ISSN XXXX XXXX © 2017 IJESC

Research Article Volume 7 Issue No.6

Various Segmentation Techniques in Image Processing

Patel Jigna.J
Assistant Professor
Department of Computer Engineering
Dr.S & S.S.Ghandhy Government Engineering College, Surat, India

Abstract:
Image-processing techniques have become increasingly important in a wide variety of applications as the technology advances. Image segmentation is very useful for different image processing techniques. Developments of several general-purpose algorithms and techniques have been done for image segmentation. This paper presents a brief idea about some of the most common segmentation techniques.

Keywords: Thresholding, Clustering, Edge Detection, Image Processing, Image segmentation.

I. INTRODUCTION:

Segmentation of an image is the process of partitioning a digital image into number of segments. The main aim of image segmentation is to segment and simplify the image in such a way that it is more meaningful and can be easily analyzed. It is important as well as challenging process of image processing. Image segmentation is useful in many applications, e.g. Content-based image retrieval, Medical imaging, Object detection and Recognition Tasks, Automatic traffic control systems and Video surveillance, etc.

II. DIFFERENT APPROACHES TO SEGMENTATION

Digital image segmentation can further be divided as below:

i) Local segmentation (segments into specific part or region of image) ,and
ii) Global segmentation (segments the whole image, consisting of a large number of pixels).

Based on the properties of an image, the segmentation process can be categorized into these two types.

Digital Image Segmentation can be classified as follows:

- Region Based Segmentation.
- Edge Based Segmentation.
- Thresholding
- Clustering(Based on features)
- Artificial Neural Network Based Segmentation.

Figure.1. Shows the general classification of segmentation.

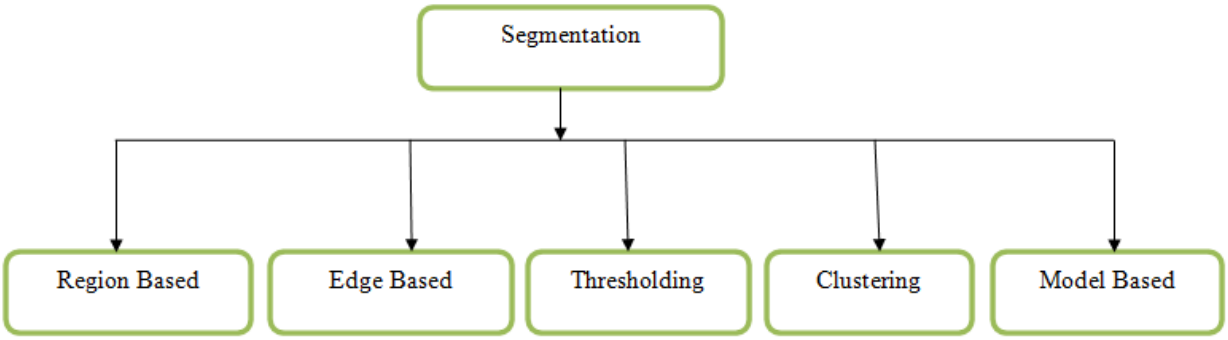

Figure.1.General classification of Segmentation

Region Based Segmentation:

Region based segmentation can further be divided into the following:

Region growing methods: In region growing based segmentation methods, based on the growing of seeds (initial pixels) the whole region of the image is segmented into various regions. These initial pixels or seeds can be selected manually (based on prior knowledge) or automatically (based on particular application). Also, the growing of seeds is controlled by connectivity between pixels, and with the help of the prior knowledge of problem, it can be further stopped. The basic connectivity algorithms are used for region growing methods

Region splitting and merging methods: An image is divided into uniform regions by splitting and merging. It uses two basic techniques i.e. splitting and merging for segmenting an image into various regions. Splitting iteratively divides an image into regions having similar characteristics and merging contributes to

combining the adjacent similar regions. Split and merge algorithms are used for such a type of segmentation.
Region splitting can be carried out as follows:

- Firstly, take the image as a whole to be the area of interest (to be segmented).
- Secondly, decide if all pixels contained in the region satisfy some similarity constraint.
- If **TRUE**, the area of interest corresponds to a region in the image.
- If **FALSE,** split the area of interest into four equal sub-areas and repeat the process for each sub-area.

It can be illustrated as follows:

- Consider, **I** as a whole image shown in Fig 2(a).
- Region is split as shown in Fig 2(b) as all the pixels in the image **I** are not similar.
- Consider all the pixels within regions **I1, I2** and **I3**, respectively are similar but the pixels in **I4** are not.
- So, the region I4 is splitted again as shown in Fig 2(c).
- Finally, assume that all pixels within each region are similar with respect to that region. But after comparing the split regions, regions **I43** and **I44** are found to be identical, so they are merged together as shown in Fig 2(d).

