

A STUDY ON IMAGE SEGMENTATION AND ITS TECHNIQUES

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Abstract: Background: Segmentation is very important process in field of image processing. In areas such as computer vision and image processing, image segmentation is a useful topic and it is a related research area due to its wide variety usage and application. Segmentation can be improvement in computer processing capabilities and the increased application of colour image. **Objective:** This paper presents a comparative study and evaluates the performance of the existing techniques regard to image segmentation techniques. This algorithm will be developed to segment and to recognize difference between a normal organ and infected organ. **Method:** To improve the required information from the given image in a way that it will not effects the other features of that image and that can be easy to understand. So, the several algorithm and techniques have been developed for some characteristics like gray level, colour, tone, texture of image processing which are used different techniques region based, edge based, threshold, clustering, watershed .

Keywords: image segmentation, edge detection, region based detection, threshold

I. INTRODUCTION

The digital image processing technology is an important field. Digital image is widely used in the society, such as education, advertisement, video, film and so on. [1] In image processing technique the image is collected a finite number of element has a particular location and value. These elements are referred to as picture element, image elements, pels and pixels. Pixel is the term used commonly to denote the elements of a digital image. In image analysis, the target is regularly required to extract from the image. Image segmentation can be described as that a particular region is separated and extracted from the other parts of the image. [1] The level of the image segmentation in image processing introduced “image engineering” concept it can be involved theory, algorithms, tools, equipment of image segmentation. According to the similar of the abstract and research methods, it can be divided into 3 levels: Image processing, image analysis and image understanding. [2]

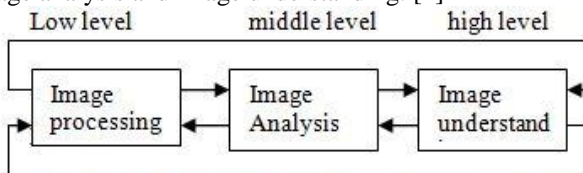


Fig1 the three –level diagram of image engineering [2]

As show in fig1 Image processing is comparatively low-level operation; it is mainly operated on the pixel-level. Then image analysis enters the middle- level, it focuses on measuring, expression and description of target. Image understanding is high –level operation, it focuses on the

operation and illation of data symbol which abstracts from the explanation. [2]

II. IMAGE SEGMENTATION

Image segmentation is the process of dividing of a digital image into multiple segments recognized as super pixels. The aim of segmentation is to simplify and/or change the representation of an image into something that is more significant and easier to study. Image segmentation is normally used to locate objects and boundaries (lines, curves, etc.) in the images. More accurately, image segmentation is the process of allocating a label to every pixel in an image such that pixels with the same label portion certain visual characteristics. Image segmentation is normally used key technique in image representation of the digital images.

III. CLASSIFICATION

Segmentation can be classified as follows:

- Region Based
- Edge Based
- Threshold
- Clustering
- ANN based.

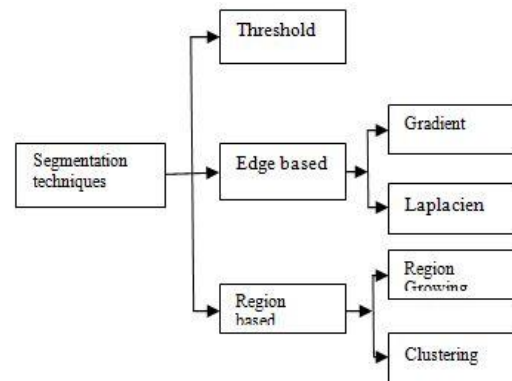


Fig2 image segmentation techniques [11]

IV. REGION BASED

In this method classify a particular image into a nubes of regions or classes. In this technique pixels that are related to an object are combined for segmentation. Thresholding technique is bound with region based segmentation. [4] Region based method is based in continuity. Region based segmentation is also known as “Similarity based segmentation”. [6]

Region based segmentation include:-

First step in region growing is to select a set of seed point. Then merge the same or similar property of pixel with the seed point around the seed point domain into the domain of seed pixel. Grow the region by adding to each seed. Stop the

region growing. [11]

Some important point:

- The seed point of suitable selection is important.
- The value is "minimum area threshold.
- The better image for more information. [11]

EDGE-BASED

Edge-based segmentation is normally introducing the segmentation method based on the edge of image. The simple methods apply some edge detection method before segmentation. [18] In this method used of detecting boundaries and discontinuities in an image. It divides an image into two parts object and its background. The change in intensity or pixel of image observing in edge detection divided an image. [4]

Edge detection consists of three major steps:

- Filtering: Image are frequently generate the noise which is variation on intensity values, common types of noise are salt and pepper, impulse and Gaussian noise. Salt and pepper noise is affecting both black and white intensity values.
- Enhancement: It is important to determine changes of intensity in neighbourhood of a point. A change in local intensity values performed by enhancement emphasizes pixel.

