

# A Review on Image Segmentation using Maximal Similarity Region Merging Technique

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**Abstract**— Image segmentation is an important image processing steps, and it is used everywhere if we want to analyze what is inside the image. Image segmentation, basically provide the meaningful objects of the image. This paper represents the various image segmentation techniques that could be used in the segmentation algorithm. Image segmentation is a mechanism used to divide an image into multiple segments. It will make image smooth and easy to evaluate. Segmentation also helps to find a region of interest in a particular image. This paper presents an overview of some well-known image segmentation methods. The segmentation procedure splits a given image into different regions and objects. Image Segmentation has become popular due to its many vision applications. The main goal of this survey is to explore numerous algorithms of the image segmentation. Numerous image segmentation methods have been developed by researchers in order to create images easy to evaluate and smoothly. This paper presents a literature survey of basic image segmentation methods from last five years. Current research in all of the image segmentation method is presented in this paper.

**Key words:** Maximal Similarity Region Merging Technique, Image Segmentation

## I. INTRODUCTION

The goal of image segmentation is to gather pixels into the salient image regions, i.e., the regions corresponding to specific objects, surfaces, or natural parts of objects. Segmentation is a challenging task of the image analysis. In specific, medical image segmentation has become more important with the development of complex medical imaging modalities which are accomplished by producing a huge quantity of high-resolution 2-D (two-dimensional) and 3-D (three-dimensional) images. Image segmentation problem has been studied extensively and there are a huge number of approaches defined in the literature [6]. The first step in image analysis is to segment the image. Segmentation subdivides an image into its ingredient parts or objects. The level to which this subdivision is carried depends on the problem being viewed. Sometime need to segment the object from the background to read the image correctly and identify the content of the image for this reason there are two techniques of segmentation, discontinuity detection technique and Similarly detection technique. In the first technique, one approach is to the partition an image based on the abrupt changes in a gray-level image. The second technique is based on the threshold and region growing. This paper discusses the first techniques using Edge Detection method. Few examples of the image segmentation are [1]

- In the automated inspection of electronic assemblies, absence of specific objects or presence can be determined with the help of analyzing images.

- Aerial photos Analyzing to the purpose of categorize terrain into forests, water bodies etc.
- X-ray images and Analyzing MRI in medicine for classifying the body organs.

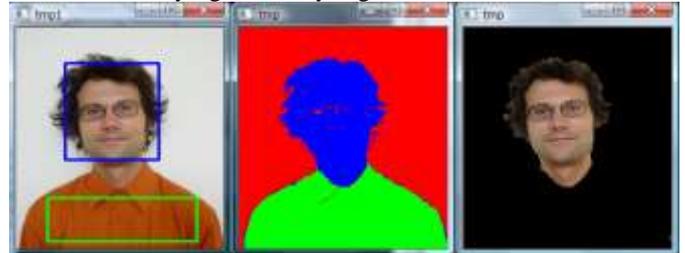


Fig. 1: Image

## A. Application of Segmentation

- Industrial inspection
- Optical character recognition (OCR)
- Tracking of objects in a sequence of images
- Classification of terrains visible in satellite images.
- Detection and measurement of bone, tissue, etc., in medical images.

## II. CLASSIFICATION OF IMAGE SEGMENTATION

Segmentation can be classified as follows:

- Region Based
- Edge Based
- Threshold
- Feature Based Clustering
- Model Based.

### A. Region Based

Region Based method object related pixels are in form of collection for segmentation [2]. The thresholding method is bound with the region based segmentation. The area that is segmentation detected should be closed. Region based segmentation is also called as “Segmentation which is Similarity Based” [3]. There won’t be any gap because of absent edge pixels in this segmentation which is region based [4] for segmentation identified The boundaries. In each and all stages at least one pixel is related region and is taken into the consideration [5]. After identifying the variation in the texture and color, the edge flow is changed into a vector. From this the detected edges for further segmentation [6]

### B. Edge Based

Edge Based Segmentation can also be complete with the help of applying edge detection methods. In this method the boundary is identified to segment. Edges are detected to recognize the discontinuities in the image. The edges of the region are traced using a pixel value identifying and also it is compared to neighboring pixels. For this type classification they use both adaptive and fixed features of SVM (Support Vector Machine) [7] In this type

segmentation, there is no need for edges detected to be closed.

