Depth of Field Image Segmentation Using Saliency Map and Energy Mapping Techniques

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Abstract— Image plays a vital role in image processing. In Image processing Depth of Field is to segment the relevant object from an Image. Depth of Field is the space between the near and extreme objects in a scene. The objective of this work is to segment the image using Low Depth of Field .Unsupervised segmentation is used to find low depth of field image. Saliency map and curve evaluation method is created and initialized for the image. Energy map have been employed so as to bring the desired result. Lipschitz function is used to generate the mathematical view of representation. Various Iteration methods have shown the graphical representation of an image. The Segmented results have shown the Object detection in an image.
Keywords: Low DOF image, iteration, segmentation, curve evaluation, object detection.

I. INTRODUCTION

Image segmentation is a basic process in many image, video, and computer vision applications [1]. It is often used to segment an image into divide regions, which ideally match to different real-world objects. It is a grave step towards content analysis and image understanding [3]. Unsupervised image segmentation is always one of the most difficult troubles in computer vision. In this paper, we focus on the partition of low depth of field (DOF) images. Segmentation of images with low DOF is also critically significant in applications such as image improvement for digital cameras, object recognition, image indexing for content-based retrieval and 3D microscopic image analysis. Low DOF is an important method extensively used by qualified photographers for variety types of images, such as telephoto images, to highlight a certain object. It is also a key method for microbiologists to understand the 3D arrangement within a specimen under a high-power microscope. In this paper various methods are implemented [5]. Normal being image is virtually perfect in segmenting sharply focused objects-of-interest in a low DOF image. Often, together global and local image characteristics are utilized by the human visual system while segmenting images.

We have developed a fully automatic curve evaluation segmentation algorithm for low DOF images. The algorithm is calculated to partition sharply focused objects in the images. In this section, we briefly explain the concept of depth of field in taking photos and its connection with image segmentation [6]. Low DOF is an important photographic method commonly used to assist readers in understanding the depth information within a 2D photograph [2]. The various methods are used in the proposed work Curve evolution, Lipschitz function and energy map is created [9]. Maximum iteration is reached and binary image is put a view as energy map. Finally get the segmented objects from the original image. Depth of field increases the listeners' depth insight when performance a two-dimensional projection of a three-dimensional scene.

II. METHODOLOGY

The proposed work is given below

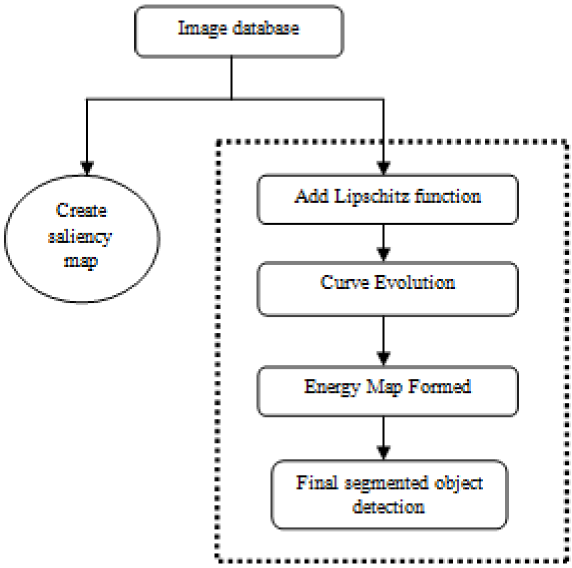

Fig. 1: System Architecture

A. DEPTH OF FIELD

Depth of field (DOF) is the range of distance from a camera that is adequately sharp in the photograph. A usual camera is a visual system containing a lens and an image screen. The lens creates images in the plane of the image screen which is generally parallel to the lens plane [3]. Note that the lens plane may not always be similar to the plane of image screen. Indicate the focal length of the lens by f and its diameter by a. Denote the aperture f-stop number for this photo by p. Then, f=ap. Suppose the image screen is at distance d from the lens and the object is at distance s from the lens. If the object is in focus, then the Gaussian thin lens law holds:

$$\frac{1}{s}+\frac{1}{d}=\frac{1}{f}$$

A peak closer or farther away from the lens than s is imaged as a circle. Assume the largest circle that a human can tolerate, namely, the circle of minimum confusion, has a diameter of c. A point is measured sharp if and only if the image of the point is lesser than the circle of minimum confusion df and dr are the front and the rear DOF limits, respectively. By simple geometry, it can be shown that

$$d_f=\frac{scp(s-f)}{f2+cp(s-f)},\ d_r=\frac{scp(s-f)}{f2-cp(s-f)}$$

Usually the size of the circle of minimum perplexity is fixed for a given image size. For a fixed circle of minimum confusion, we close from the above equations that larger aperture, closer object distance, or longer focal length, leads to lower DOF.

