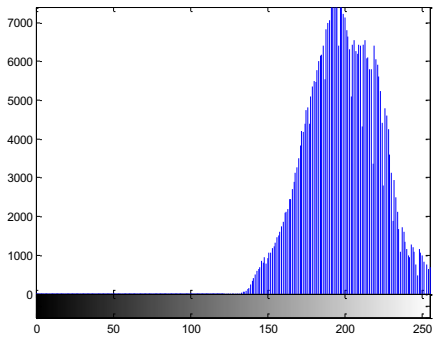
(c) Using dark channel prior ω is 0.5.

(d) Using dark channel prior ω is 0.8.

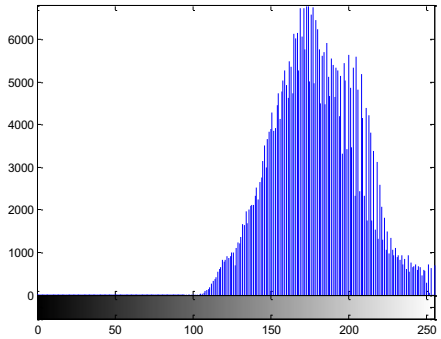
FIGURE 3-1 Strong light removable using dark channel algorithm.



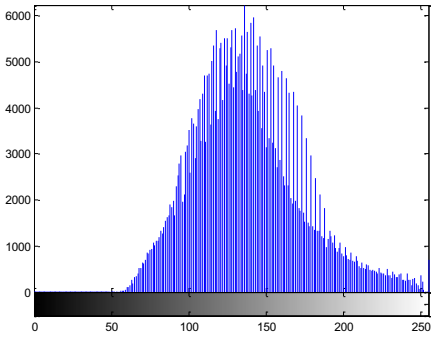
(a) Original image



(b) Using dark channel prior ω is 0.2.

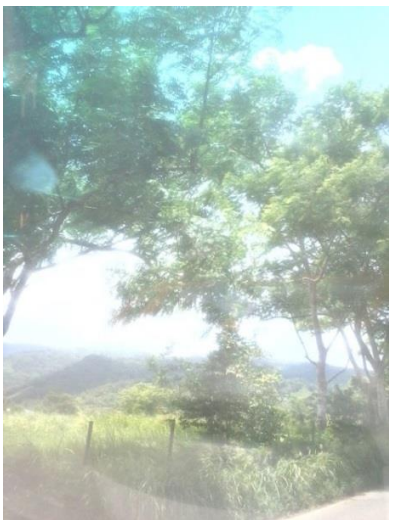


(c) Using dark channel prior ω is 0.5.



(d) Using dark channel prior ω is 0.8.

FIGURE 3-2 Processing image on original and dark channel prior by HE



. (a) Original image

(b) Power function in block 3*3.

(c) Dark channel prior ω is 0.8.

FIGURE 3-3 Comparison of result by different method