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SHADOW REMOVAL FROM SINGLE TEXTURE REGION

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ABSTRACT
Shadows arise in images wherever three-dimensional substances are exposed by robust directional lights. Shadows will knowingly influence the effects of image processing, such as object discovery and image subdivision. Shadow removal has been an important subject as one kind of introductory processing methods and varies schemes have emerged.

KEY WORDS-shadow removal, histogram matching

I .INTRODUCTION

The occurrence of shadows has been accountable for dropping the reliability of many computer visualization algorithms, including subdivision, object discovery, scene investigation, stereo, tracing, etc. Therefore, shadow recognition and elimination is asignificant pre-processing for educating performance of such visualization tasks.

Breakdown of a single image into a shadow image and a shadow-free image is a hardproblematic, due to composite interactions of geometry, albedo, and brightness. Many techniques have been projected over the ages, but shadow recognition still remains avery challenging problematic, particularly from a single image.

Our goal is to make a scheme that can mechanically detect shadow regions and then eliminate from simple images. While perceiving all shadows is expected to remain hard, we make some restrictions related to the images.

II. RELATED WORK

Generally speaking, two stages of work wants to be done for eliminating shadows: shadow recognition and image returning. A lot of approaches have been established to recognize the shadowed area, most of them are with user provided hints and a few use an automatic way to section shadowed region from one single image.

For example, M. Baba et al [1] detect shadow by a K-means grouping method on color distribution. A darker cluster is categorized as shadow region. In [2], they detect the shadow region based on the shadow mass, which is defined as a measure of intensity. Then the shadow is detached by adjusting the intensity and color. In the end a smooth filter is used to correct borders between sunshine and shadow regions. This system provides moral results, but it enforces many constraints of the surfaces in the image. Some of the most standardmethods in shadow elimination are characterized by the work of Finlayson and colleagues whose work differ from other methods that are based on color constancy conditions as the lightness algorithms, in using a so-called illuminant invariant approach [3,4,5]. Shadow elimination is then achieved by an image matting approach and then the shadow free image is improved by relighting each pixel in the shadow.

III. SHADOW MODAL

A. SHADOWED MODEL

In this paper, we assumed a simple shadow model which the lighting of image contains two foundations, one is the direct light, usually being measured as sun light, and the other is environment light. We present an algorithm to mechanically discover shadows and eliminate them from simple consumer images. We start from the idea that for home-use photograph and significant application would be to be able to eliminate the shadows cast by objects into the ground. Our algorithms are established in Matlab and C++.

For shadow recognition we present an approach based on statistics of intensity:

1. We signify the picture in the YCbCr color space. We stress on the Y channel, and compute its histogram. Histogram dissension gives us a more distinction image at the Y channel.
2. We compute the full average of the image at Y channel
3. Then we accomplish sliding window iteration through the image. The sliding window size is condensed iteratively
4. In order to choose which pixels belong to the shadow, we engage two approaches:

a) We consider being part of the shadow those pixels that have the concentration lower than 60% of the full average

b) Compute the non-shadow point's average for the sliding window. We consider being part of the shadow, the pixels that have the concentration lower than the 70% of the window's average

Afterwards this, we compute the median filter to decrease the noise

As a further development, we can present a segmentation algorithm and we can use our method for each of the segments.

The algorithm finds the lower concentrations areas in the picture, and this can be blacker object or darker textures not related to shadows (false detection).

B. SHADOW REMOVAL

Model based shadow elimination-

We use a simple shadow model, where there are two kinds of light foundations: direct and ambient light. Direct light comes directly from the source (L_d), while environment light(L_r) is from replications of neighboring surfaces. For shadow areas part or all of the direct light is occluded.

Generally talking, the model decomposed an image I into two portion: the albedo image R and the light image L, R stands for the reflectance of each pixel and L stands for the light radiance of the image, furthermore, the light irradiance is disintegrated into a linear mixture of the sun light S and the environment light E, as illustration

$$I=RL=R(\alpha S+E) \quad (1)$$

α is a factor shows which area of the pixels go to, for a shadowed image should contain mainly two parts, nonshadowed area and shadowed area, and shadowed area is detached into two parts: penumbra and umbra. $\alpha=1$ resembles to the non-shadow region, $0<\alpha<1$ is the penumbra, $\alpha=0$ to the umbra. We can see that casting shadows created duel to the loss of S which stands for the direct sun light, and the environment irradiance does not change to the whole image with this model. Hence we can derive (2) from (1)

$$I=A\alpha+B \quad (2)$$

Where A=RS, B=RL,B is constant for each pixels of the image and $A\alpha$ varies in dissimilar regions. Zhenlong and Xueying [7] used this model, and they explained the value of L and S from a single image after a series of compound calculation and used them for removing the shadow.

