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## IMAGE SEGMENTATION AND CLASSIFICATION

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### Abstract:

Image segmentation is the fundamental step for analysing the images and extracting data from them. It is already a widely researched field but it still provides the various challenges to the researches. This paper concentrates on basic methods which is used for image segmentation and classification. Image segmentation can be categorized as semi-interactive approach and fully automatic approach and the algorithms are developed either of these approaches. Image segmentation is like a step and it helps to influences the overall success to understand the image. This is the interesting application for testing the robustness of our approaches due to the complexity of the images and consequently we believe the algorithms will be suitable for many other real world applications.

### Introduction:

Digital image processing is the application of various algorithms on the image to improve the quality of the image and to avoid the noise and unwanted pixels and also to obtain more information about the image. By using the various image processing techniques image segmentation is the crucial step to analyse the image. This paper mainly focuses on various methods and followed by various algorithms for image segmentation. Here we compare the various methods for image segmentation by taking test images. The images are operated by Mat Lab software. An image is basically a two dimensional function of coordinates  $f(x,y)$  and the amplitude of the image will gives the intensity value of the image. The image can be expressed as a product of function of illumination and reflection.

$$f(x,y)=i(x,y).r(x,y)$$

Where  $i(x,y)$  is the function of intensity and  $r(x,y)$  is the function of reflectivity.

Our proposed framework is well suited for the applications and where the final outcome is accurate segmentation and classification of object in an image. The user have much interest to find the images by using this method within a large collections of objects and shape is critical to its recognition.

**Image segmentation:**

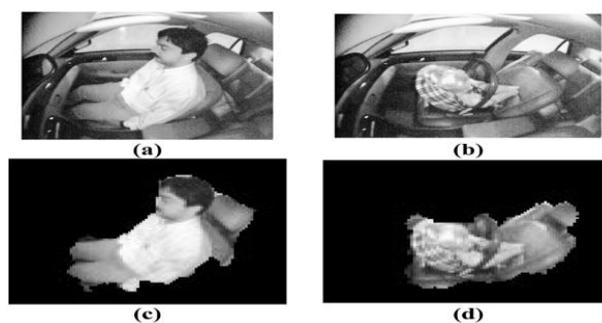
Image segmentation refers to the process of dividing the images into disjoint regions. This process is fundamental on computer vision in many applications such as image retrieval, visual summary and image based modelling. Image segmentation is the midlevel processing technique is used to analyse the image and this can be defined as a processing technique and it is used to classify or cluster the image into several disjoint parts by grouping the pixels to form the region of homogeneity based on the pixel characteristics like gray level, colour, texture , intensity and other features. The main purpose of the segmentation process is to get the more information about the image region which helps the annotation of the object scene. Image segmentation is the domain-partition of the image into a set of visually distinct and homogenous regions with respect to certain properties. The main objective of the segmentation process is to differentiate the object and background of an image.

**Proposed approach:**

There are few stages for image segmentation and classification they are 1) image segmentation and 2) classification and 3) feature extraction.

**A. Preliminary segmentation:**

Preliminary segmentation serves has two functions: 1) removes a large number of pixels from the image prior to assign the labels and 2) reduce the large number of blogs which it is processed. In many applications it can be implemented as a binary region mask and defining the object of interest. The preliminary segmentation has perform through the correlation based background subtraction.

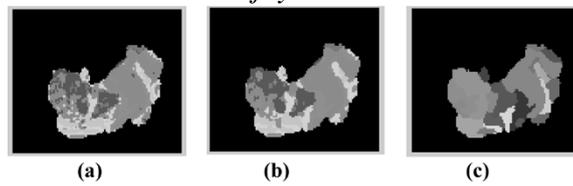


Preliminary segmentation results for adults and infant images.

(a)adult image (b)infant image (c)preliminary segmentation for adult image (d)preliminary segmentation for infant image.

**B. Classification:**

The purpose of region labelling is to group together regions with common attributes for example grayscale, texture etc. There are many mechanisms is proposed for defining the common characteristics such as expectation mechanism (EM) , normalize cuts, relaxation methods and region growing methods.



Region labelling for instant image. (a) EM labelling, (b)result for mode filtering, (c)result for small region removal.