- To decrease the noise effect, the image surface is smoothed with the help of Gaussian Convolution.
- Sobel operator is applied to the image for detecting the edge directions and edge strength.
- The edge directions are taken into non-maximal suppression considerations, i.e., the pixels that are not related to the detected edges and then, they are minimized.
- The final step is eliminating the broken edges i.e., the threshold value of an image is calculated and then pixel value is compared with threshold that is gained. If the pixel value is higher than the threshold, then it is considered as an edge or else it is disallowed. [3]

The method that is used for the segmenting the remote sensing image has higher spatial resolution. The two phase procedures for segmentation are extracting the edge knowledge from the edge detector and then pixels are labeled. The benefit of this method is retrieving knowledge from weak boundary too. The spatial resolution for the segmentation progresses positional accuracy. Based on edge flow, the image is segmented. It recognizes the direction of the alteration in texture and color of a pixel in an image segment. Segmentation can also be done with the edges.

### C. Threshold

Threshold is the easiest method of the segmentation. It is complete with threshold values which are obtained from histogram of those edges of the original image. The threshold values are found from the image which is edge detected. So, if the edge detections are perfect then the threshold too. Segmentation through threshold has fewer computations compared to other methods. Roughness measure is followed by a threshold technique for the image segmentation. Segmentation is done by the adaptive threshold. The gray level points where the high gradient, is then added to the threshold surface for segmentation. The disadvantage of this segmentation method is that it is not appropriate for complex images.

### D. Feature Based Clustering

Feature Based Clustering Segmentation is also done by the Clustering. They followed a various procedure, where most of them apply the method directly to image, but here the image is changed into the histogram and also clustering is done on it. Color image Pixels are clustered for segmentation by applying an unsupervised method Fuzzy C. This applies to ordinary images. If it is the noisy image, its outcomes to the fragmentation.

A basic clustering algorithm that is K-means is used for the segmentation in textured images. It clusters the related pixels to the segment and the image Segmentation is done through a feature clustering and there it will be altered according to color components. Segmentation is also decently depending on characteristics of the image. Features are taken into the account for segmentation. The difference in the color values and intensity are used for segmentation.

### E. MRF

MRF (Model Based Markov Random Field) based on segmentation is called as Model based segmentation. An inbuilt region-smoothness constraint is accessible in Model Based Markov Random Field which is used for the color segmentation. The components of color pixel tuples are considered as the independent random variables for the further processing. Model Based Markov Random Field is collective with edge detection for recognizing the edges correctly. Model Based Markov Random Field has a spatial region smoothness constraint and there are associations between the color components. EM (Expectation-Maximization) algorithm values the parameter is based on the unsupervised operation. Multi-resolution based segmented method named as "Narrow Band". It is faster than the classical method. The first segmentation is achieved at coarse resolution and then at the finer resolution. The procedure changes on in an iterative fashion. Resolution based segmentation is done only to the image part. So, it is fast.

## III. LITERATURE SURVEY

Shikha Rani Dhiman (2014) et al present that Segmentation is a procedure that splits the images into its objects or regions that have the same characteristics or features. Segmentation has no single standard process and it is the most tough on the non-trivial images. Summit to the which segmentation is carried out depends on problem specification. Segmentation algorithms are based on the two features of intensity values-discontinuity and similarity. The first class is to divider an image based on abrupt alterations in the intensity and the next approach is to image partition into the regions that are same according to a collection of predefined standards. In this paper some of the approaches for determining and the discontinuity will be discussed and also different segmentation approaches will be attempted. Three basic methods for detecting gray level discontinuities in a digital image's edges, points and lines. The other segmentation method is the thresholding. It is based on fact that numerous kinds of functions can be categorized by applying a range functions applied to the intensity value of the image pixels. [1]

Sujata Saini (2014) et al present that Image segmentation is an important image processing steps, and it is used everywhere if want to analyze what is inside the image. Image segmentation, basically provide the meaningful objects of the image. This paper represents the various image segmentation techniques that could be used in the segmentation algorithm. Whenever work with the image in any application, the initial step is to segment the image in order to solve its complexity. The segmentation of images is the basic thing for understanding the images. It is used in the Image processing applications, Computer vision, etc. In this paper, two categories are emphasized: Edge based and region based segmentation, which further includes their respective techniques. [8]