Based on (1) we substitute I with R, G, B values of each pixel, resulting the following equation:

$$R=[AR\alpha+BR]\rho \quad (3)$$

$$G=[AG\alpha+BG]\rho \quad (4)$$

$$B=[AB\alpha+BB]\,\rho(5)$$

Where ρ is a constant factor of the camera sensor, quantified by certain camera. Closing from (3) (4) and (5) we can see that the pixel values for each pixel in a single image has a linear relation with α only.

The shadow model can be represented by following formula:

$$I_i=(t_i\cos\theta_i L_d+L_e)R_i$$

-$I_i$denotes the value for the i-th pixel in RGB space.

-L_d and Le represent the intensity of the direct light and environment light, also measured in RGB space

-$R_i$is the surface reflectance of that pixel.

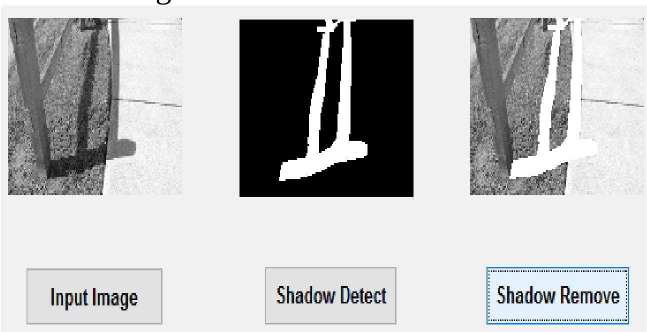
-θ_i is the angle between the direct lighting direction and the surface norm

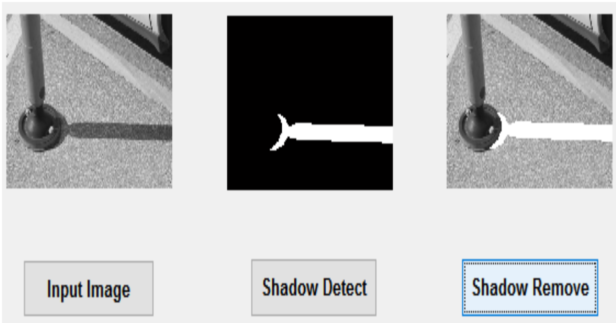
- t_i is the attenuation factor of the direct light; if t_i= 1 means the object point is in a sunshine region, if t_i = 0 then the object point is in a shadow region.

We denote by $K_i = t_i \cos\theta_i$ the shadow coefficient for the i-th pixel and by $r = L_d/L_e$ the ratio between direct light and environment light.
Based on this model, our goal is to renew each pixel using this coefficient in order to obtain a shadow free image.

IV. EXPERIMENT RESULTS

Here are some results of our shadow recognition and elimination methods.





The shadow recognition has good results at same regions, but for more surfaced regions it could result in incorrect detections.
Concerning shadow elimination algorithms, we saw that the light based model has the benefit of maintaining the texture in the images, while shadow is removed. Some problem still occurs at the boundaries of the shadow, mainly due to the sharp edges of the shadow masks.

V.CONCLUSION

Shadow elimination is a problematic task. Many methods have been suggested to solve this problem in the past decades.
In this paper, a simple and fast method has been projected to eliminate shadows from single surface image. By applying shadow matting and local histogram matching to shadows, we accomplished a nice result, but there is still things not that prefect, since pixels value are of quantization during their handling, the range of the pixels value is different between shadowed and non-shadowed regions, this lead to the problem that we can never find one function which meet a point-to-multi-point mapping, but a point-to-point mapping, resulting in the uneven of the histogram of the shadow-free region. Our method is based on analyzing statistic of intensities related to light. Our system can eliminate shadows from similar textures.

REFERENCES

I. M. Baba N. Asada, Shadow Removal from a Real Picture, Proceedings of the SIGGRAPH conference on Sketches & applications, 2003
II. M. Baba, M. Mukunoki, N. Asada: Shadow Removal from a Real Image Based on Shadow Density, SIGGRAPH Posters, 2004.
III. G.D. Finlayson, S.D. Hordley and M.S. Drew. Removing shadows from images. ECCV, 2002
IV. G. D. Finlayson, S. D. Hordley, and M. S. Drew. Removing shadows from images using retinex. Color Imaging Conference. IS&T - The Society for Imaging Science and Technology, 2002.
V. G. D. Finlayson, S. D. Hordley, C. Lu, and M. S. Drew. On the removal of shadows from images. PAMI, 28:59–68, Jan 2006.
VI. R. Guo and Q. Dai and D. Hoiem. Single-Image Shadow Detection and Removal using Paired Regions CVPR, 2011.
VII. Du, Zhenlong, Hai Lin, and Hujun Bao. "Shadow removal in gradient domain." Image Analysis and Recognition. Springer Berlin Heidelberg, 2005, pp. 107-115.