

Shadow Detection And Removal From Images

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Abstract— A shadow appears on an area when the light from a source cannot reach the area due to obstacle by an object. The shadows are sometimes helpful for giving useful information about objects. However, they cause problems in computer vision applications, such as segmentation, object detection and object counting. Thus shadow detection and removal is an important task in many computer vision applications. The proposed algorithm uses the threshold method to detect and remove the shadow from a single RGB image. This method is a simple, fast and efficient way to remove shadows from images once the location of shadows has been found. The shadows are detected and removed using morphological operators. The benefit of this method is that removing shadow does not affect the texture and all the details in the shadowed regions.

Keywords— Shadow Detection, Shadow Removal.

I. INTRODUCTION

Shadows and shadings in images lead to unwanted problems on image analysis. That's why much attention was paid to the area of shadow detection and removal over the past decades and covered many specific applications such as traffic surveillance, face recognition and image segmentation.

A shadow occurs when an object partially or totally occludes direct light from a source of illumination. In general, shadows can be separated into two main classes: self and cast shadows. A self shadow occurs in the portion of an article which is not illuminated by direct light. A cast shadow is the area projected by the article in the direction of direct light. Based on the intensity, the shadows are of two types – hard and soft shadows. The soft shadows keep the texture of the background surface, whereas the hard shadows are too dark and have little texture. Thus the detection of hard shadows is obscured as they may be mistaken as dark objects rather than shadows. Though most of the shadow detection techniques need several images for camera calibration, the best technique must be able to extract shadows from a single image. This paper provides easy method to detect and remove shadows from RGB image.

II. LITERATURE SURVEY

Shadow detection and removal from image related work as followed.

1. The Mask Pyramid-Based Shadow Removal method [1], they first identify shadowed and lit areas on the related surface

in the scene utilizing an illumination-invariant distance measure. These areas are utilized to calculate approximately the factors of an affine shadow formation model. A novel pyramid-based restoration method is then applied to produce a shadow-free image, while evading defeat of texture contrast and beginning of noise. They report for varying shadow intensity within the shadowed region by processing it from the interior towards the boundaries. Finally, to make sure a seamless transition flanked by the original and the recovered regions they apply image in painting along a thin border.

2. A Complete Processing Chain for Shadow Detection and Reconstruction method [3], the detection and classification chores are accomplished by indicates of the state-of-the-art support vector machine approach. A quality check mechanism is included in order to reduce subsequent misreconstruction difficulties. The reconstruction is based on a linear regression method to compensate shadow regions by correcting the intensities of the shaded pixels according to the statistical characteristics of the corresponding nonshadow regions. Moreover, borders are clearly handled by making use of adaptive morphological filters and linear interpolation for the avoidance of probable border artifacts in the recreated image.

3. Detecting and removal method [4], initiates with a segmentation of the color image. It is then decided if a segment is a shadow by examination of its neighboring segments. They utilize the method introduced in Finlayson to eliminate the shadows by zeroing the shadow's borders in an edge representation of the image, and then re-integrating the edge using the technique introduced by Weiss. This is completed for all of the color channels thus leaving a shadow-free color image. The current technique requires neither a calibrated camera nor several images.

4. They utilize Removing Shadows from Images method [6], position out in to derive a 1-d illumination invariant Shadow-free image. They then utilize this invariant image collectively with the original image to position shadow edges. By setting these shadow edges to zero in an edge representation of the original image, and by subsequently re-integrating this edge representation by a method paralleling lightness recovery, They are able to appear at our sought after full color, shadow free image.

5. They utilize Deriving Intrinsic Images from Image Sequences method [7], demonstrates how to recover intrinsic illumination and reflectance images under the assumption that the histogram of the illumination and intensity derivatives are sparse, meaning most of the values are 0. A sequence of images with illumination changes, where shadow edges move, but with no reflectance changes, where all the surfaces and objects do not move, go through derivation filters. For each pixel, only the median of this sequence is kept, amounting to the maximum-likelihood estimation of the invariant reflectance. While this method computes especially natural looking, shadow less images, it does not work on single images or on a sequence where illumination does not change or where the reflectance does.