Muhammad Waseem Khan (2014) et al present that Segmentation is considered as one of the main stages in image process. It splits a digital image into the multiple regions in order to study them. It is also used to the distinguish various image objects. Various image segmentation methods have been developed by researchers

in order to create images easy to evaluate and smoothly. This paper presents a literature survey of the basic image segmentation methods from last five years. Recent research in all of image segmentation method is presented in this paper.[9]

Ms. R. Saranya Pon Selvi (2014) et al present that the image segmentation plays an important role in the present life. The novel technologies are developed in the Image processing field, particularly in the domain of segmentation. Segmentation is considered as one of the main phases in image processing. It splits a digital image into the multiple regions in order to the analyze them. It is also used to the distinguish various image objects. Various image segmentation methods have been developed by the researchers in order to create images easy to evaluate and also smooth. This paper presents a brief outline of selected of the most generally used segmentation methods like Edge detection, thresholding, Region based, Model based. etc. mentioning its benefits as well as the disadvantages. Some of the methods are appropriate for noisy images. [10]

Waseem Khan (2013) et al present that Image segmentation is a mechanism used to split an image into various segments. It will create image easy to evaluate and also smooth. Segmentation procedure also helps to the find region of interest in a specific image. The main aim is to create images more meaningful and simple. Existing segmentation methods can't satisfy each kind of the images. This review addressed numerous image segmentation methods, evaluates them and presents the subjects related to those methods. In this paper, numerous methods of image segmentation have been discussed, a summary of all related image segmentation techniques has been presented in this paper. Recent research in image segmentation techniques is presented in this paper. After the analysis of different techniques of image segmentation, it is observed that a hybrid solution for image segmentation consists of two or more techniques is being the best approach to solve the problem of image segmentation. [11]

Prof. S. T. Khandare (2014) et al present that In computer vision, image segmentation is the procedure of splitting a digital image into multiple sections. The aim of segmentation is to simplify and/or variation the representation of image into something that is more

important and easier to examine. Image segmentation is classically used for the locate objects and background images. More exactly, image segmentation is the procedure of assigning a label to each pixel in the image such that pixels with the similar label share various visual characteristics. Image segmentation is an important signal processing tool that is extensively employed in numerous applications with object detection, object-based coding, object tracking, image retrieval, and clinical organ or tissue identification. Thresholding is the basic technique of image segmentation. From a grayscale image, thresholding can be used to generate binary images. The idea of this technique is to select the threshold value. A number of accepted methods are used in engineering, including the maximum entropy technique, Otsu's technique that uses maximum variance, and k-means clustering. The main idea is that, the proposed segmentation can be work effectively for image based on automatic thresholding and color model based image segmentation. [12]

Akshay P. Vartak (2013) et al present that Image segmentation, i.e., identification of the homogeneous regions in an image, has been the topic of significant research action over the last three decades. Numerous algorithms have been elaborated for the grayscale images. However, the problem of color image segmentation, which convey much more knowledge about objects in scenes, has received much less scientific community attention. While numerous reviews of monochrome image segmentation methods were published, same comprehensive reviews for color images, to information, did not emerge. This paper contains an extensive review of algorithms for the color image segmentation, a classification of them according to the well-defined attribute list, suggestions for their enhancements, and descriptions of some new methods. Mathematical morphology provides a systematic technique to study the geometric characteristics of signals or images, and has been applied widely to numerous applications such as edge detection, object segmentation, noise suppression and so on. The main purpose of this paper is to provide an summary of mathematical morphology and analysis particular morphological filters which are extensively used in image processing. Furthermore, a morphology-based supervised segmentation system is proposed. [13]

S.No.	Title of Paper	Author of Paper	Publications	Work Done
1.	Interactive Image segmentation by improved maximal similarity based region merging [14]	Chen Jian, Yan Bin, Jiang Hua	2013 IEEE	A novel approach which combines a SLIC Super pixels for pre segmentation. For accuracy of similarity measurement he used region merging.
2.	Interactive image segmentation by maximal similarity based region merging. [15]	Jifeng Ning, Lei Zhang, David Zhang	Pattern Recognition (2009), doi:10.1016/j.patcog.2009.03.004	A technique is proposed which deals with the new region merging based image segmentation method. In pre segmentation they used mean shift segmentation. In this scheme the interactive information is introduced a user input marker.
3.	SLIC Super Pixels [16]	Radhakrishna achanta appu shaji, Kevin smith	School of Computer and Communication Sciences (IC), EPFL Technical Report 149300, June 2010.	In this at work proposed to produce the super pixels For achieving the segmentation quality with lower computational cost. SLIC Super pixels produce high quality segmentation, fast, and easy to use.

