

Role of Segmentation Technique in Digital Image Processing

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Abstract: Image processing Technique have become greatest Important in wide variety of applications as the technology Advance. Image segmentation Technique play a very useful Role for different image Processing Technique. It is used for analyzing function in image Processing and analysis. In Digital Image Processing Image Segmentation is the process of partitioning a digital image into multiple segment (basically groups of pixel, also termed as Super Pixel). The Term Images Segmentation refer to the Partition of an image into a set of regions. That cover it this is typically used to identify objects or other relevant information in Digital image. By This Paper I have presented a review on various image Segmentation Techniques Such as Thresholding, region based, clustering, Edge Detection.

Keywords: Segmentation; DIP; Techniques.

I. INTRODUCTION

Digital image processing is the use of computer algorithms to perform image processing on digital images. Segmentation of image is a process of dividing image in such a manner that its original concept or information is not destroyed and it help in image analysis. Image segmentation helps us in personal identification as well as object identification [1]. Segmentation of an image entails the division or separation of the image into regions of similar attribute. The basic attribute for segmentation is image amplitude luminance for a monochrome image and color components for a color image. Image edges and textures are also useful attributes for segmentation. The result of image segmentation is a set of regions that collectively cover the entire image, or a set of contours extracted from the image Based on investigation, the conclusion is that image segmentation has a favorable future and a lot of work is necessary for evolving a best segmentation technique which has an ability to Applied universally. For getting a better result of image segmentation we can also use hybrid approaches that

means combining two approaches [2, 5]. The goal of image segmentation is partition of an image into a set of disjoint regions with Uniform and homogeneous attributes such as intensity. The main aim of segmentation is simplification i.e. representing an image into meaningful and easily analyzable way. Image segmentation is necessary first step in image analysis [8, 3]. Segmentation technique, basically convert the complex image into the simple image as shown in the Fig1.



Fig1. Segmentation technique

Type of Segmentation:

There are different types of Segmentation

1. Pixel based direct classification:

In this method, segmentation is done on the basis of pixels.

2. Global knowledge based segmentation:

This segmentation identifies a threshold value from a grayscale or color histogram that represent an image.

3. Edge based segmentation:

It is used for line detection application such as text recognition.

4. Region based segmentation:

Graph partitioning is a region based method, used for complex image segmentation.

5. Cluster based segmentation



In cluster based segmentation a given set of data is divided into groups.[4]

Application of Image Segmentation

There are some most applications of Image segmentation:

1. Medical Imaging
 - In Some pathologies
 - Measure tissue volumes
 - Computer guided surgery
 - Diagnosis
 - Treatment planning
 - Study of anatomical structures
2. Used in satellite images (Like roads, forests)
3. Face recognition
4. Fingerprint recognition
5. Automatic traffic controlling systems
6. Machine vision
7. Finger print Recognition [9]

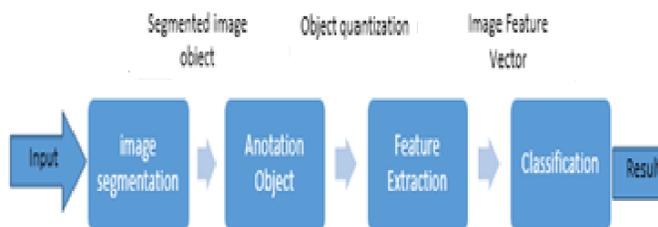


Fig2. Typical image Analysis pipeline

II. SEGMENTATION TECHNIQUES

There are many existing techniques which are used for image segmentation. These all techniques have their own importance. Every technique can be applied on different images to perform required segmentation.