Detection: -All the points in image are non-zero value and all points are edge for a particular application. So the method is created to determine which points are edge points.

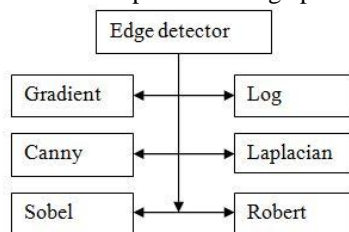


Fig3. Types of Edge detection [4]

THRESHOLD

Threshold is the easiest method of segmentation. It's done through that threshold values which are obtained from the histogram of individuals edges of the original image. [8] This method is typically used for image have light object on darker background. Thresholding algorithm will choose a proper threshold value T to divide image's pixels into several classes and divide objects from the background.

Threshold is two types:-

- Global threshold
- Local threshold

V. CLUSTERING

Segmentation is also done during clustering. They follow a different method, where most of them apply the technique directly to the image but here the image is converted into histogram and then clustering is done on it. [4] The main concept of clustering is used for centred of cluster to classify. According to the characteristics of clustering algorithm; we can roughly divide into hierarchical and partitioned clustering. [18]

ANN based

It is neural web is a synthetic demonstration of human brain that tries to faux its learning approaches and might be used for decision making process. a synthetic neural web work is usually known as a neural network or just neural net. Neural network that simulate life, particularly the human brain's learning techniques, organizes an oversized variety of parallel nodes. Every node will perform some basic computing. Neural network may also cut back the necessities of professional interference throughout the image segmentation process [4].

VI. RELATED WORK

The problems of digital image segmentation represent great challenges for computer vision. Many researchers had created different methods to deal with these problems in image segmentation.

- Diagnosing diabetics with reflex zones of the tongue using color image segmentation is discussed in this paper. The tongue is a powerful organ that has capacities to deglutition, taste and speech. It is an effectively available organ for the valuation of health in patients. Any abnormal working of the Stomach, Pancreas, Liver Gall Bladder and Intestines will be reflected on the tongue. The characteristic changes happen in the tongue can be truly helpful and will provide some signs for diagnosing a percentage of the diseases [3].
- A New Parallel Segmentation Algorithm for Medical Image is discussed by the authors. In medical Image analysis, the parallel segmentation is the main technology. As one of the previous classical methods and regional growth algorithms have some problems: it is hard to confirm the feed points automatically. To resolve this defect, a new parallel segmentation algorithm with regional growth and support vector machine (SVM) is suggested. As SVMs has a good result in segmentation but a non-ideal convergence rate. Which has been the advantage of regional growth method? So by combining them and the idea of the algorithm is clearly classify by SVM to search the seed points and then segmented by regional growth method [4].
- Author Comparing the Performance of $L^*A^*B^*$ and HSV Color Spaces with Respect to Color Image Segmentation. Color image segmentation is a very developing topic for image processing research. Since it has the ability to present the result in a way that is much more close to the human eyes recognize, so today's more researches are going on this area. Choosing a proper color space is a most important topic for color image segmentation technique [5].
- Image Segmentation for Food Quality Evaluation Using Computer Vision System is studied; Quality assessment is very important factor in food processing industries using the computer vision system where human inspection systems provide

high inconsistency. In many countries food processing industries aims at manufacturing defect free food materials to the consumers. Human inspection techniques suffer from high labor costs, inconsistency and variability. Thus new techniques provide various steps for detecting defects in the food material using the computer vision systems. Various steps in computer vision system are image acquisition, Preprocessing, image segmentation, feature identification and classification [6]

