ISSN: 2278 – 1323
International Journal of Advanced Research in Computer Engineering & Technology (IJARCET)
Volume 5, Issue 11, November 2016

An Automated Approach for Segmentation of CT Liver Images Using Graph cuts

G.Divya, Mrs.Susmita Mishra

Abstract- **Liver segmentation is a difficult task in medical image processing area due to the complexity of the liver shapes. This is done by using CT scan images which is used to know the detailed structure of the body. It includes the automatic explanation of liver on CT images using graph cuts. The CT images were used to evaluate the accuracy and efficiency of the graph cut techniques. The accurate detection of liver surface is done by using graph cut technique. It will detect the liver surface with less execution time especially when dealing with the diseased liver cases.**

Index Terms-- **Liver segmentation, Graph Cuts**

INTRODUCTION

LIVER disease is a leading cause of death worldwide. Liver segmentation is very important to accurately evaluate the liver structure for diagnosis of liver disease. The Computed Tomography (CT) is used to diagnosis the liver using image processing techniques. There are two methods Semi-automatic or automatic liver segmentation is used for clinical applications. Though the CT scan images are used widely in clinics, liver segmentation is tedious task in the medical image processing. The liver segmentation use pixel based methods where the noise and other artifacts are easily identified. The structure of the liver varies largely from different healthy persons in both shape and size. The tumors and other artifacts in the organ may also change the structure of the liver. Here the graph cut technique is used for segmentation of liver using CT images. This is difficult task due to the shape, pose and location of the abdomen.

If the structure of the liver is more complex, the segmentation is tedious to perform. The graph cut technique reduces the under-segmentation and over-segmentation of livers because of its shape conditions. The semi-automatic and automatic liver segmentation methods are based on region growing, clustering, deformable models, statistical shape models (SSMs) and graph cuts.

Manuscript received Nov, 2016

***G. Divya**, PG Student, Department of Computer Science and Engg, Rajalakshmi Engg College, Chennai, India*

Mrs. Susmita Mishra, *Assistant professor, Department of Computer Science and Engg, Rajalakshmi Engg College, Chennai, India*

The paper is organized as follows. Chapter II narrates literature survey. Chapter III describes the proposed model.

I. RELATED WORK

[1] Guotai Wang, Shaoting Zhang, Hongzhi Xie, Dimitris N.Metaxes and Lixu Gu proposed with Shape sparse composition (SSC) and L1-minimization algorithms which is used to solve the problem of optimization. They provides high efficiency in liver structures, the homotopy based sparse representation updates the optimal solution and avoids re-computing.

[2] Xinjian Chen, Jayaram K.Udupa, Abass Alavi and Drew.A.Torigian proposed with GC-ASM method, Graph cut method and Active shape model. GC-ASM achieves full automation in the segmentation and it is performed in different clinical data sets (i.e.) CT images. This method increases the computation cost due to the iterative nature of the algorithm.

[3] Guotai Wang, Shaoting Zhang, Feng Li and Lixu Gu proposed with Sparse Shape composition (SSC) Model and Supervised segmentation algorithm to detect the accuracy of segmentation of hepatic diseases .This method handles the difficult structures of liver which is evaluated by using the clinical data sets. It improves the accuracy and robustness of the LDLT surgery planning when deals with complex clinical liver shapes. The SSC not only obtains the accurate segmentation, but also shows toughness when deals with large variations in liver shapes.

[4] Reinhard Beichel, Alexander Bornik, Christian Bauer and Erich Sorantin proposed with Graph cut method, Volume based segmentation and Mesh based segmentation which is evaluated by using computed tomography (CT) images. The segmentation is done by initial graph cuts based segmentation and interactive segmentation. The volume segmentation can be corrected by adding or removing volume chunks and these chunks subdivide the graph cut segmentation outcome (object) as well as the background into disjunct sub regions based on edge information. After chunk-based segmentation refinement, the set of selected chunks is converted to a deformable mesh model to allow surface-based segmentation enhancement.

[5] Nuseiba M. Altarawneh, SuhuaiLuo, Brian Regan, Changming Sun proposed with Distance Regularized Level Set (DRLS) model which segment the liver surface by using

balloon force method. It controls the direction and slows down the evolution process in the region with weak or without edges. This model defines the probability density energy. The new method is introduced (i.e.) Modified Distance Regularized Level Set (DRLS) model which achieves high accuracy when compared with the DRLS model.