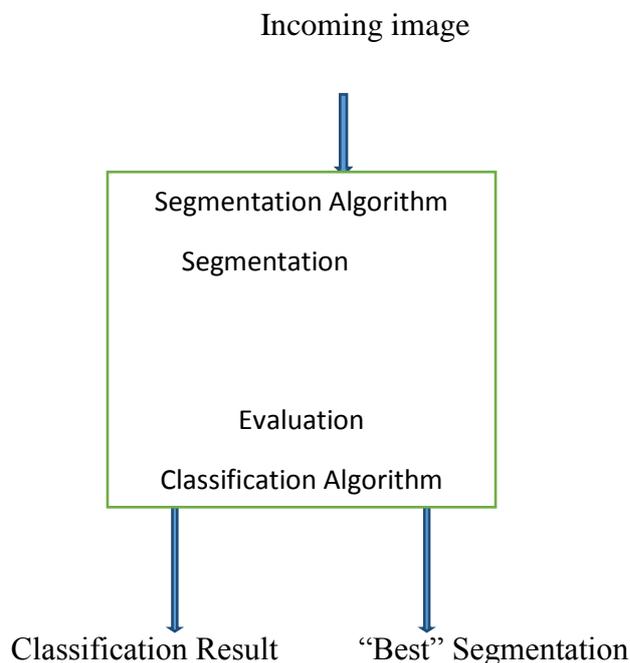
### C. Feature extraction:

Feature Extraction has two methods: 1)they define a classification problem using tree or graph distance and 2)they build the segmentation specific identical sub regions in the images. The two methods have each of these descriptions moments for region based descriptions and Fourier descriptors for boundary based descriptions. The combinations of these speed up mechanism will boost the classification processing for each moment calculated.

### Literary Survey:

#### A.Image Segmentation based on wrapper based approach:

Wrapper based approach is prefers the interest of the object to be over segmented means it will be divided into a number of small regions. Segmentation is correct means it based on some low level image intensity of the object, i.e., color, texture, etc... Then it based on the probability of correct classification. The classification algorithm provides the benefit of the result of segmentation and context for the segmentation. It is based on the classification pattern class. First you get the image and using the segmentation algorithm then taken the result of the segmentation algorithm this result will be performs the classification method then given the classification result and the best segmentation. Classification algorithm also performs the evaluation of the segmentation algorithm. These are the simple steps are followed for the image in wrapper based method.

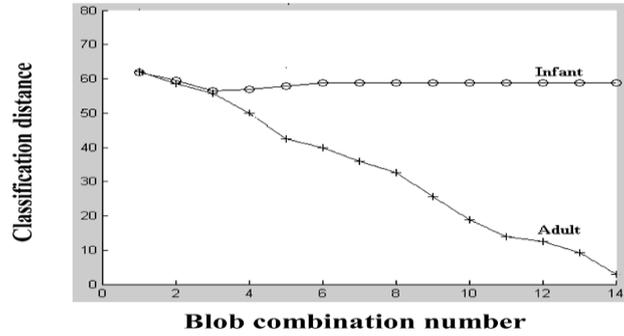


**Processing of the wrapper based approach:**

**Blob Combiner:** It is determine the subset of the blobs. One problem is blob selection. It means quite the subset blobs there will give the largest classification accuracy to the pattern class.

**Classification of Blob Combinations:**

It is calculated the classification accuracy. Some of the algorithm will be used. Forward and plus1 algorithm is used. It is important.



**B.Intensity Based Segmentation:**

It is also called Threshold based Segmentation. It also based on intensity level of the image. Then threshold is categories two classes. First class is work on the certain range of the postulate that pixels of intensity values represents. Second class is working the image represents for the remaining pixels. It is implemented by the global or local method. Global method is used to describe the object of the image and background of the image pixels. Then it will be check the threshold value and binary partition image. Then these pixels send to the threshold test method, the method considered as the object pixel then it will be assigned the binary value “1”. Other pixels are assigned to the binary value “0” it considered as background pixels.

$$g(a,b) = \{1,0\}$$

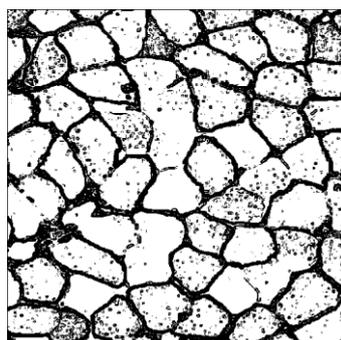
$$\text{for } t(a,b) \geq I \quad \text{for } t(a,b) < I$$

where

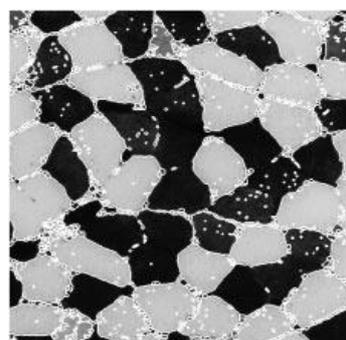
$g(a,b)$  is output image.