4.	Automatic image segmentation by dynamic region merging. [17]	Bo Peng, Lei Zhang	Department of Computing, The Hong Kong Polytechnic University, Hong Kong IEEE.	It proposed an approach based on dynamic region merging (DRM) automatically group the initially over segmented many small regions. For computationally efficiency is used a RAG (region adjacency graph), NNG (nearest neighbor graph).
5.	Interactive Image Segmentation and Edge Detection of Medical Images [18]	Sameena Banu1, Apparao Giduturi2, Syed Abdul Sattar3	International Journal of Advanced Computer Research Volume-3 Number-4 Issue-13 December-2013	It proposed an edge detection algorithm is used to detect the edges. Through edge detection algorithm to find their regular parts of edge and all the edges are clear and effective.
6.	Improved technique for object detection using Similarity Based Region Merging. [19]	Garima Singh Rawat ,Joy Bhattacharjee ,Roopali soni	International Journal of Research in Computer and Communication Technology, Vol 2, Issue 5, May-2013	It proposed a novel segmentation technique to detect the object contour using a flood fill algorithm. Improving the effectiveness of region merging. In this method does not need to indicate at the object.
7.	Advanced Maximal Similarity Based Region Merging By User Interactions [20]	Nehaverma, Deepak Sharma	International Journal of Engineering Research and Applications Vol. 3, Issue 4, Jul-Aug 2013, pp.681-688	It proposed approach is based on Multilevel thresholding the method for initial segmentation because it provides very good segmentation results. The idea to introduce the markers for interactive segmentation.
8.	An Efficient Interactive Image Segmentation by Maximal Similarity Based Region Merging With Artificial Neural Networks for MRI Medical Images [21]	G.SUMANA, G.ANJAN BABU	International Journal of Engineering Sciences Research-IJESR Vol 04, Special Issue 01, 2013	It proposed a method for object recognition with artificial neural network. The auto adaptive feature of the algorithm ensures that the primary symbolic edges are identified for different scenarios.
9.	Distance Regularized Level Set Evolution and Its Application to Image Segmentation [22]	Chunming Li, Chenyang Xu	IEEE TRANSACTIONS ON IMAGE PROCESSING, VOL. 19, NO. 12, DECEMBER 2010	It proposed a work on level set method. The proposed DRLSE formulation has an intrinsic Capability of maintaining regularity of the level set function, mainly the required signed distance property in a vicinity of the zero level set, which is ensures correct computation and stable level set evolution

#### IV. PROBLEM STATEMENT

This paper addresses to the image segmentation problem. Image segmentation is a fundamental issue in the computer vision that tries to image partition into disjoint regions. Number of various methods exists. Several types of data, like gray values, edges or any other local features, can be used as an input for segmentation. A general disadvantage of a wide range of segmentation algorithms is that they lack generality. Al-though they perform very well on a particular task, they can only be used on a very small class of segmentation problems. The aim of this paper is to develop an interactive image segmentation, that can be used for a wide range of input images and it's also provide segmented image accuracy. The proposed segmentation algorithm relies both on gray value and on edge knowledge. Additionally user knowledge is accounted for. Although the proposed algorithm is fully designed and applicable as a general purpose segmentation tool, we will focus on its application

to medical data as well as natural images. Medical imaging is a challenging task, and a lot of work was done on medical image segmentation.

#### V. CONCLUSION

In this paper, we discuss and evaluate main image segmentation techniques used for the purpose of image analysis. It is found that there is no perfect method for image segmentation because the result of image segmentation is depends on many factors, i.e., pixel color, texture, intensity, similarity of images, image content, and problem domain. Image Segmentation is a process of image processing and understanding. It is defined as the process of dividing the image into parts based on homogeneity. The purpose of image segmentation is to make the representation of an image simpler into something that is more meaningful and easier to understand. In this article, various techniques of image segmentation has been discussed, an overview of all related image segmentation techniques has been

presented in this paper. Recent research in image segmentation techniques is presented in this paper. In this paper, the comparative studies applied by using various techniques of image segment. The study also analyses the research on several research procedures applied for image segmentation.

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