6. Pattern Recognition method [8], making various assumptions about the behavior of shadows at their boundaries, and segment images into shadow and non-shadow regions with the help of a manually trained support vector machine. After some post-processing, continuous and closed boundaries are found, and pixel color within the shadow regions are replaced with the average color found at the boundaries. Unfortunately, this method removes all high frequency details from the shadow regions and amounts to a very strong smoothing of the reflectance.

III. METHODOLOGY

. Fig 1 shows a flowchart with the main step methodology. Let us judge an image I of dimension $l \times w$. This image distinguished by the attendance of shadow area and composed of N bands. In first step, arrange image for image processing by converting color image into gray scale. After this step image contain only intensity information. Apply threshold function on grayscale image in order to distinguish shadow and nonshadow region.

A. Grayscale Conversion

The grayscale conversion is executed by grayscale conversion algorithm, which convert color image into grayscale image. Algorithm applies on original input image characterized by shadow region. In this algorithm, initially analyze length (l) and width (w) of image. Find pixel value in integer format at (x,y) location of image, where x is the distance from the origin in the horizontal axis, y is the distance from the origin in the vertical axis. Convert this integer value into hexadecimal value. By doing this, I find Red(R), Green (G) and Blue (B) of that pixel. Then analyze GRAY value for that pixel by using equation (1). Relate this evaluated GRAY value to every one Red(R), Green (G) and Blue (B) value of that pixel i.e. $R=GRAY$, $G=GRAY$, $B=GRAY$. Currently reset this new Red(R), Green (G) and Blue (B) to that pixel. Relate equal step for pixels starting 0 to width (w) and for pixel starting 0 to length (l). As a finishing point, I get grayscale image.

$$= (+ +) 3 \quad (1)$$

B. Threshold function

This technique challenges to remove shadows by using threshold method pixels value is divided into high and low level intensity, threshold is locate to discriminate between self and cast shadow, cast shadow pixels are than replaced by background pixels. The gray scale image is applied to the threshold technique it can be converted into binary image. White area specify foreground and gray pixel signifies shadow, pixel image is taken, black region means background.

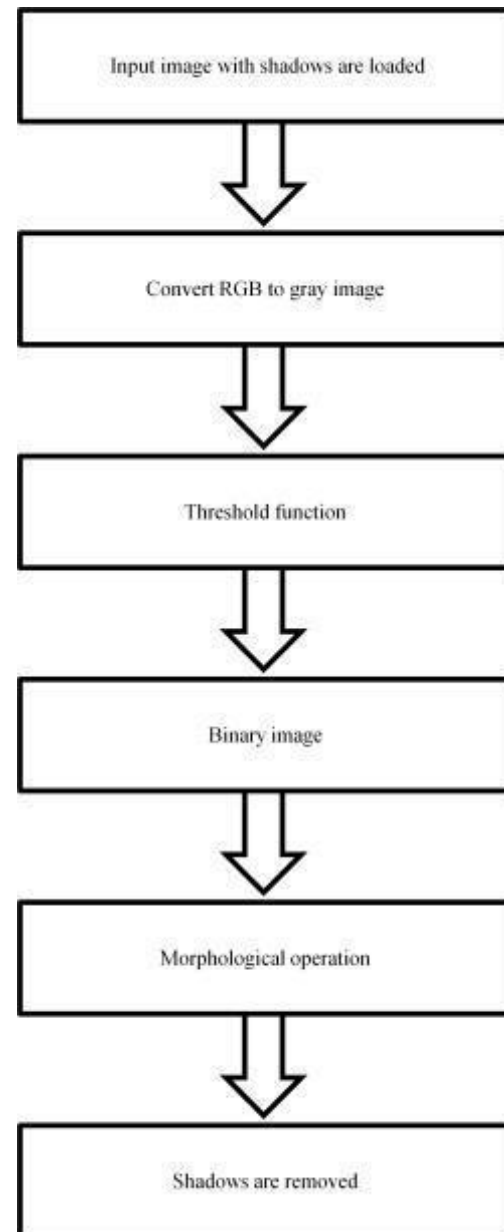


Figure 1-Shadow Removal

C. Morphological operations

There are four basic operations for morphological operation on a digital image. Those are erosion, dilation, opening and