$t(a,b)$  is input image.

$I$  is the threshold value.



Threshold image



Original image

**Local method:**

It also called adaptive threshold method. Local characteristic are regions in the image. The method is following some steps are:

1. Breaking the image into the small images.
2. Then select the threshold of the small images.
3. Check the pixels of the small image and find the segment region.
4. All small images are select individually and select the threshold values.
5. Stop
6. Then all the small images are processed.

**Advantage:**

1. It is inexpensive.
2. Fast
3. Implementation is easy.
4. It also works in all applications.
5. Easy to access
6. Easy to maintain
7. This algorithm is easily understood.

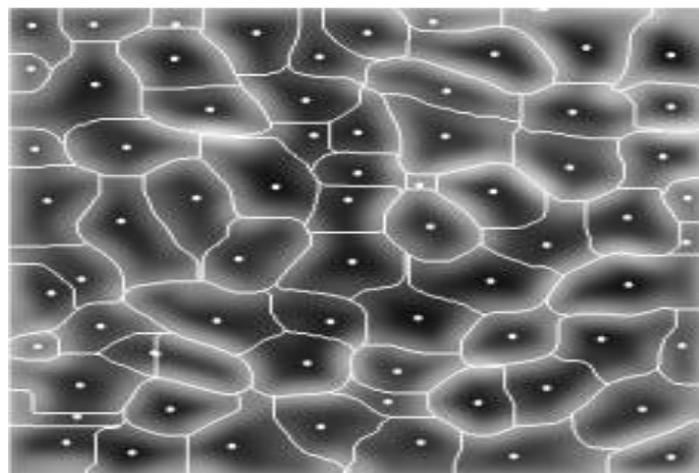
**Disadvantage:**

1. Noise is very large.
2. Sometime edges are missing.
3. Select the threshold value is difficult.

**C. Region Based Segmentation:**

Region based segmentation objective is to provide the homogeneous region. It is neighbouring of the pixels are similar in the region means it will be inside the region possess. Dissimilar of the pixels means stored to the other region. This approach is checks the all neighbour pixels of the image. If it is similar means added to the pixel.

Dissimilar means stopped the test.



**Two methods:**

1. Region growing methods
2. Region split and merge methods

**Region Growing Method:**

It is used to image in extracting the region using some of the predefined condition or method. Compare the candidate pixels and neighbors pixels image.

**Types:**

1. Seeded region growing method(SRG)
2. Unseeded region growing method(UsRG)

**Advantage:**

1. Multiple criteria access at the same time.
2. It is simple concept.
3. Only need the small numbers of the seed point
4. Provide real images and perfect edges.

**Disadvantage:**

1. Noise problem
2. No time limit

**Seeded Region Growing Method:**

It is specified by the user. Seed is tested to the pixel means it will be display the ideal of the region interest. Seed segments is used to more users, seed input is used to segmentation. Allocated pixels will be taken the same region and same value and the same label.

Unallocated pixels will take to another value and another label and another region. Seeded process is semiautomatic.

It is based on the seed specification.

First step are start to the segmentation process.

Second step is find the pixel of region in based on some condition.

Third step is get the candidate pixels and store to the region it should be 8 connected.

Fourth step is check the all possible way then tested the pixels and stored to the allocation region and label.

Last step is some region will get same label means these two region are merged.

### **Unseeded Region Growing Method:**

It is flexible. Unseeded region growing methods are automatic segmentation. Do not replay to the tuning parameters. Then do not get the manual input. It is high level knowledge. Unseeded are contains single pixels and results are several regions.

### **Region Split and merge Method:**

Main objectives is describes the homogeneity image. You can take the image and stored to the single region then extract the image into the quadrants it all process based on the quadrants tree then it split into four quadrants image. Test is failed means process will be taken the some of the step. Test is pass means process will be continue.

### **Advantage:**

1. It maintains inner point to outer region.
2. Seed method is gives very accurate result.
3. It is simple method.

### **Disadvantage:**

1. Good segmentation result depends on the correct choice but bad segmentation is depends on the noisy seed.
2. Selection process is itself required.

### **D.Clustering Based Method:**

Clustering method means it will be identify the group of the data. It also contains the pixels and the region. Images will be based on the content of the group data. Group will be made in characteristics of the pixels, shape etc.

