

# A Review on Region Based Segmentation

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**Abstract:** Segmentation is making the part of image or any object or entity. Pattern recognition and image analysis are the fundamental footsteps of image segmentation. Image segmentation mention to partition of an image into different divisions that is homogeneous or similar and inhomogeneous in some attributes. Image segmentation outcomes have consequence on image analysis. There are many algorithms and basic methods available for image segmentation but still there needs to develop an improved method for it.

**Keywords:** Image Segmentation, Image Analysis

## 1. Introduction

Images are reviewed as one of the most principal channel of fetching information, in the area of computer vision, by grasping images. In traditional, image noise should be abolished along image processing. Dynamic background is done by utilizing segmentation of video for segmentation we require images. Image segmentation plays major role in segmentation of medical images. Digital image processing is one of the procedures of artificial intelligence and it integrated with fuzzy logic, pattern and machine learning are invaluable in image technique can be grouped following framework-image engineering. Image segmentation is the introductory step and also one of most grinding tasks of image analysis.

## 2. Image Segmentation

The distribution of an image into meaningful structures, image segmentation, is often fundamental step in image analysis, object representation, visualization, and many other image processing tasks. In this paper focus is on how to analyze and represent an object, but we supposed the group of pixels that identified object was known beforehand. We will focus on methods that will identify the particular pixels that make up an entity.



Figure 1: Example of Image Segmentation

A special difference of segmentation techniques has been presented in the past decades, and some categorization is compulsory to introduce the methods properly here. A disserverment grade does not appear to be attainable though, because even two immensely dissimilar segmentations

approximates might share properties that flout singular categorization.

### A. Categories of Image Segmentation

The following categories are used:

#### 1) Segmentation based on Threshold

Histogram thresholding and slicing methods are used to partition the image. They may be applied directly to an image, but can also be combined with pre- and post-processing methods. Thresholding is matured, basic and popular technique for image segmentation [1]. Image segmentation by thresholding is a simple but powerful approach for segmenting images having light objects on grim background [3]. Thresholding method is based on image space regions i.e. on attributes of image [2]. Thresholding working transform a multilevel image into a binary image i.e., it choose a particular threshold T, to divide image pixels into several regions and separate objects from background. Thresholding procedure used to distribute as intensity value called as threshold, and threshold divides the desires classes. The segmentation is gained by varying all pixels with intensity sizeable than the threshold into one class, and all other pixels into another class.

#### 2) Segmentation based on Edge

With this technique, detected edges in an image are concluded to represent object boundaries, and handled down to recognize these objects. This process that edge detection methods are normally ill-posed, i.e. they are under-constrained and so may not have distinctive solutions. The easiest way to observe edges in an image is to focus for places in the image where the intensity changes promptly, using one of this criterion.

A. Places where the first derivative of the intensity is larger in magnitude than some threshold.

B. Places where the second derivative of the intensity has a zero crossing.

Edge detection [3] method is one of the systematic techniques of the image segmentation techniques. Based on hypothesis there are two main edge based segmentation methods- gray histogram and gradient based method [2]. In the edge approach, the edges are discovered first, and then they are linked together to form forced boundaries.

### 3) Segmentation based on Region

Where an edge based technique may try to explore the object boundaries and then discover the object itself by packing them in, a region based method takes the opposite approach, by (e.g.) beginning in the inside of an object and then “growing” outward until it encounter the object boundaries.

In appreciably the same way as the platypus does not seem to fit in any of normal zoological categories. It seems that any segmentation system categorized as a mammal, upon closer inspection, appears to have some part that shows it to be laying eggs.

### 4) Clustering Techniques

Although clustering is occasionally used as a name for (agglomerative) segmentation techniques, we use it here to indicate techniques that are primarily used in searching data analysis of high-dimensional measurement patterns. In this factor, clustering techniques try to batch together patterns that are alike in unspecified sense. This object is very alike to what we are trying to do when we segment an image, and really some clustering techniques can voluntary be applied for image segmentation.

### 5) Matching

Depending on the looks of the object that we are trying to identify in an image, we can use this knowledge to locate the object in an image. This attitude to segmentation is called matching.

## B. Approaches of Image Segmentation

There are three approaches of image segmentation

1. Region approach
2. Boundary approach
3. Edge approach

## 3. Region Based Segmentation Method

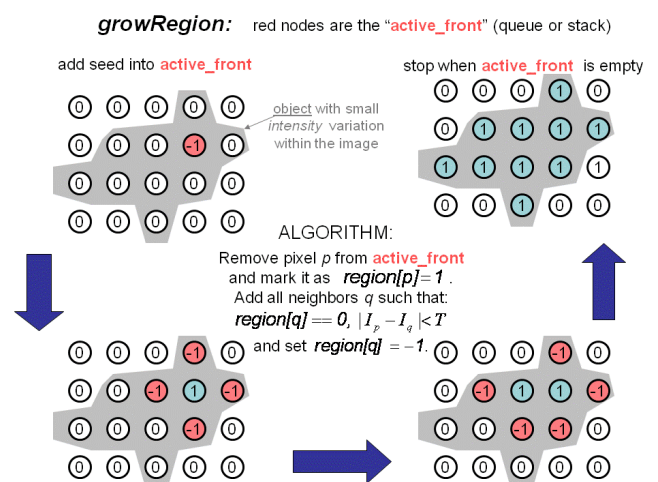
A region denoted by R of an image is explained as a connected homogenous subset of the image regarding some criterion such as gray level or texture. Regions in an image are a group of connected pixels with similar properties. In the region approach, each pixel is assigned to a particular object or region. Compared to edge detection method, segmentation algorithms based on region are comparatively manageable and more immune to noise [2][3]. Edge based methods break up an image based on brisk reforms in intensity near edges whereas region based methods, partition an image into regions that are close according to a set of predefined criteria [6][8].