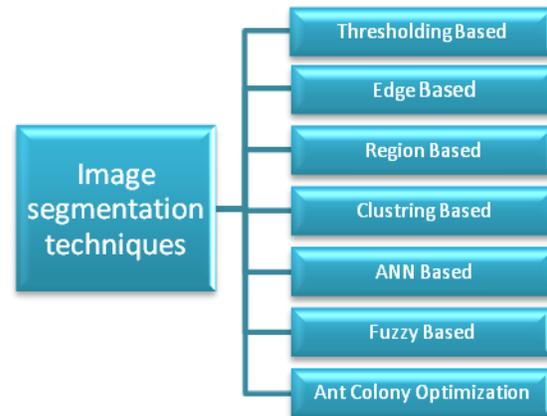


Fig3. Classifications of Segmentation Technique

A. THRESHOLDING BASED

Thresholding is a standout amongst the most essential technique utilized for picture division. It is valuable in separating closer view from the foundation. By choosing a sufficient edge esteem T , the dim level picture can be changed over to twofold picture. At that point all the dark level esteems underneath this T will be named dark (0), and those above T will be white (1). The paired picture ought to contain the majority of the basic data about the position and state of the objects of intrigue (closer view). The upside of acquiring initial a parallel picture is that it diminishes the many-sided quality of the information and disentangles the procedure of acknowledgment and characterization [6]. During the time spent Thresholding, picture should be made out of locales and these areas have a place with various scopes of dark scale [7]. The fascinating item in the picture is a frontal area and the rest is a foundation. Limit T is first finished by breaking down all the pixel power. Consider a pixel $f(x, y)$ grouping is done as though $f(x, y) = \{> T; forefront < T; Background\}$ Problem related with the Thresholding strategy is that it will disregard the spatial data of the Pixel esteems and henceforth they are wasteful for pictures that obscure at protest limits or for various Image segment division [8]. For $T=T[f(x, y)]$, limit is worldwide

For $T=T[p(x, y), f(x, y)]$, threshold is local
 For $T=T[x, y, p(x, y), f(x, y)]$, threshold is dynamic or adaptive.



F4.Segmented image using Thresholding Segmentation.

B. EDGE BASE

Edge location is an imperative advance for picture division. The objective of edge recognition Process in an advanced picture is to decide the boondocks of every single spoke to question in view of programmed handling of the shading or dim level data in each present pixel.

The thought is to identify the sharp changes in picture brilliance which can catch the critical occasions and properties. This is done in 3 ways [9]. The edge detection process is shown in Fig 3.

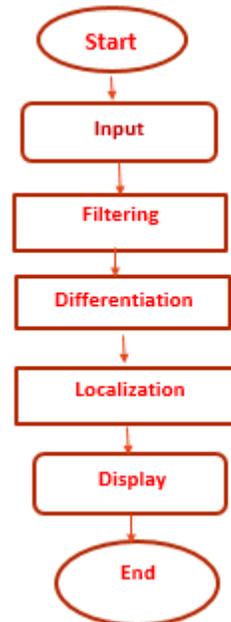
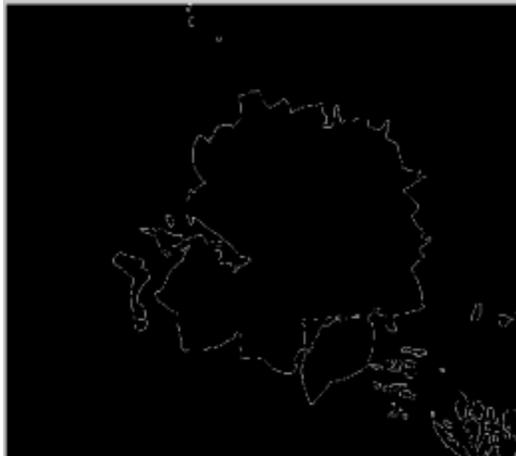


Fig5.Edge Detection Process

Edge detectors have different operator for detection of edge such as sobel operator, Laplace operator, canny operator, Log (Laplacian of Gaussian) operator and so on. Edge detection method require a higher image quality so its need to reduce or remove the noise [9].