### **Types:**

1. K-means algorithm
2. Fuzzy C-means algorithm

Clustering method will be extract to the two methods, hierarchical method and partition method.

### **Hierarchical clustering:**

Hierarchical also called as Agglomerative clustering. Each date will be stored to the separate cluster. Then find to the similar data then merged these data then stored to the single clusters. Hierarchical clustering is main purpose is compute the distance.

Steps are:

1. Choose the largest similarity value from the input matrix value.

2. Matrix are  $A_{i,j}$
3. Calculate the cell value

$$\text{Similarity}(A_{i,j}, A_k) = \min\{\text{similarity}(A_i, A_k), \text{Similarity}(A_j, A_k)\}$$

4. Repeat step2 until matrix cell.

**Partition clustering:**

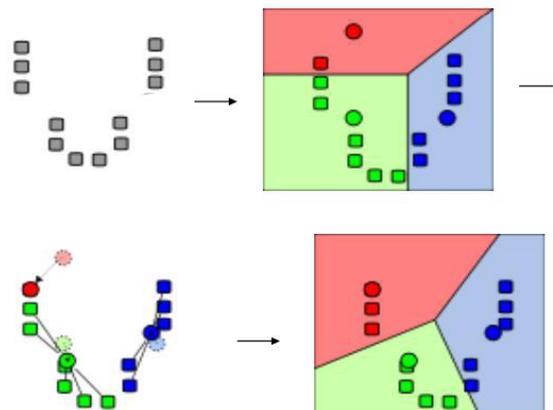
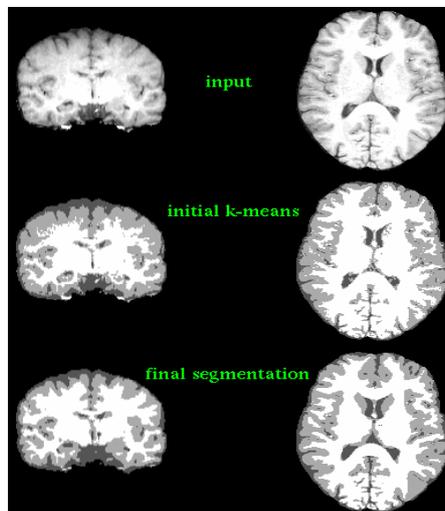
It is achieved in K-means clustering. It is breaking the data points then results will be storing the single partition of the image.

**K-means Algorithm:**

Steps:

1. Choose the total clusters k. k is a cluster center points.
2. Store each data points to the cluster then find the center of the cluster data point.
3. Recalculate the center of the cluster.
4. Then go to step 2 until no changes occur.

K-means is used to minimize the data points distance. K-means algorithm is never split and merge function will not be done. Drawback is they need more clusters set.



## **Experimental Results:**

Image segmentation process has classified on various categories which is based on parameter selected for segmentation like pixel intensity, homogeneity, discontinuity, cluster data and topology. The result is obtained from one approach is not same as when compared to the other approach. And the each of the approach has its own advantages and disadvantages. Basically the segmentation can be semi-interactive and fully automatic. The algorithm which is developed for segmentation is lies in each of this category. The major difficult of the nature of segmentation it is hard to obtain the single answer for segmentation of given image as the interpretation varies from individual approaches. Image segmentation and classification is the process of dividing an image into its constituent homogenous regions to extract data from the attributes of an image. A good segmentation will be resulted in regions in which the elements should have uniform properties in terms of brightness, colour and texture. In some cases the manual interaction for segment the image may be error prone. The fully automated approach can give error output but in some cases the interactive methods can be laborious and time consuming. The measurements of quality of segmentations is that of the elements of the same region should be similar and they have differences between elements of other regions. So a single approach to segment all variety of images is practically unavailable. The prior knowledge of the image will give better results and gives choice to user to decide proper method to segment the image.

## **Conclusion:**

In this paper has discussed various Segmentation Techniques and its very important project in the field of image processing and computer vision. In this area the research will be done since decades and still there is no one segmentation will be accepted for every kind of image. There are various factors that will affect the image segmentation process they are spatial characteristics of images, texture, homogenous continuity and image content. Due to considered all these factors only the segmentation problem still remains the image processing and computer vision fields. But on this paper the techniques which we discussed here we considered that wrapper based approach is one of the best approach. So we concluded that Wrapper based approach will do better segmentation and classification when compare to other techniques.

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