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VISUAL SEGMENTATION USING FIXATION METHOD

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ABSTRACT

Image segmentation is a set of segments that collectively cover the entire image or a set of contours extracted from the image. *Visual image segmentation is the process by which the visual system such as that of robot, groups features that are part of a single shape.* ***This correspondence is concerned with a method for image segmentation on the visual principle. For the interpretation of a visual scene, it is important for a visual system to pay attention to the objects in the scene and segment them from their background. For the image segmentation there are variety of methods are present some of them are histogram based method, compression based method, edge detection based, model based segmentation, triangle segmentation, but each have some disadvantages such as one disadvantage of histogram seeking method is that it may be difficult to identify peaks and valleys in the image. In our view these are incomplete methods and to overcome these disadvantages we proposed new method. We propose a method to segment the object of interest by finding the "optimal" closed contour around the fixation point in the polar space, avoiding the perennial problem of scale in the Cartesian space. We propose a segmentation refinement process based on such a feedback process.***

KEYWORDS: Visual image segmentation, Superpixels, Fixation-based, polar space.

1. INTRODUCTION

Image segmentation is one of the fundamental parts in computer vision. It is important to other computer vision tasks such as image understanding and retrieval, object recognition and categorization, etc., and medical imaging application such as computer-aided diagnosis and surgery, etc. The main goal of image segmentation is to partition an image into its constituent segments that have strong homogeneities with respect to certain criteria [1]. In practice, all the regions in image are not always important, and one or more of them usually belong to meaningful object, that is region of interest that is desired by the user or critical to the following task. In this study we mainly focus on the object segmentation problem. That is the goal of our segmentation algorithms is to find one specific object surrounded by smooth and closed boundary contour. A seed point or small region is manually specified and the region of interest containing it is then segmented automatically. Therefore without significant loss of modeling generality, we simplify the model parameter.

Image segmentation is the process of assigning a label to every pixel in an image such that pixels with the same label share certain visual characteristics role of fixations—the voluntary eye movements—is capturing high resolution visual information from the salient locations . The human visual system (HVS) has an attention module that uses the low-level visual cues (such as color, texture etc.) to quickly find the salient locations in the scene [14]. The human eyes are then drawn to these salient points (also called fixations). These fixations points are going to be used as the identification markers for the objects of interest in the scene. The ability to automatically segment a "simple" object of any size from its background.

The primary goal of such research has been to study the characteristics (e.g., color, texture) of the fixated location by tracking the eye of human subjects looking at still images or videos and use that information to make a prediction model that can estimate the possible fixation locations in the scene [10]. The map showing the likelihood of each point in the image to be fixated by a human visual system is called saliency map. In [1], the saliency map is used to group the over segmented regions, obtained using the mean-shift algorithm, into a bigger region representing the object. In essence, instead of using color information directly, they use the derived feature (saliency) to group the pixels together. So, it is in the spirit of any intensity or color-based grouping algorithm as per the segmentation step of the algorithm is concerned. While visual attention research has made significant progress in making better predictions of what draws our attention [10], it does not explain what happens while the human visual system is fixated at a particular location in the scene.

2. RELATED WORK

2.1 Frequency- Tuned Salient Region Detection

Detection of visually salient image regions is useful for applications like object segmentation, adaptive compression, and object recognition. In this paper, we introduce a method for salient region detection that outputs full resolution saliency maps with well-defined boundaries of salient objects. These boundaries are preserved by retaining substantially more frequency content from the original image than other existing techniques. Our method exploits features of color and luminance, is simple to implement, and is computationally efficient. We compare our algorithm to five state-of-the-art salient region detection methods with a frequency domain analysis, ground truth, and a salient object segmentation application. Our method outperforms the five algorithms both on the ground truth evaluation and on the segmentation task by achieving both higher precision and better recall [3].

2.2 Image Segmentation by Probabilistic Bottom-Up Aggregation and Cue Integration

We present a parameter free approach that utilizes multiple cues for image segmentation. Beginning with an image, we execute a sequence of bottom-up aggregation steps in which pixels are gradually merged to produce larger and larger regions. In each step we consider pairs of adjacent regions and provide a probability measure to assess whether or not they should be included in the same segment. Our probabilistic formulation takes into account intensity and texture distributions in a local area around each region. It further incorporates priors based on the geometry of the regions. Finally, posteriors based on intensity and texture cues are combined using a mixture of expert's formulation. The algorithm complexity is linear in the number of the image pixels and it requires almost no user-tuned parameters. We test our method on a variety of gray scale images and compare our results to several existing segmentation algorithms [4].