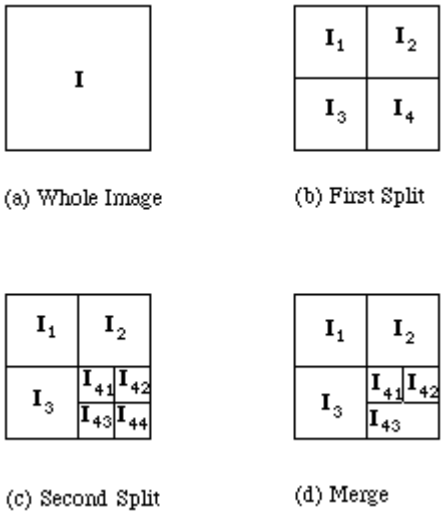

Figure.2.[15]

Edge Based Segmentation:

Edge detection is a common method to segment an image. Essential information regarding the shapes of objects in the scene is retained even though the edge representation of an image significantly reduces the quantity of data to be processed. It detects and outlines of an object and boundaries among various objects and the background in the image. It detects significant discontinuities in intensity values of an image. Edge detection has important feature for image analysis which can be used by advanced computer vision algorithms. Edge detection facilitates higher level image analysis therefore is an active area of research. Basically, three different types of discontinuities occur in the grey level like point, line and edges and spatial masks can be used to detect these discontinuities in an image. Commonly used techniques for edge detection are Roberts edge detection, Sobel Edge Detection, Prewitt edge detection, Kirsh edge detection, Robinson edge detection, Marr-Hildreth edge detection, LoG edge detection and Canny Edge Detection.

Thresholding:

The simplest method of image segmentation is thresholding. It can be used to create binary images from a grayscale image. Each pixel in the source image is assigned to two or more classes through thresholding. Several binary images are formed if there are more than two classes. Thresholding is used to split an image into smaller segments, using at least one gray scale value to define their boundary. This reduces the complexity of the data and simplifies the process of recognition and classification.

Clustering (Based on features):

An image is segmented into clusters having pixels with similar characteristics using clustering. Clustering divides the data elements into different clusters such that elements in same cluster are more similar to each other than elements in other clusters. Clustering can further be classified into:

i) Hierarchical method: - A Hierarchical method uses the concept of trees, where the root of the tree represents whole database and the internal nodes represent the clusters.

ii) Partition based method:-Partition based methods use optimization methods iteratively that minimizes an objective function.

Types of Clustering:

1) Hard Clustering*:* Hard clustering divides an image into set of clusters such that one pixel can only belong only to one cluster. Membership functions having values either 1 or 0 are used by these methods which define whether a pixel can belong to particular cluster or not. e.g. k-means clustering.

2) Soft clustering*:* In soft clustering techniques division is not strict so they are most useful for image segmentation.e.g. fuzzy c-means clustering, in which pixels are partitioned into clusters based on partial membership. In this technique one pixel can belong to more than one clusters and this degree of belonging is described by membership values.

Artificial Neural Network Based Segmentation: -

It simulates the learning strategies of human brain for the purpose of decision making. These types of methods are mostly used for the segmentation of medical images. It separates out the required image from background.

III. CONCLUSION

In this paper various segmentation techniques have been discussed. Segmentation can be applied to various types of images for estimation of the surfaces. Thresholding is the simplest and computationally faster methods in comparison with other methods. Depending on the application technique various segmentation methods can be applied to an image.

IV. REFERENCES:

[1].R.Yogamangalam, B.Karthikeyan," Segmentation Techniques Comparison in Image Processing", International Journal of Engineering and Technology (IJET), ISSN : 0975-4024 Vol 5' Feb-Mar 2013

[2].Nida M. Zaitoun, Musbah J. Aqel," Survey on Image Segmentation Techniques", Procedia Computer Science 65 (2015) 797 – 806, ICCMIT'2015

[3].D. Comaniciu," Robust analysis of feature spaces: color image segmentation", IEEE Xplore'06 August 2002.

[4].Muzamil Bhat,"Digital Image Processing". International Journal of Science & Technology Research, Volume 3 (issue 1), ISSN 2277-8616'Jan'2014.

[5].Nikita Sharma, Mahendra Mishra, Manish Shrivastava, "Color Image Segmentation Techniques and Issues: An Approach". International Journal of Science & Technology Research. Volume 1 (issue 41), ISSN 2277-8616'2012, May

[6].Saeed Mirghasemi, Ramesh Rayudu, Mengjie Zhang," A feature-based region growing-merging approach to color image segmentation", IEEE Xplore'30 January 2014

[7]. Yu, Z., Wong, H.: 'A rule based technique for extraction of visual attention regions based on real-time clustering', IEEE Trans, Multimedia, pp. 766–784'2007.

[8]. Pushmeet Kohli, Stefanie Jegelka,"A Principled Deep Random Field Model for Image Segmentation", 2013.

[9].S.A. Hojjatoleslami, J. Kittler," Region growing: a new approach", IEEE Transactions on Image Processing, Volume: 7, Issue: 7, Jul 1998

[10].O. J. Tobias, and R. Seara, Image segmentation by histogram thresholding using fuzzy sets, IEEE Trans. Image Process, 1457–1465'2002.

[11].Lehmann, F."Turbo segmentation of textured images", on Pattern Analysis and Machine Intelligence,vol: 33,pp: 16 – 29,2011

[12].RA Al-Zahrani, A El-Zaart ,"SAR Images Segmentation Using Edge Information", in Computer Engineering and Technology (ICCET),Vol :4,pp: V4-496 - V4-499 on 2010.

[13].M. Jogendra Kumar, Dr. GVS Raj Kumar ,R. Vijay Kumar Reddy," Review on Image Segmentation Techniques", International Journal of Scientific Research Engineering & Technology (IJSRET), ISSN 2278 – 0882 Volume 3, Issue 6, September 2014

[14].Fan, J., Zeng, G., Body, M., Hacid, M.: 'Seeded region growing: an extensive and comparative study', Pattern Recognit. Lett., pp. 1139–1156'2005.

[15].http://users.cs.cf.ac.uk/Dave.Marshall/Vision_lecture/node34.html