



A Review Paper on Image Segmentation

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Abstract: Image segmentation is the process of partitioning a digital image into multiple segments. It is used to identify objects and background in images. Different Image Processing techniques are available and segmentation is one of the challenging fields in which complexity is least and implementation is effective. This is widely employed in many applications including object-based coding, object tracking, object detection, image retrieval, and clinical organ or tissue identification. Different technique such as Edge based, region based, Thresholding and computational steps for image segmentation is covered in this paper.

Keyword: segmentation, edge based, region based, Thresholding

I.INTRODUCTION

Images are considered as one of the most important medium of conveying information, in the field of computer vision, by understanding images the information extracted from them can be used for other tasks.

Image segmentation means assigning a label to each pixel in the image such that pixels with same labels share common visual characteristics. It makes an image easier to analyze in the image processing tasks. There are many different techniques available to perform image segmentation.

II.METHODOLOGY

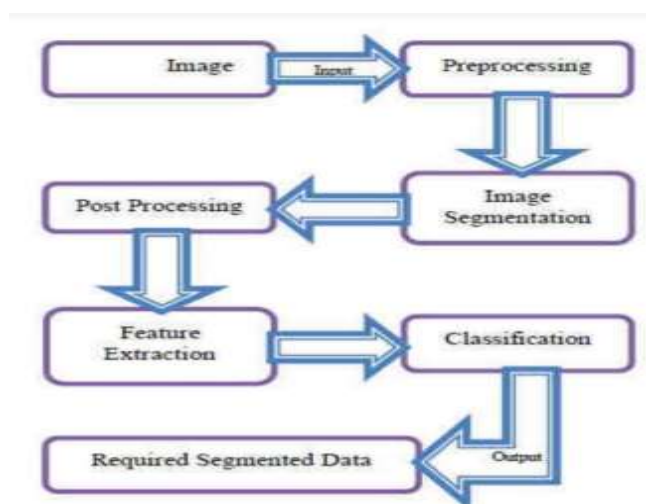


Fig1: Computational steps for Image Segmentation

The following computational steps should be applied to the process of segmentation of the image onto the taken image as input to obtain the required segmented data:

1. Pre-processing: The main goal of the pre-processing step is to define the focus area of the image. Since the input image may contain a certain amount of noise in the images, it is necessary to reduce or eliminate the noise.
2. Image Segmentation: Image segmentation is the process of dividing a digital image into multiple parts. In this step, the pre-processed image is segmented into its component sub-regions.
3. Post Processing: To improve the segmented image, further processing may be required which is performed in post-processing which is used to smooth the predictive scores.



4. Feature Extraction: It is a technology to redefine a large set of redundant data to a set of low-dimension features. This step helps reduce the complexity of classification problems and can make classification more efficient.
5. Classification: The classification step's goal is to use extracted features to classify the segmented image. To arrive at a decision, this stage employs statistical analysis of the features as well as machine learning algorithms.

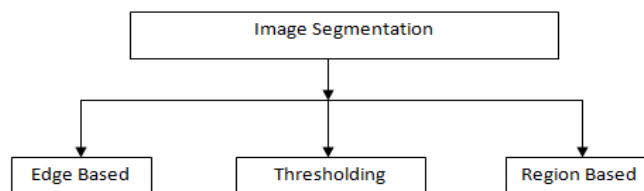


Fig2: Image Segmentation Methods

1. Edge Based: Edge refers to a related pixel that is located on the region's boundary. As a result, these pixels on the edge are referred to as edge points. The derivative of an image function can be used to measure the edge. Some of the edges are very obvious. There are four types of edges: Ramp edge, Step edge, Roof edge, Spike edge. A sudden shift in strength level is referred to as a step edge. A gradual shift in pressure is referred to as a ramp edge. Spike edge is a quick change in intensity and then returns to its original intensity. Over a short span, the roof edge is not immediate. The structural techniques category includes edge-based segmentation.
2. Thresholding: This is the most basic image segmentation process. In this method, a specific value known as the threshold is used for measurement. A pixel in an image is an object pixel if its value is greater than or equal to the threshold value, otherwise it is a background pixel. There are three types of thresholding techniques: local thresholding, global thresholding, and adaptive or dynamic thresholding. The threshold parameters are considered over a small area in a local thresholding technique. If the intensity distributions of the object and background pixels are sufficiently distinct, global (single) thresholding can be applied to the entire image. When the threshold value is determined by the spatial co-ordinates (a, b), it is referred to as dynamic or adaptive thresholding. Based on the knowledge that each Thresholding algorithm manipulates, the following six classes of Thresholding methods can be identified:
 - a. Histogram shape-based methods: The study of a smoothed histogram is done using peaks, valleys, and curvatures in this process.
 - b. Clustering-based methods: The gray-level samples are either clustered in two segments, i.e. background object and foreground object, or modelled as a mixture of two Gaussians in this process.
 - c. Entropy-based methods: The entropy of the foreground and background regions is used in this process.
 - d. Object Attribute-based methods: The measure of similarity between the gray-level or strength and the binary images given is searched in this process.
 - e. Spatial methods: The higher-order probability distribution and/or correlation between pixels are used in this procedure.
 - f. Local methods: The procedures used in this approach adapt the threshold value on each pixel to the local image characteristics.
3. Region Based: Another image segmentation approach is region based segmentation, in which the image is divided into constituent sub-divisions with similar properties called regions. The following techniques can be used to segment data:
 - a. Region Growing: It is an image segmentation method in which pixel groups or sub-regions are grouped into larger regions according to predefined growth criteria. In this step, one seed pixel and a threshold value are chosen, and each pixel is checked for the specified threshold value. Put into one region if the threshold is greater than the pixel value; otherwise, put into another region. To reflect the property of region we need, only a few seed points are needed. This process will be repeated until all of the pixels in the area have been made.
 - b. Region splitting and merging: It is an image segmentation method in which an image is subdivided into a number of arbitrary disjoint regions, which are then combined to satisfy the segmentation condition. A top-down method for separating or dividing an image that produces a quad tree in which the image is subdivided into smaller quadrants.