3. EXISTING SYSTEM

1. Given a fixation on the object (or region) in the scene/image it defines a transformation of the edge map available in Cartesian coordinate to generate the probabilistic edge map in the polar coordinate system, with fixation point as pole. In the transformed polar space, the lengths of the possible closed contours around the fixation points are normalized, thus, the segmentation results are not affected by the scale of the fixated region.
2. Segmentation is carried out in two separate steps; it provides an easy way to incorporate feedback from the current segmentation output to induce the segmentation result for the next fixation by just changing the probabilities of the edge pixels in the edge map.

4. PROPOSED SYSTEM

Proposed system is an enhancement of the existing work, which explains how to do segmentation iteratively on multiple fixation points. We propose to embed probability of connectivity of the region at the stage where multiple fixation based segmentation is being done. It will be faster because it will remove the less visited region from the search path during segmentation and merging of edges. In other words, if the fixation point is very far from the field of view of the attention and eye movement is not too large then spending time to do segmentation on out of view regions will be the wastage of resources. Existing system does not employ this observation and therefore it will spend more time in less probable region. Our proposal will be an enhancement in this regard.

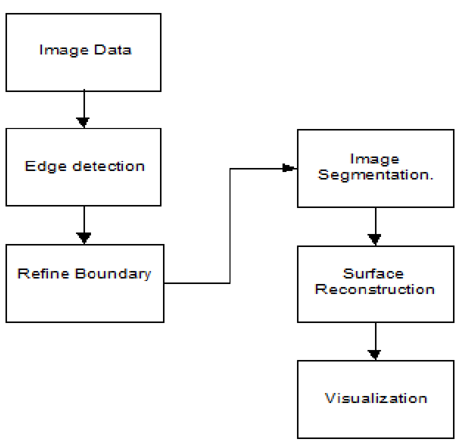

Fig (4.1): Proposed System

4.1 SUPER-PIXEL GENERATION ALGORITHM:

Super-pixels are becoming increasingly popular for use in computer vision applications. However, there are few algorithms that output a desired number of regular, compact super-pixels with a low computational overhead. We introduce a novel algorithm called SLIC (Simple Linear Iterative Clustering) that clusters pixels in the combined five-dimensional color and image plane space to efficiently generate compact, nearly uniform super-pixels. The simplicity of our approach makes it extremely easy to use a lone parameter specifies the number of super-pixels and the efficiency of the algorithm makes it very practical. Experiments show that our approach produces super-pixels at a lower computational cost while achieving a segmentation quality equal to or greater than four state-of-the-art methods, as measured by boundary recall and under-segmentation error. We also demonstrate the benefits of our super-pixel approach in contrast to existing methods for two tasks in which super-pixels have already been shown to increase performance over pixel-based methods.

SLIC uses the same compactness parameter for all super-pixels in the image. If the image is smooth in certain regions but highly textured in others, SLIC produces smooth regular-sized super-pixels in the smooth regions and highly irregular super-pixels in the textured regions. So, it become tricky chooses the right parameter for each image.

4.2 FIXATION BASED SEGMENTATION ALGORITHM:

Fixation based segmentation algorithm is the one that takes a point ("fixation") in the image (or video) as input and outputs the region containing that fixation point. Such formulation of segmentation with fixation is a well-defined problem in contrast with the traditional segmentation formulation that tries to break an image (or a scene) into mutually exclusive regions. This shown qualitatively in the thesis that the traditional definition of segmentation is not well defined and that segmentation can be defined optimally only if the object of interest is identified prior to segmentation. The proposed algorithm carries out segmentation as a two-step process. In the first step, all visual cues, static monocular, stereo and motion, are used to generate a probabilistic boundary edge map that contains the probability of an edge pixel being at a depth boundary. In the second step, the probabilistic boundary edge map is transformed from the Cartesian space to the polar space with the fixation point chosen as the pole for this transformation.

Fig (4.2): The fixations, indicated by the green circular dots on the different parts of the face, are shown overlaid on the inverse probabilistic edge map of the leftmost image. The segmentation corresponding to every fixation as given by the proposed algorithm is shown right below the edge map with the fixation.