In the region-based segmentation, pixels corresponding to an object are grouped together and marked. Region-based segmentation also requires the use of appropriate thresholding techniques. The important principles are usefulness similarity (which have gray value differences and gray value variance) and spatial proximity (which consists of Euclidean distance and compactness of a region). Segmentation algorithms based on region mainly include following methods:

### A. Region Growing

Region growing [4] is ability for removing a region of the image that is connected based on some predefined criteria. This criterion is based on intensity information. Region growing is an approach to image segmentation in which neighboring pixels are examined and joined to a region class of no edges are detected. This process is iterated for severally boundary pixel in the region. If adjacent regions are found then a region-merging algorithm is used in which weak edges are disappeared and strong edges are left intact. A new region growing algorithm is proposed in this paper based on the vector angle color similarity measure. The region growing algorithm as-

1. Firstly select seed pixels within the image
2. Then from each seed pixel grow a region:
  - a. After that Set the region prototype to be seed pixel;
  - b. Calculate the similarity between the region prototype and the candidate pixel;
  - c. And Calculate the similarity between the candidate and its nearest neighbor in the region;
  - d. Include the candidate pixel if both similarity measures are higher than experiment all set thresholds;
  - e. After that Update the region prototype by calculating the new principal component;
  - f. At last go to the next pixel to be examined.



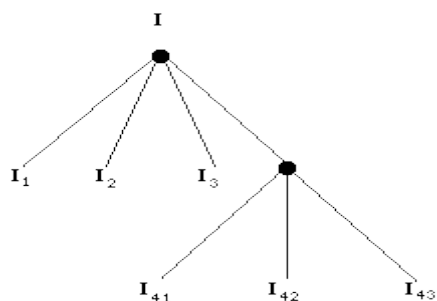
**Figure 2:** Grow Region example

This algorithm presents several advantages over other color image segmentation algorithms. Region growing approach is simple. The border of regions found by region growing are perfectly thin and connected. The algorithm is also very stable with respect to noise.

Limitation is that, it requires a seed point, which generally means manual interaction. Thus, each region to be segmented, a seed point is needed.

### B. Region Splitting and Merging

Split and merge method is the opposite of the region growing. This technique works on the complete image. Region splitting is a top-down approach. It appears with a complete image and splits it up such that the segregated sliced are more homogenous than the total. Splitting single is insufficient for sensible segmentation as it severely limits the shapes of segments. Hence, a merging phase after the splitting is always desirable, which is termed as the split- and-merge algorithm. Any region can be split into sub regions, and the appropriate regions can be merged into a region. Rather than choosing kernel points, user can divide an image into a set of arbitrary unconnected regions and then integrate the regions [2]-[3] in an attempt to serve the shapes of rational image segmentation. Region splitting and merging is usually executed with theory based on quad tree data.

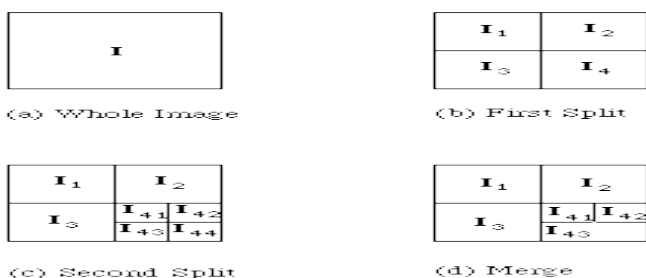


**Figure 3: Split tree**

Region splitting and merging is an image-segmentation technique that takes spatial information into consideration. The region-splitting and merging method is as follows:

#### 1) Region splitting Method

1. Suppose R represent the entire image. Select a predicate P.
2. Split or subdivide the image successively into smaller and smaller quadrant regions.



**Figure 4: Image Segmentation**

The splitting method has a convenient representation in the form of composition called a quad tree shown in figure 4. In a quad tree, the root of the tree corresponds to the entire image and each node corresponds to subdivision.

#### 2) Region Merging Method

Merge any adjacent regions that are similar enough. The procedure for split and merge is given.

1. Firstly start with the whole image.
2. If the variance is too large then break it into quadrants.
3. Merge any adjacent regions that are similar enough.
4. Repeat step (2) and (3) again and again until no more splitting or merging occurs.

This technique requires the input data to be organized into a pyramidal grid structure of regions, with each region organized in groups of four in case of 2D, and of eight in case of 3D.

### 4. Conclusion

In this review of image segmentation study, the overview of region approach segmentation methodologies applied for digital image processing is explained briefly. The study also reviews the research on various research methodologies applied for image segmentation and various research issues in this field of study. These methods are most important for detection of pattern and recognition using edges, images and points. The image segmentation techniques mentioned in

This review paper can be used in many advanced machine for identification of faces, images and to recognition of pattern. Image segmentation used in medical science to detect cancerous cells from medical images. They also detect roads from satellite images. Image segmentation has a promising and challenging future as the universal segmentation algorithm and has become the focus of contemporary research. There is no single method which can be considered good for all type of images or all methods equally good for a particular type of image. Due to all above factors, image segmentation remains a challenging problem in image processing and computer vision and is still a pending problem in the world. Still image segmentation gives more methodologies applied to different fields.

### Acknowledgment

The author's wants to heartily thank their guide, Ms. Pratibha Goyal, Asst. Prof., CGCTC, Punjab Technical University for their critique discussion, constant encouragement, valuable suggestion and timely guidance.

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