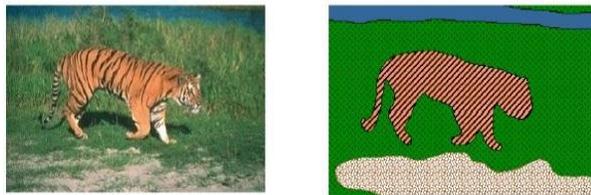




F6.Segmented image using Edge Based Segmentation.

C. REGION BASED

In this technique, corresponding pixels of objects are grouped for segmentation. For segmentation method, boundaries are identified. In every step at least one pixel is associated to the region and is taken into consideration. After recognizing the change in the texture and color, the edge flow is turned into a vector. From this the edges are detected for further segmentation [11].



Region Segmented Image

F7.Segmented image using Region Based Segmentation.

D. CLUSTERING BASED

The clustering in image segmentation is defined as the process of identifying groups of similar image primitive. Clustering techniques can be classified into following two categories: Supervised Clustering Unsupervised Clustering.

i. Supervised clustering: This type of clustering includes human interaction to decide the clustering criteria. It includes hierarchical approaches such as relevance feedback techniques, Log-Based Clustering, Hierarchical K-means is one of many simplest unsupervised learning algorithms that

classify a given data set into certain quantity of clusters (assume k clusters) fixed a priori. The key idea is always to define k centroids, one for each single cluster.

ii. Unsupervised clustering: This type of clustering decides the clustering criteria by itself.

E. ARTIFICIAL NEURAL NETWORK:

A neural net is an artificial representation of human brain that tries to simulate its learning process. An artificial neural network is often called a neural network or simply neural net. In recent years, artificial neural networks have been widely used to take care of the issue of medicinal picture division. Neural system in light of reproduction of life, particularly the human cerebrum's learning procedure, constitutes countless hubs. Every hub can play out some essential figuring. The learning procedure can be accomplished through the exchanging the associations among hubs and association weights. Its fundamental leverage isn't subject to the likelihood thickness dissemination work. It can likewise demonstrate the division comes about when the information deviation from the ordinary situation.[11].

Fuzzy based Segmentation

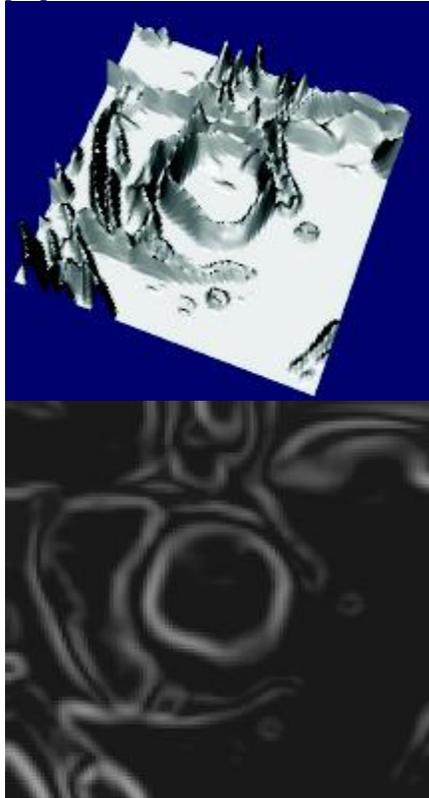
In fluffy grouping (likewise alluded to as delicate bunching), information components can have a place with more than one bunch, and connected with every component is an arrangement of participation levels. These demonstrate the quality of the relationship between that information component and a specific group. Fluffy grouping is a procedure of doling out these enrollment levels, and after that utilizing them to allocate information Element to at least one bunches. A standout amongst the most generally utilized fluffy grouping calculations is the Fuzzy C-Means (FCM) Algorithm. The FCM calculation endeavors to segment a limited accumulation of N components into a gathering of c fluffy bunches as for some given standard. Given a limited arrangement of information, the calculation restores a rundown of C bunch focus and a segment grid W. In fluffy bunching, each point has a level of having a place with groups, as in fluffy rationale, instead of having a place totally with only one group. Subsequently, focuses on the edge of a group might be in the bunch to a lesser degree than focuses in the focal point of group. The calculation limits intra-bunch difference too, however have indistinguishable issues from k-implies; the base is a nearby least, and the outcomes rely upon the underlying selection of weights. Utilizing a blend of Gaussians alongside the

desire augmentation calculation is an all the more factually formalized strategy which incorporates some of these thoughts: fractional enrollment in classes. Fluffy c-implies has been an essential instrument for picture handling in bunching objects in a picture [12].