[6] Xinjian Chen, Jayaram K. Udupa, Ulas Bagci, Ying Zhuge, and Jianhua Yao proposed with active appearance model (AAM), live wire(LW) and graph cuts (GCs) for segmentation. The iterative GC–OAAM method is used for object delineation. This method was tested by using clinical CT data sets. It combines the AAM, LW, and GC ideas to exploit the balancing strengths. The segmentation is done by using MOAAM method which also combines the AAM and LW methods. In delineation, the GC–OAMM method integrates the shape information which is gathered from initialization step with the help of GC algorithm.

[7] Xiao Song, Ming Cheng, Boliang Wang, Shaohui Huang, Xiaoyang Huang proposed with adaptive fast marching method (FMM) to segment the liver. The preprocessing takes place to reduce the noise and enhancement is to improve the quality of structures. The enhanced image is very tough to delete the small regions in the liver. The pre-processed image is taken as input which produces the speed function to generate the liver contour. It is evaluated by using computed tomography (CT) data-sets. It is fully automatic and requires less time. It produces fast and accurate liver segmentation by using clinical data sets. The method has been applied successfully to fast and accurate liver segmentation on the clinical validation.

[8] Vishakha V. Hambire, Dr. S. R. Ganorkar proposed K-means and k Nearest Neighbours (kNN) algorithm to classify the liver disease using ultrasound images. The noise is removed by using discrete wavelet transform and the quality of an image is improved by contrast enhancement to the ultra sonographic image. K-mean clustering is used to segments the image and the classification are performed by neural network classifier. It reduces the time of liver diagnosis.

[9] Marius George Linguraru, William J. Richbourg, Jianfei Liu, Jeremy M. Watt, Vivek Pamulapati, Shijun Wang, and Ronald M. Summers proposed with Graph cut method, Watershed Algorithm and Support vector machine to detect the tumor on liver using Computed Tomography images. The segmentation is verified by using an active contour. The graph cut method is used to detect the accurate surface of liver. SVM is used to reduce the number of false tumor which is detected. When there is a presence of tumors and other artifacts in data sets the segmentation provides less accuracy. The tumor detection and segmentation is achieved using graphs which deals with shape and enhancement models to segment the tumors in variable sizes with reduced number of false positives.

[10] Liang Lin, Wei Yang, Chenglong Li, Jin Tang, and Xiaochun Cao proposed with Lucas-Kanade algorithm, Inference algorithm, Lagrangian method and Collaborative Model for tumor segmentation using CT images. The inference algorithm is used to solve the segmentation of repeated slices. It is also used for other types of tissues where the different regions and boundary features are extracted. The liver tumors are segmented from a number of clinical data sets.

II. PROPOSED ARCHITECTURE

In this proposed work graph cut technique is used to detect the disease

The proposed method is a segmentation of liver which consists of two steps: 1) Preprocessing 2) accurate surface detection.

A.IMAGE PREPROCESSING

In image preprocessing, the image restoration and image enhancement steps are involved. The image restoration is used to remove the unwanted noise from a CT image. The image enhancement is used to improve the quality of an image like improving the image contrast and its characteristics, reducing its noise content or sharpen the details. CT images are enhanced by using filtering techniques. It is suitable for improving the local contrast of an image and bringing out more detail of an image.

B.ACCURATE SURFACE DETECTION

The method for accurate detection of liver surface is model initialization that provides a common surface for graph cut and makes the approach automatic. The initialization algorithm proposed in this work preserves the graph with no vertex or triangle is removed or inserted. After the input CT images are enhanced using the filtering, the initial position of the liver is calculated. The outline of the liver surface has several non-liver regions, which can be identified by using thresholding techniques. The position of the liver is computed by using threshold values or radius of structuring elements. The graph cut algorithm is efficient and produce the accurate results.

The graph cut technique is used to detect the accurate liver surface which segmented easily. It provides less computation time and provides high accuracy. While using graph cut technique, the mesh is evaluated in a liver boundary and this mesh is adapted by graph cut technique. And the input image is compared to the threshold image.

III.ARCHITECTURE

In the preprocessing step, the noise is removed from a CT image and image enhancement is used to improve the quality of an image and original images are smoothed. In the initialization step, the initial liver surface is detected. In the segmentation, the graph cut is used for detection of accurate liver surface.