In the polar space, the segmentation of the fixated region is carried out as a binary labeling problem that finds the optimal cut through the polar edge map, which becomes the closed contour around the fixation point as it gets transformed back to the Cartesian space. Motivated by the experiments in the psychophysics that suggest humans do not just make a single fixation but a series of them, a subset of which are related to each other, we propose a multi-fixation strategy that starts with a given fixation and makes a series of dependent fixations to segment the object of interest completely even when the shape of the object is complex. The multiple fixation strategy is also used to segment complex shaped objects especially the ones with a thin elongated part. Finally, an attempt to use the sparse motion information instead of the dense optic flow map to segment moving objects has also been made. The motivation for this lies in the difference between motion and color cues. Motion cues are inherently sparse since motion can be detected unambiguously only at some salient locations in the scene whereas color cues are known at every location with high accuracy. We propose an algorithm to segment moving objects in a video without having to calculate the dense optic flow map of the scene.

5. SYSTEM ARCHITECTURE

5.1 SYSTEM ARCHITECTURE

The general framework is to be used as an inspiration in the design of a segmentation system.

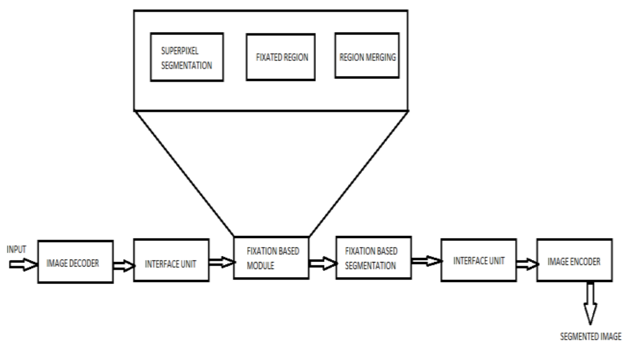

Fig (5.1): System Architecture

User input image is provided to the Image Decoder for processing. Interface Unit helps in communication between the Image Decoder and Fixation Based Module. The Fixated Based Module is a combination of the two methods working in the background. These methods carry out mathematical calculations in the background required for segmenting the image. The evaluated results provided to Fixation Based Module are given to interface unit. The Interface Unit supplies these results to the Image Encoder which encodes the segmented image which is our expected result. The System Architecture is logically simple to understand and not actually a complex and intense to interpret for the user or designer. All interfaces provide accurate and relevant evaluated results working with efficiency.

5.2 SYSTEM FEATURE

The propose segmentation process is carried out in two separate steps. First, all visual cues are combine to generate probabilistic boundary edge map of the scene second in this edged map the optimal closed contour around a given fixation point is found. Having level cue or regions and the low level visual cues or edges .In fact we proposed a segmentation refinement process based on such a feedback process. Finally, our experiment shows the promise of the proposed method as an automatic segmentation framework for a general purposed visual system.

5.2.1 FEATURES

5.2.1.1 Input:

Inputs are images taken from camera or resided on file system having Bitmap format.

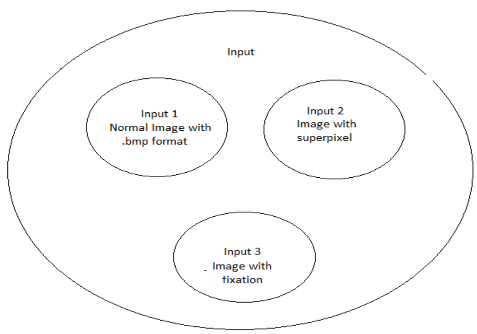

Fig 5.2.1.1: System Input

5.2.1.2 Output

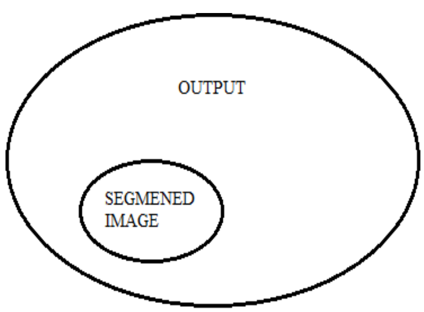

Fig 5.2.1.2: System Output

6. CONCLUSION AND FUTURE SCOPE:

We proposed here a novel formulation of segmentation in conjunction with fixation. The framework combines static cues with motion and/or stereo to disambiguate between the internal and the boundary edges. The approach is motivated by biological vision, and it may have connections to neural models developed for the problem of border ownership in segmentation.

Scope of this project is in the medical image processing, in space image processing, in military image processing, and many more other image processing industries. In medical image processing to detect the different metal object present in the human body such as the coins, or any other like gold when the x-ray image provided to system. In Space image processing to eliminate the other stars which are present around that particular star. You can implement an application using this project in which you can track moving object from a video.

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