B. LOW DOF AND IMAGE SEGMENTATION

The normal human vision system (HVS) is nearly perfect in depth view of both low DOF and high DOF photographs. For the case of sympathetic high DOF photographs, human knowledge plays a key role [7]. For example, the HVS is able of interpreting a lake in a scene as a flat surface. The HVS can also understand cartoon sketches when no detailed surface information is available. On the other hand, for images with considerably separate depths, such as images with low DOF, the unevenness of objects assists our depth perception. Low DOF is often chosen by expert photographers when taking a photograph with disturbing background objects. Low DOF microscopic imaging is also significant for microbiologists who use a low DOF microscope to determine the 3D arrangement of a specimen from 2D slices.

III. PROPOSED WORK

In this proposed work the low DOF images are stored in the database. The input images are read from the database. Initialized the iteration methods are applied in the images. After that various functions are used in this proposed work.

A. SALIENCY MAP

The Saliency Map is a topographically prearranged map that represents image saliency of an equivalent visual scene. The Saliency map which integrates the normalized information from the character attributes maps into one global measure of conspicuity [11]. In similarity to the center-surround representations of basic visual features, bottom-up saliency is thus resolute by how dissimilar a motivation is from its surround, in many sub modalities and at many scales. It contains two
approaches for bottom-up and top-down. It is significant for the worried scheme to make decisions on which part of the accessible information is to be preferred for further, more complete processing, and which parts are to be discarded. Furthermore, the selected stimuli need to be prioritized, with the most related being processed first and the less significant ones later, thus most important to a sequential action of different parts of the image scene [7]. This collection and ordering procedure is called selective attention. In this work the saliency map is used to get the different parts of the visual scene attention.

B. INITIALIZATION

The image should be initialized so that outside of the image area can be calculated. Iteration method is used to resize the image. Automatically the curve has been evaluated in that selected area.

C. CURVE EVOLUTION

In this work the motions of hydroplane curves driven by a function of the curvature. If C is a smooth (say C2) curve, they are described by a partial differential equation (PDE) of the type

$$\frac{\partial c}{\partial t} = G(k)N$$

Where, K and N are the curvature and the usual vector to the curve. This equation means that any position of the curve moves with a velocity which is a function of the curvature of the curve at this point. In this work the curve evolution is used to calculate the local interior points and exterior points in an image.

D. LIPSCHITZ FUNCTION

A function f such that
$|f(x) - f(y)| \leq C\,|x - y|$
For all x and y, where C is a constant independent of x and y, is called a Lipschitz function. For example, any function with a bounded first derivative must be Lipschitz.

E. LIPSCHITZ CONDITION

A function f(x) satisfies the Lipschitz condition of order β at x=0 if
$|f(h) - f(0)| \leq B\,|h|^{\beta}$
For all $|h| \leq €$, where B and β are independent of h, β>0 and a is an upper bound for all β for which a finite B exists.

F. EVOLUTION OF ENERGY MAP

In this work the energy map is created based on iteration. Automatically the iteration values are changed based on that evolution of energy map will get formulated. The iteration is mainly focused on low DOF of image segmentation. Maximum iteration is reached and binary image is put a view as energy map. Finally get the segmented objects from the original image.

G. FINAL OBJECT SEGMENTATION

Here the object segmentation is often a very difficult task. In this work the main difficulty is finding proper object in the image. So compute the local energy functional and get the local interior and exterior points of image. Now the curve evaluation is formulated. Finally the specific object is detected and segmented.

IV. EXPERIMENTAL RESULTS

In this implementation work had done mat lab 2010. The experimental results are shown.

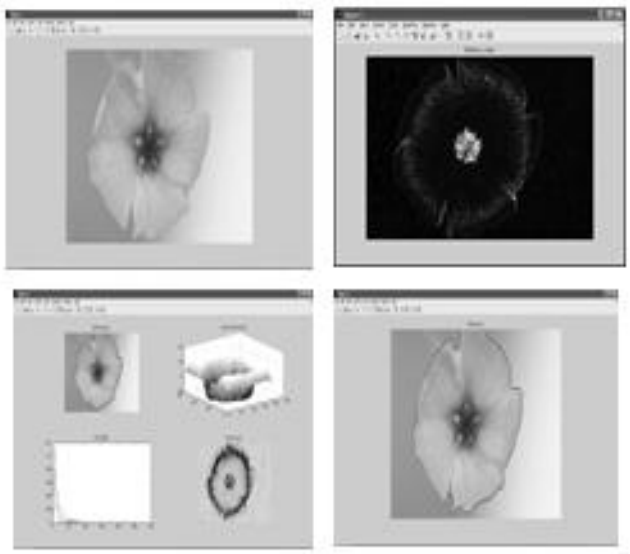

Fig. 2: (a) Input Image (b) Saliency Map (c) Iteration, Lipschitz function, Energy Map (d) Low DOF image segmentation

V. CONCLUSION

In this paper, we have established a novel unsupervised image segmentation algorithm for low DOF images. We developed an effective and efficient algorithm to automatically extract objects from individual image or image sequences captured with a low-DOF technique. Partitioning images with high DOF or images requiring individual information will still be highly challenging. However, the exactness of this algorithm may be better for images with low DOF by scheming a better feature and using a better graphical representation. It is also helpful to plan an algorithm that is accomplished of object detection in an image as a low DOF image or a high DOF image.

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