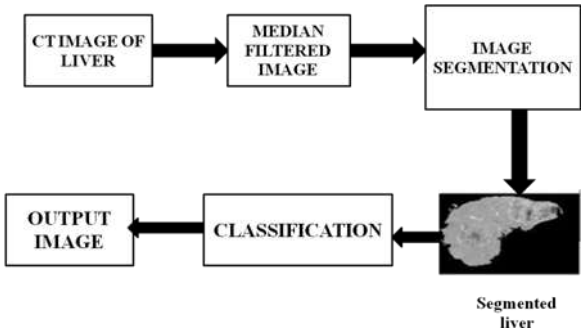


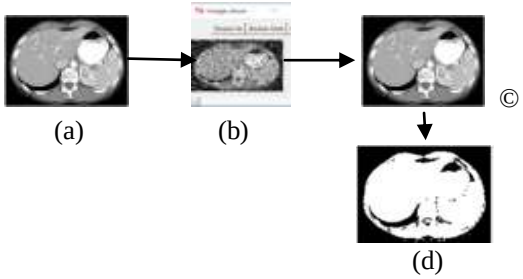
FIG: 1Proposed Architecture

The CT image is taken as input where the image preprocessing takes place to reduce the noise and improves the quality of an image by using filtering techniques. Then the filtered image is obtained which is used to image segmentation. The Segmentation can be done by detecting edges or points or line in the image. The segmentation of the liver is done by using graph cut technique. The graph cut technique is used to detect the accurate liver surface which segmented easily. It provides less computation time and provides high accuracy. The segmentation is difficult due to shape, size, location and large variations in liver structure.

IV. CONCLUSION

This work use the graph cut technique, which accurately segment the liver. The input image undergoes preprocessing technique where the image denoising and image enhancement is done and the image segmentation is done by using graph cut technique. The main goal of this method is to reduce the diagnosis time. This will produce efficient and high accuracy with decrease of processing time. The overall process is done by using the tool SCILAB which is high level language. This is mainly used for memory management and numerical computations. It is similar to MATLAB.

V. RESULTS



The Fig (a) is an input CT image in which the salt and pepper noise is added in the image which is shown in Fig (b). The noise is filtered by using the median filter Fig (c). Fig (d) the image is segmented.

REFERENCES

[1] Hussein Alahmer, Amr Ahmed,"Computer-Aided Classification of Liver Lesions Using Contrasting Features Difference ",Volume 90, 2016, Pages 80–8620th Conference on Medical Image Understanding and Analysis (MIUA 2016).

[2] Olivier Ecabert, Jochen Peters, Hauke Schramm, Cristian Lorenz, Jens von Berg, Matthew J. Walker, Mani Vembar, Mark E. Olszewski, Krishna Subramanian, Guy Lavi, and Jürgen Weese ,"Automatic Model-Based Segmentation of the Heart in CT Images", IEEE TRANSACTIONS ON MEDICAL IMAGING, VOL. 27, NO. 9, SEP 2008.

[3] Xing Zhang, Jie Tian, Kexin Deng, Yongfang Wu, and Xiuli Li, "Automatic Liver Segmentation Using a Statistical Shape Model with Optimal Surface Detection", IEEE TRANSACTIONS ON BIOMEDICAL ENGINEERING, VOL. 57, NO. 10, OCTOBER 2010.

[4] Weiwei Wu, Zhuhuang Zhou, Shuicai Wu and Yanhua Zhang, "Automatic Liver Segmentation on Volumetric CT Images Using Supervoxel-Based Graph Cuts ", Computational and Mathematical Methods in Medicine Volume 2016.

[5] Liang Lin, Wei Yang, Chenglong Li, Jin Tang, and Xiaochun Cao," Inference With Collaborative Model for Interactive Tumor Segmentation in Medical Image Sequences", IEEE TRANSACTIONS ON CYBERNETICS, 2015.

[6] Ahmed M. Anter, Ahmad Taher Azar, Aboul Ella Hassanien, Nashwa El-Bendary, Mohamed Abu ElSoud, " Automatic computer aided segmentation for liver and hepatic lesions using hybrid segmentations techniques", Proceedings of the 2013 Federated Conference on Computer Science and Information Systems pp. 193–198.

[7] Vishakha V. Hambire, Dr. S. R. Ganorkar, "Classification of Liver Disease Based on US Images", International Research Journal of Engineering and Technology (IRJET) Volume: 02 Issue: 04 | July-2015.

[8] Dr. Alyaa H. Ali, Entethar M. Hadi, "Diagnosis of Liver Tumor from CT Images using Digital Image Processing ", International Journal of Scientific & Engineering Research, Volume 6, Issue 1, January-2015.

[9] Guotai Wang, Shaoting Zhang, Hongzhi Xie , Dimitris N. Metaxas, Lixu Gu, " A homotopy-based sparse representation for fast and accurate shape prior modeling in liver surgical planning", Medical Image Analysis 19 (2015) 176–186.

[10] Guotai Wang, Shaoting Zhang, Feng Li and Lixu Gu, "Segmentation using Sparse Shape Composition and Minimally Supervised Method in Liver Surgery Planning System", 35th Annual International Conference of the IEEE EMBS Osaka, Japan, 3 - 7 July, 2013.