closing. Dilation is the expansion of the foreground whereas erosion is the contraction of the foreground. If a foreground pixel is detected, dilation would mark its current pixel as a foreground and erosion would perform the opposite way. When erosion is followed by dilation, the technique is called opening and it will eliminate noises that are present in the background. When dilation is followed by erosion, the technique is called closing and it will fill up any unwanted holes inside an enclosed foreground area. These operations can be used to eliminate misclassified and isolated pixels. This guides to an improved performance.

D. Shadow removal

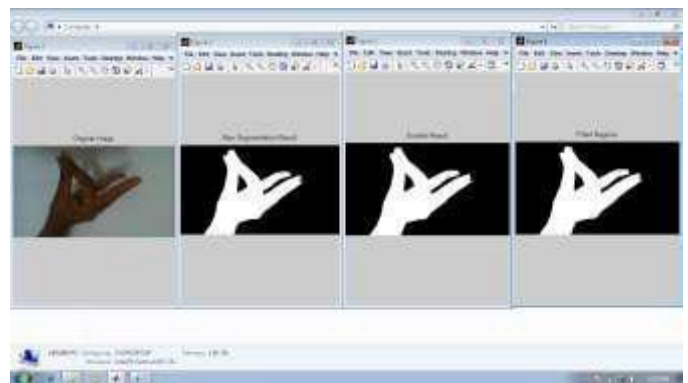
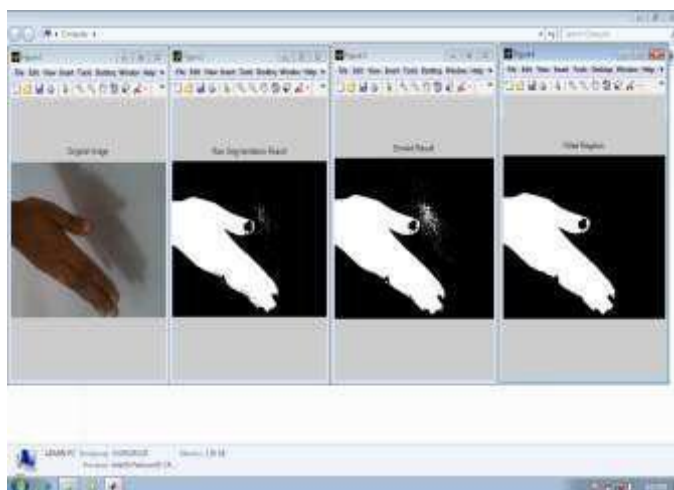
Shadow removal approach is supported on a simple shadow model where lighting consists of directed light and environment light. I try to identify how much direct light is lies for each pixel in the image and relights the entire image using that information.

E. Shadow Model

In shadow model, there are two categories of light sources: direct light and surroundings light. Direct light comes directly from the source (e.g., the sun), while surroundings light is from reflections of surrounding surfaces. Non-shadow areas are lit by both direct light and surroundings light, while for shadow areas, part or all of the direct light is occluded.

IV. RESULT AND DISCUSSION

The work done the threshold method reveals a better result when compared to the other existing systems. threshold method pixels value is divided into high and low level intensity, threshold is locate to discriminate between self and cast shadow, cast shadow pixels are than replaced by background pixels.



V. FUTURE WORK

The future work of proposed system is to implement the video. The effectiveness of this method is needed to check in real time situations. This method needs to implement in specialized application for satellite images and cricket stadiums.

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