**III.LITERATURE SURVEY**

Amarpreet kaur[1] et al has proposed image segmentation as the one that divides the image into multiple parts in the form of pixel. To detect the object boundaries and other relevant data segmentation is used.

Vrushali mendhule[2] et al has proposed the study of different technologies of interactive image segmentation for image of foreground background separation system. Technologies that are used for interactive image segmentation are intelligent scissors, adaptive GMMRF model, probabilistic hyper graphs, and interactive graph cut method.

Tao Wang [3] et al image segmentation is approached by segmentation problem which is formulated in probabilistic manner. Here the author measure similarities between pixel pairs and seed pairs to improve the robustness to the seeds. By imposing smoothing constraints on unary potential the work is proposed to blend the region and boundary information of the image.

Zaitoun[4] et al This paper presents a comparative study of the basic Block-Based image segmentation techniques. Block image segmentation methods are two main categories: region based and edge or boundary based method and each of them is divided into several techniques. The image is segmented using a series of decision and there is no universal segmentation method for all kinds of images and also an image can be segmented by using different segmentation method sent of these image segmentation techniques are done.

Shivhare[5] et al This paper proposes that Image segmentation is a process of partitioning an image into meaningful regions that are homogenous or similar and inhomogeneous in some characteristics. Image segmentation results have an effect on image analysis and it following higher order tasks. Image analysis includes object description and representation, feature measurement. Higher order task follows classification of object. Hence characterization, visualization of region of interest in any image, delineation plays an important role in image segmentation. These image segmentation techniques need comparative analysis for further development and modifications for continuous and consistent improvement.

Anjna[6] et al This paper is about the various methods that are widely used to segment the image. Among the various image processing techniques image segmentation plays a vital role in step to analyze the given image. Image segmentation is the fundamental step to analyze images and extract data from them. This work deals on the basic principles on the methods used to segment an image. Segmentation has become a prominent objective in image analysis and computer vision. On observing these techniques, edge detection yields better result with images that are having fine features such as flower, river and satellite images. Thresholding technique is best with images that are having fewer features such as face and fruit images.

Gautam[7] et al In this paper image segmentation is explained by using different techniques like edge detection, region based segmentation, Thresholding and neural network techniques etc. are used. The summary of diverse segmentation techniques applied on digital image processing is enlightened shortly, evaluates variety of research techniques applied on image segmentation and the factors that affect the process of image segmentation.

Karungan [8] et al This paper is based on various segmentation techniques, the advantages, and disadvantages of it. Segmentation can be applied to any type of images. Comparing to other methods thresholding is the simplest and computationally fast. Depending on the application the technique varies. 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. The result of image segmentation depends on many factors, i.e., pixel color, texture, intensity, a similarity of images, image content, and problem domain.

Gwet[9] et al this paper presents an overview of image segmentation and its present techniques. Image analysis includes object description and representation, feature measurement. Image segmentation can be broadly classified into two types: Local segmentation, Global segmentation. Gives brief outline on different fields that have contributed in development of better image segmentation such as clustering based technique, neural network-based technique, genetic algorithm-based technique, wavelet-based technique, etc. Also presents discussion on image segmentation and its different techniques that are used in various fields such as biomedical field, computer vision and image processing.

Agrawal [10] et al This paper is based on various segmentation techniques, the advantages, and disadvantages of it. Segmentation can be applied to any type of images. Comparing to other methods Thresholding is the simplest and computationally fast. Depending on the application the technique varies. 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. The result of image segmentation depends on many factors, i.e., pixel color, texture, intensity, a similarity of images, image content, and problem domain.

**IV.CONCLUSION**

The proposed benchmark provides the overview representation of different segmentation techniques that are used in various fields. Image segmentation remains a challenging problem which attracts the researcher's attention. Opting a single technique or method would not provide a better optimized results. Thus the proposed method of edge based image segmentation is novel and highly reliable in terms of accuracy of the results. The locally adaptive thresholding technique removes the background by using local Binarization and standard deviation. The proposed techniques can provide the original images which have clear edges with the good segmentation results. And they arguably approach to the most robust methods when image data is noisy. Therefore, they are the prime choice for many applications. Our segmentation algorithm makes simple grasping decisions and produces segmentation that obeys the world-wide properties. Thus the segmentation technique is relatively superior in all terms when compared to the conventional techniques available and can serve as a reliable and robust tool. The presented methods are the general and efficient approach which gives the better performance among image segmentation and also provides a confidence level associated with segmentation. Further elegance would take account of dusk and explore the expansion of the techniques.

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