F. WATERSHED BASED SEGMENTATION

In the investigation of Image handling, a watershed is a change characterized on a grayscale picture. The name alludes allegorically to a land watershed, or seepage partition, which isolates neighboring waste bowls. The watershed change treats the picture it works upon like a topographic guide, with the splendor of each point speaking to its stature, and finds the lines that keep running along the highest points of edges.

There are diverse specialized meanings of a watershed. In charts, watershed lines might be characterized on the hubs, on the edges, or half and half lines on the two hubs and edges. Watersheds may likewise be characterized in the nonstop space. There are additionally various calculations to process watersheds. Watershed calculation is utilized as a part of picture preparing principally for division purposes.



Relief of the gradient magnitude
Gradient magnitude image
Watershed of the gradient

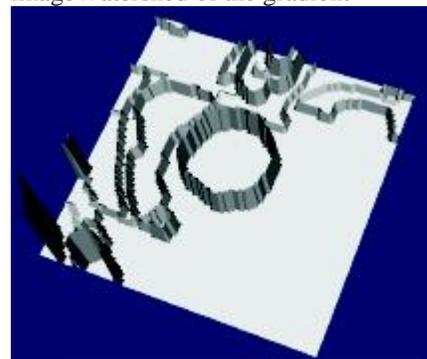


Fig9. Watershed of the gradient (relief)

III. REVIEW OF LITERATURE

In 2001, Deng et al. introduce a method for unsupervised segmentation of color-texture regions in images and video, called as JSEG [14]. He wanted to segment images and video into homogeneous color-texture regions. He trying to describe the image segmentation part of JSEG.

The concept of the JSEG algorithm is to separate the segmentation process into two portions, color quantization and spatial segmentation. The color quantization quantizes colors in image into several representative classes that can differentiate regions in the image. In 2015 Nameirakpam Dhanachandra, Khumanthem Manglem etc. all. In [15] presented a clustering algorithm that is Composed of k-means clustering and Subtractive clustering method used to generate the initial centers and those centers are used in k-means algorithm for the segmentation of image. Then finally median filter is applied to the segmented image to remove any unwanted region from the image. In [16] Author claims that if the Number of clusters is estimated inaccurate manner, K-means image segmentation will provide better results. They



proposed a new method based on edge detection to estimate number of clusters. Phase congruency is used to detect the edges. Then these edges are used to find clusters. Threshold and Euclidean distance is used in order to make clusters. K-means is used to find the final segmentation of image. Sujata Saini et al. [2014] Image segmentation is a broad step in image Processing. Image segmentation provides the significant objects of the image. This paper represents the various image segmentation Technique that could be used in the segmentation algorithm. First step is to segment the image so as to remove its Complexity. The segmentation of images is the first thing for understanding the images. It is used in the Image processing applications like Computer vision, etc. this paper, some categories are mentioned: Edge and region based Segmentation, which further more includes their respective techniques. In [18] I. Irum, M. Raza, And M. Sharif, Represent Image Texture Classification technique based on Artificial Neural Networks(ANN). Firstly, image is captured and pre-processing is performed, after it, feature extraction is performed, whereas, ANN classifier is used for

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texture classification, Clustering is performed to separate background from sub-images. Trained ANN combines the input pixels into two clusters which give results. It produces the texture classification and segmentation of image.

IV. CONCLUSION

In This paper presents a relative overview of various Image Segmentation Techniques has been done. These techniques are applicable in different fields like medical imaging, object recognition, pattern recognition etc. It is found that image segmentation is having vital use and challenging future in image processing. 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.

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