

# A Review on Different Techniques of Segmentation For Liver Segmentation

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**Abstract:** Digital Image processing is the prevalent in various fields. The success of the segmentation depends upon the pre processing phase of the image. Image processing includes two phase one is pre processing phase and other is post processing phase. In pre-processing of the image having various processing steps like image resizing, image denoising, and image filtration. In post processing phase the segmentation and features extraction will be done. In medical image processing mainly CT images are used for segmentation. These CT images have overlapping of the organs. These overlapping organs images segmentation is most difficult process with higher level of precision. Various types of segmentation techniques are being used for segmentation of the medical images. Edge based segmentation technique is best suited for this purpose. Edge based segmentation has higher success rate and higher precision for the medical images discussed by various authors.

**Keywords:** Segmentation, Edge based, CT Images.

## I. INTRODUCTION

### 1.1 Image Segmentation

Image segmentation is the process of dividing the image into small parts based upon the intensity levels. The goal of segmentation is to provide us the large area detection in simplest way. These days segmentation of image is widely used in the field of medical imaging, context-based image retrieval, and object reorganization.

Segmentation can be used to divide into different classes:

- Feature space method: It consists of feature extraction and clustering. Different features are considered during segmentation, [16] pixels having same value are clustered in one cluster and so on.
- Image domain based method: These are used to find out the boundaries in an image for the segmentation purpose. The methods that come under this are split and merge, region growing etc.
- Edge based method: It is the method of segmentation under which edge links are found and edge detection is performed.

### 1.2 Technique Based On Segmentation

Thresholding based segmentation: the Thresholding is the technique which uses intensity values. In this range of intensity is considered i.e. which pixel lies under which intensity level. Thresholding can be local or global in nature. It converts gray scale image to binary image. The binary image have value 0 and 1. Binary value '1' is considered as object pixel and '0' is considered as background pixel. Thresholding values can be either taken using interactive ways or using automatic thresholding method. OTSU method is one of the most widely used method of thresholding its fast and inexpensive method. In this image is divided into different objects and background is separated and then different values of threshold are considered. It can be local threshold value or multi-level as they help in detecting objects separately.

#### 1.2.1 Region based segmentation

Region based segmentation is the technique that divides the image into different regions that is pixels having the same value are kept in one region. Region based segmentation works on seed point and that seed point is compared to the neighboring pixels and the pixels that come out to be similar are kept under one region (comparison is done using different properties such as gray level, color texture, shape).

#### 1.2.2 Region growing method

Region growing uses of the initial seed point where entire image is considered and divided into different regions. The pixel taken as seed can be either predefined seed, randomly chosen or all pixels are considered as seed. Then we move to bottom up method of region growing in this all the pixels with the similar features are considered (gray level, texture, color) seed can be either selected from the entire gray level present in the image or from the object of interest.

#### 1.2.3 Region split and merge

Region split and merge method is considered an entire image into a single region and that region is splitted into different quadrants on the basis of some properties. Then the regions get merge if they are similar to each other merging is carried out until no such merging is possible as all the pixels are considered as a single unique label. The method used here is "quad tree".

### 1.2.4 Clustering based segmentation

Clustering based segmentation is the process in which the entire data of the image is divided into the groups. Similar one fall under one group. [41] K-mean clustering method is highly used to partition data into K clusters. In this data is organized under two classes:

- High intra-class similarity
- Low inter-class similarity

### 1.2.5 K-mean algorithm

Initially we have to decide clusters needed. The total distance present between the data points and centre of cluster is minimized using K-mean algorithm. Steps followed in K-mean algorithm are. Desired cluster K is decided and randomly center of K-cluster is set. Each cluster is assigned the pixels and that pixel is compared with randomly picked pixel centre. Then comparisons are made to form new cluster centre which will provide average data points. Entire process will be repeated until no changes are needed

### 1.2.6 Edge/Boundary based method

Edge based method is used to change the required image into the edge images by making changes like converting edges in gray tone, edges are considered discontinuous. It helps in detecting the discontinuities of intensity values of a given image. Edges lie between boundaries of two regions as it is called set connected method.

## 1.3 FEATURE EXTRACTION

Feature extraction is also the technique of segmentation as we know segmentation is the process of dividing the image into sub image this division is sometimes done on the basis of different features. Features are considered as the interesting parts of the given image and these features can be used as the initial points to be taken into consideration. The algorithm that will be implemented for segmentation will be selected according to the features considered so that it will be able to detect those features, for this we have feature detector. Feature detector is used to detect the same feature in two different images.[43] The most commonly used features that are used that are considered during segmentation are statistical features, textural features, colored features, shape features, structural features and statistical features. Under feature extraction we follow three steps:

- Extraction of features
- Selection among the features
- Then classification

The result that we get is in the form of vector it's called feature vector. Feature extraction can be defined as measure of collecting the visual information from the image so that it can be recorded and can be used or referred in future during

segmentation process. At abstract level these features can be divided into three forms:

- Pixel level features: Features that are collected using pixel by pixel process for example: color, location
- Local features: Under these features edges are considered. Edges are discontinues in nature and due to this their intensity value changes
- Global features: Features used to calculate the whole image region for example: aspect ratio, moment invariance and intensity levels

During feature extraction process we should keep in mind few points:

- The extracted features should be such that they provide us with adequate information and should not be specific to domain
- To make the process of segmentation feasible its necessary that they can be easily computed
- They should make connection with human sustain characteristics

## II. LITERATURE SURVEY

**Liaqat Ali, et al. (2017) [11]** Medical image processing helps in the detection of diseases in the early stages as we are able to see inside the humans body for the detection of abnormalities and this early detection of diseases helps in curing it faster as its helps in detecting the Hepatocellular Carcinoma(HCC). This paper is based on computer aided diagnosis (CAD) system that helps out in detecting the problem in initial stages. It consists of four different stages: first is image enhancement, liver segmentation, feature extraction and at last we characterized HCC. To diagnose HCC here they used Discrete Wavelet Transform (DWT) for feature extraction and support vector machine (SVM) and biomarkers are used to cross-check the diagnosis and provide the accurate and desired results.

