International Journal of Scientific Engineering and Applied Science (IJSEAS) – Volume-2, Issue-6,June 2016
ISSN: 2395-3470
www.ijseas.com

GROUND SHADOW DETECTION AND ESTIMATION

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ABSTARCT: A simple way to estimate shadow of an object by using human cast shadows. Shadow detection is important for areas like augmented reality, image processing, sunlight direction estimation etc. This paper focus on a simple distance calculation method to find the slope of a cast shadow so as to provide shadow for any inserted object in the image. The simplicity of the method helps to concentrate on human shadow which are always available and need not perform training on other objects.

I. INTRODUCTION

There are several existing methods in determining shadows. They are very important in image processing, augmented reality, etc. Here we concentrate on giving realistic shading for an object inserted to an image. The existing methods for this purpose lie upon illumination information, shadows and other small data like sky, shading on vertical surfaces , or object geometry etc. This paper involves cast shadow detection which is based on [] and the detected shadow points are utilized to find the maximum length distance between two x coordinate points and also for y coordinate points. This provides the slope, which can be given for any object inserted to the image. We use the maximum length of the distance calculated between given x points and also between y points of the shadow because we only use human shadows for this method. This is because of the view that human create elongated shadows. Then the longest distance found will be in the direction opposite to that of the sunlight. It need not required that we need to provide the full shadow obtained. We can also provide selected areas for distance calculation. We also provide the position of object so as to understand the direction of shadow i.e., if the object is right of the cast shadow , the shadow lies left of the inserted object. This simple view opens up a new method of estimating shadow direction.

The paper is organised in five sections. Section II deals with shadow detection methods, section III covers shadow estimation, section IV concludes the paper, section V gives future works.

II. SHADOW DETECTION METHODS

A. BILATERAL FILTRING

It is done to sharpen the image by preserving the edges while smoothing it. They combines gray level pixels or color pixels based on their geometric closeness or photometric similarity. It is based on Gaussian low pass filtering that compute weighted average of neighbouring pixel value. Images have slow variations over space, thus neighbouring pixels have similar values hence can average them. Weights are given according to the distance, and are inversely proportional to the distance from neighbourhood center.

B. WATERSHED ALGORITHM

Image segmentation is a computer analysis of image objects or boundarieson deciding which pixel belongs to each. There are different methods of watershed algorithm like distance transform, etc, For example distance transform of binary image is distance of every pixel to nearest non-zero valued pixel . Each pixel in a region would be similar to some computed property such as texture, color, intensity etc.

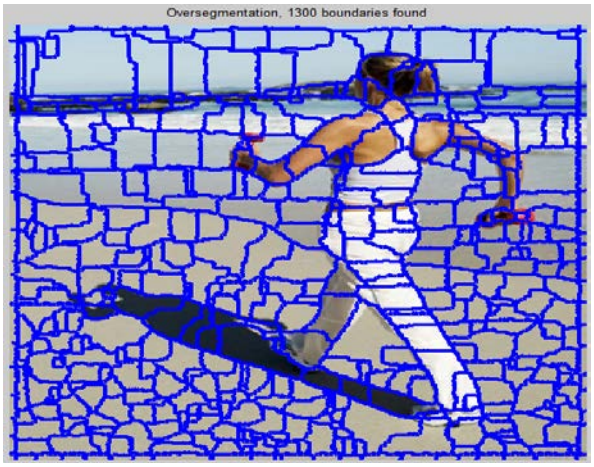

Fig.1. Segmented Image

C. CONDITIONAL RANDOM FIELD

Conditional Random Fields are a class of statistical modelling method often applied in pattern recognition and machine learning, where they are used for structured prediction. In computer vision, CRFs are often used for object recognition and image segmentation. It connects similar pixels, avoids junctions.

Fig.2. Strong Boundaries

The ground layout is calculated and matches with the strong boundary image to get the cast shadow.

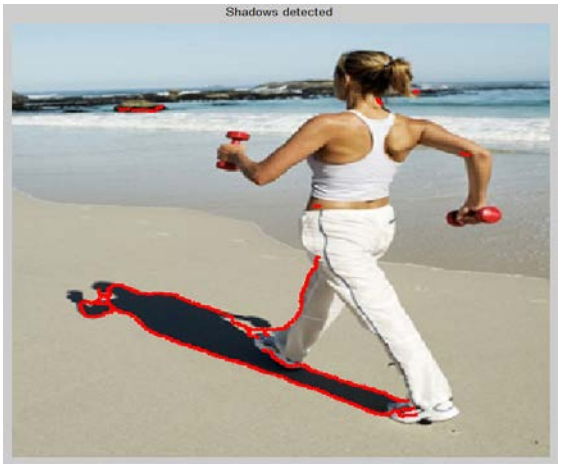

Fig.3. Ground shadow

III. ESTIMATION OF SHADOW DIRECTION

The detected shadow boundary is copied to a cell array. The maximum distance between two x points are calculated also that of y points. The maximum distance is used to find the slope, which will be the direction of shadow. The position where the shadow could be placed can be found out using the position of object and ground shadow points. Thus for any inserted object in image, shadow can be provided.

Fig.4. Slope detection

Fig.5. Inserted object and shadow

IV. CONCLUSION

The method focus on simple way of calculating shadow for an inserted object in an image. It depends only on human shadows, since they are long distance calculation is done for estimation. The method eliminates complex training, use of geometrical patterns and numerous use of data. The method might not work when the human shadow is not long i.e., bending of human doesnot provide a long shadow. We can select region of interest for ease of use.

V. FUTURE WORK

The method can be extended for different objects like for human we used maximum distance, for some other like a car we need to change the concept to width also. Thus widening the method to include other objects.

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