A Novel Approach of Image Segmentation in Biomedical Field Survey

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Abstract— Image segmentation is the problem of partitioning an image into meaningful parts, often consisting of an object and background. As an important part of many imaging applications, e.g. face recognition, tracking of moving cars and people etc, it is of general interest to design robust and fast segmentation algorithms. However, it is well accepted that there is no general method for solving of all segmentation problems. Instead, the algorithms have to be highly adapted to the application in order to achieve good performance. In this thesis, we will study segmentation methods for medical images. The need for accurate segmentation tools in medical applications is driven by the increased capacity of the imaging devices. Common modalities such as CT and MRI generate images which simply cannot be examined manually, due to high resolutions and a large number of image slices. Furthermore, it is very difficult to visualize complex structures in three-dimensional image volumes without cutting away large portions of, perhaps important, data. Tools, such as segmentation, can aid the medical staff in browsing through such large images by highlighting objects of particular importance. In addition, segmentation in particular can output models of organs, tumours and other structures for further analysis, quantification or simulation.

Key words: Image Segmentation, k-means clustering, Fuzzy c-means, level set method.

I. INTRODUCTION

Image segmentation is the problem of partitioning an image in a semantically meaningful way. This vague definition implies the generality of the problem - segmentation can be found in any image-driven process e.g. fingerprint, text, face recognition, detection of anomalies in industrial pipelines, tracking of moving people, cars, airplanes, etc. For many applications, segmentation reduces to finding an object in an image. This involves partitioning the image into two classes of regions - either object or background. Segmentation is taking place naturally in the human visual system. We are experts on detecting patterns, lines, edges and shapes, and making decisions based upon the visual information. At the same time, we are overwhelmed by the amount of image information that can be captured by today's technology. It is simply not feasible in practice to manually process all the images (or it would be very expensive, and boring, to do so). Instead, we design algorithms which look for certain patterns and objects of interest and put them to our attention. For example, a recent popular application is to search and match known faces in your photo library which makes it possible to automatically generate photo collections with a certain person. An important part of this application is to segment the image into "face" and "background".

This can be done in a number of ways, and it is well accepted that no general purpose segmentation algorithm exists, or that it ever will be invented. Thus, when designing a segmentation algorithm, the application is always of primary focus: Should we segment the image based on edges, lines, circles, faces, cats or dogs?

II. LITERATUTE SURVEY

- K-means method
- Fuzzy c- means method
- Level set method

A. K Means Method:

K-means clustering is a partitioning method. The function partitions data into *k* mutually exclusive clusters, and returns the index of the cluster to which it has assigned each observation. *k*-means clustering operates on actual observations (rather than the larger set of dissimilarity measures), and creates a single level of clusters. The distinctions mean that *k*-means clustering is often more suitable than hierarchical clustering for large amounts of data.

1) The algorithm of k means:

- choose the no of k cluster manually.
- Generate K cluster and determine the cluster center.
- Assign each pixel in image and minimizes the variance between the pixel and the cluster center.

B. Fuzzy C- Means Algorithm:

In fuzzy clustering, the centroid and the scope of each subclass are estimated adaptively in order to minimize a pre-defined cost function. It is there by appropriate to take fuzzy clustering as a kind of adaptive thresholding. Fuzzy c-means (FCM) is one of most popular algorithms in fuzzy clustering, and has been widely applied to medical problems. The classical FCM algorithm originates from the k-means algorithm. In brief, the k-means algorithm seeks to assign No objects, based on their attributes, into K clusters (KrN). For medical image segmentation, N equals the number of image pixels Nx x Ny. The desired results include the centroid of each cluster and the affiliations of N objects. Standard k-means clustering attempts to minimize the cost function.

C. The Algorithm Of Fuzzy C Means:

- Choose a number of cluster in a give image.
- Assign randomly to each point coefficients for being in a cluster.
- Compute the center of each cluster.
- For each point ,compute its coeeficients of being in a the cluster.

1) Comparison algorithm:

K means clustering produces fairly highly accuracy and require less computation. C means prouduces close result to k means clustering yet it require more computation time than k means.

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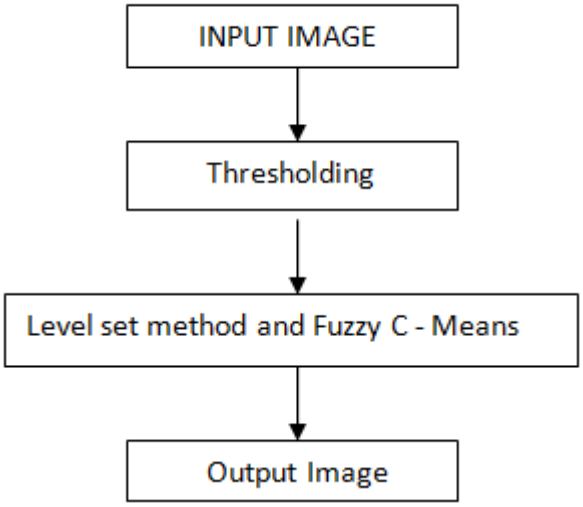
D. Level Set Method:

In contrast to FCM using pixel classification, level set methods utilize dynamic variational boundaries for an image segmentation. Segmenting images by means of active contours is a well known approach, but instead of parametric characterization of active contours, level set methods embed them in to a time- dependent PDE function Ø(t,x,y). It is then possible to approximate the evolution of active contours implicitly by tracking the zero level set ɼ(t).

$$\begin{cases} \phi(t,x,y) < 0 & (x,y) \text{ is inside } \Gamma(t) \\ \phi(t,x,y) = 0 & (x,y) \text{ is at } \Gamma(t) \\ \phi(t,x,y) > 0 & (x,y) \text{ is outside } \Gamma(t) \end{cases}$$

The level set is based on combination of several existing method. Normally thresholding is used to make an image binary.Most of image segmentation using in bio medical images success in .jpg format.More accurate result possible in .jpg formate only.

E. Proposed Method:



III. Conclusion

The performance of the level set segmentation is subject to appropriate initialization and optimal configuration of controlling parameters, which require substantial manual intervention. A proposed algorithm is to facilitate medical image segmentation. It is able to directly evolve from the initial segmentation by fuzzy clustering. The controlling parameters of level set evolution are also estimated from the results of fuzzy clustering. Moreover the fuzzy level set algorithm is enhanced with locally regularized evolution. Such improvements facilitate level set manipulation and lead to more robust segmentation.

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