- A New Approach towards Clustering based Color Image Segmentation, in this Color image segmentation is currently a very evolving topic for researchers in Image processing. Clustering is a frequently chosen methodology for this image segmentation job. But for a better segmentation, there rises the need of an optimal technique. In this paper, author proposed an integrated approach for color image segmentation which is a new of its kind. Here, the famous k-means algorithm is integrated with watershed algorithm. But, by choosing 'cosine' distance measure for k-means algorithm to optimize the segmented result of the later one [7].
- A Survey Paper on Fuzzy Image Segmentation Techniques, in this, the image segmentation plays an important role in the day-to-day life. The new technologies are emerging in the field of Image processing, especially in the domain of segmentation. Segmentation is considered as one of the main steps in image processing. It divides a digital image into multiple regions in order to analyse them. It is also used to differentiate different objects in the image. Several image segmentation techniques have been developed by the researchers in order to make images smooth and easy to evaluate [8].
- A Survey Paper on Image Segmentation with Thresholding, in this computer vision, image segmentation is the process of partitioning a digital image into multiple sections. The aim of segmentation is to simplify and to change the representation of an image into something that is more important and easier to examine. Image segmentation is usually used to locate objects and background in images [9].
- Color Image Segmentation Algorithms based on Granular Computing Clustering, in this color image segmentation algorithm are proposed based on granular computing clustering (GrCC). Firstly, the atomic hyper spherical granule is represented as the vector including the RGB value of pixel of color image and radii 0. Secondly, the union operator of two hyper spherical granules is designed to obtain the larger hyper spherical granule compared with these two hyper spherical granules [10].
- Color Image Segmentation Using K-Means Clustering and Otsu's Adaptive Thresholding, In this paper, an approach for color image segmentation is presented. In this method foreground objects are distinguished clearly from the background. As the HSV color space is similar to the way human eyes see color, hence in this method, first RGB image is converted to HSV (Hue, Saturation, Value) color model and V (Value) channel is extracted, as Value corresponds directly to the concept of intensity/brightness in the color basics section. Next an Otsu's multi-thresholding is applied on V channel to get the best thresholds from the image [11].
- Color Image Segmentation with Different Image Segmentation Techniques, in this paper deals with different image segmentation techniques to enhance the quality of color images. The technique follows the principle of clustering and region merging algorithm. The system is combination various stages like histogram with hill climbing techniques; auto clustering includes k means clustering, the consistency test of regions, and automatic image segmentation using dynamic region merging algorithms. The different techniques of image segmentation include thresholding, clustering, region merging, region growing, color segmentation, motion segmentation and automatic image segmentation. This paper mentions different methods for efficient segmentation which is combination of different algorithms. Here the given image gets converted into histogram. The histogram is graphical representation of input image [13].
- Texture segmentation in medical imaging for red spot blotches analysis in human body. In an Image, the sort of regions are analyze in segments by image texture. Color intensity in the image provide unusual pattern of information about the image. Texture Interpretation describes the regions on the behalf of the texture of an image. Texture description of an image used sort of properties of an image, for determine the quality such as smoothness, roughness, etc. based on intensity of pixels in that particular image [14].
- Review of Graph, Medical and Color Image base Segmentation Techniques. This literature review attempts to provide a brief overview of some of the most common segmentation techniques, and a comparison between them. It discusses Graph based methods, Medical image segmentation research papers and Color Image based Segmentation Techniques. With the growing research on image segmentation, it has become important to categories the research outcomes and provides readers with an overview of the existing segmentation techniques in each category [15].
- A New Method for Image Segmentation. Image processing is a form of signal processing. One of the important operations on image processing is image segmentation. In this paper, author used new image segmentation algorithms based on information bottleneck method. Two algorithms going to be used; first is the split-and-merge

algorithm, where an image is segmented into set of regions (input) and the intensity histogram bins (output) is obtained. The second algorithm is the histogram clustering algorithm, where the input variable represents the histogram bins and the output is given by the set of regions [16].

- Research review for digital image segmentation techniques. Evaluating the previous work is an important part of developing segmentation methods for the image analysis techniques. The aim of this paper is to give a review of digital image segmentation techniques. The problems of digital image segmentation represent great challenges for computer vision [17].

Method	Advantage	Disadvantage
1.region based	Clear edges, which means the good segmentation results. The concept is simple. Good shape matching of its results. Can determine seed points and criteria	Has a problem of computational time consuming Selection of noisy seed by user leads to flawed segmentation. To decide stopping criteria for segmentation is difficult task.
2.Edge based	Fast speed. The large numbers of segmented region result is reliable.	Over-segmentation.
3.Threshold	Does not require prior information of the image. Computationally inexpensive. Fast and simple for implementation. • Can be used in real time applications.	For an image with broad and flat valleys or without any peak, it doesn't work well. Highly noise sensitive. Selection of threshold is critical, wrong choice may result into over or under segmentation.
4.clustering	For small values of k, k-means is computationally faster. Eliminates noisy spots. Reduces artificial blobs. More homogeneous regions are obtained.	Computationally expensive. Doesn't work well with non globular clusters. Difficult to predict k with fixed number of clusters

VII. CONCLUSION

Image segmentation based on colour is an important step to remove all background objects and insignificant information in the image. It generates a binary image containing the infected organ. This step reduces the amount of calculation needed in the following steps as it generally reduces the number of steps. A colour segmentation algorithm should be strong enough to work in a wide spectrum of environmental conditions and be able to generate binary images even when organ colours are attenuated.

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