**H.L. Aravinda, et al. (2017) [12]** Segmentation of liver for the detection of tumor is very difficult task. The research in this paper was carried out to segment the infected liver using novel framework using automatic liver segmentation using Simple Linear Iterative Clustering (SLIC) method. In this technique our main focus is to reduce the number of regions before segmentation to generate super pixel. Reducing the regions will reduce the complexity for further steps and the noise is taken in considerations as minimum noise provides highly accurate results. Median filter is used for pre-processing as it includes removing of noise and the filtering process resizes the image for super-pixel generation. Components are estimated using Gray-level co-occurrence metric (GLCM) and histogram and hamming distance is used to validate that region has tumor or not

.This is carried on the dataset of different CT images and provides the results.

**M. Mirah Kasturi, et al. (2017) [13]** Detecting the lung cancer or the liver cancer in the initial stages help the person to take proper treatment in the initial stages and get aware of the correct problem helps out in good treatment options but still it's a difficult task to detect cancer as in initial stages as the symptoms are not fully clear but due to the emergence of medical imaging detection process has become easy even in early stages. In this research cancer is detected using 2D and 3D CT scan images using Sobel edge segmentation techniques.

**Wenquan Cheng, et al. (2017) [14]** The research that provide us with the fast and accurate method in detecting the tumor in the liver from abdominal CT images as liver segmentation is the ongoing medical image processing research. The traditional level set algorithm used curves and low contrast borders of CT images provide bluer information. For this reason, level set based method is used to segment narrowband gradient. In this research the first step carried out was morphological gradient transformation was conducted on image to receive gradient image that provide function relationship among structure element and gradient values and further modified the image. Finally the results were used as initial contours and built narrowband with special width by splitting the tumor within the narrowband and the process was repeated and there constructed the 3-D reconstruction as the result.

**Qin Zhang, et al. (2017) [15]** Medical images now a days are very useful in this field as helps the doctors to model and visualize the CT images to find the spatial relationship between veins artery and detection of tumor. Accuracy in the understanding of liver anatomy is necessary for automatic segmentation of the liver for clinical cases. This research is based on couinaud's theory that automatically segments the liver by portal veins. Automatic liver segmentation provides the adjustments of portal veins so that it can adapt to various implementations. The final result of the research shows that the liver segmentation has important clinical values and vein blood supply in livers segmentation provide 3-D visualization and helps in getting the estimate of liver volume.

**Jiayin Zhou, et al. (2017) [16]** Hepatic components are needed to be modeled from pre-operative images for treatment planning and segmentation. This uses Ct image data for in-house development system. In research system uses gross liver segmentation using the 3-D mesh deformation model and context-based voting is used for vasculature segmentation and other segmentation tools. This research was carried out on 20 data sets and 5 sets of porcine CT image scan and the paper provide us with information that the experimental research helps in conducting fast segmentation and can model hepatic components for living beings both human and animals with the high accuracy and best treatment planning.

### III. COMPARITIVE ANALYSIS

Author Name	Year	Technique	Constraints
T. Kitrungrotsakul	2015	Computer aided diagnosis (CAD) are used for the segmentation of the liver having 3D organ	need for reducing the graph size and the speed
Chunhua Dong	2015	Random Walk-Based method of segmentation is most widely used for the 3D image segmentation	Need for removal of error caused due to the noise
Fang Lu	2015	Segmentation of the abdominal liver which is deformed	Novel Geodesic Selection Scheme is used to consider desired boundaries
Tugba Palabas	2016	liver due to abdominal trauma which effect the segmentation accuracy	removing all the unwanted tissues and organs
Gabriel Chartrand	2016	semi automated method for liver segmentation	obtained the high accuracy and reliable results
Maithili Lawankar	2016	watershed transform segmentation	To detect these problems in time

### IV. CONCLUSION

Medical imaging is the process through which we can get visual representation of inside body for the clinical and diagnosis purpose. It helps doctors a lot in detecting the

cause of problem and the region of existence so that we can see the functioning of some organs inside the body for medical interventions. Computed tomography is also known as CAT scan, it makes use of x-ray projections that are



taken from different angles and provide us with the images of cross-sectional form produced from inside the body. Image segmentation is the process of dividing the image into small parts based upon the intensity levels. The goal of segmentation is to provide us the large area detection in simplest way. These days segmentation of image is widely used in the field of medical imaging, context-based image retrieval, and object reorganization.

## V. FUTURE WORK

Segmentation is the most important segmentation for the image processing. Large number of CT images are being passed through the segmentation process. Each segmentation technique has its own set of advantages and disadvantages. Segmentation based on shape features can be performed for more success on the segmentation process.

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