Delineation of Liver

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Abstract- Liver is the largest internal organ in human body. It lies under right ribs just beneath right lung, shaped like a pyramid and divided into four different lobes. It is the only internal organ which has the property of regeneration of lost tissue. It plays major role in metabolism, emulsification of lipids and stores nutrients. Accurate segmentation of liver is still a challenge due to differences in intensity, contrast and texture. In this paper we have proposed a method to extract the liver from computed tomography DICOM images using seed point in such a way that it will always be present within the liver. This method assists radiologists in accurate segmentation of liver which in turn helps the patients.

Index Terms- Computed Tomography, DICOM, Liver, Seed point, Segment.

I. INTRODUCTION

This paper proposes a method for the extraction of liver. Liver is a vital organ in most of the vertebrates and animals. This gland plays a dominant role in protein synthesis, chemical production and decomposition of red blood cells. Liver's a very specialized tissue contains hepatocytes necessary for bio chemical reactions. It also plays major role in synthesis, breakdown of molecules and storage. When it comes to medical field regarding liver extraction, it's a challenging task due to high inter-organ intensity similarity and intra liver intensity variability. But accurate detection of liver helps in early treatment of liver diseases, liver transplantation and liver resection. Many algorithms have been proposed till now but most of them lack accuracy and involves loads of complexities.

Luo et al proposed the paper [2] on automatic liver parenchyma segmentation. In this paper, a multi–layer heuristic approach is introduced to segment liver region from other tissues in multi–slice CT images. Pixels are heavily misclassified and do not cater spatial information. Kyung-SikSeo proposed paper [3] on liver segmentation based on histogram processing. This paper presents a method to extract liver from computed tomography (CT) abdomen images in axial orientation. In histogram processing selecting the lower and higher threshold is difficult. The results are not accurate.

Weiwei Wu, Zhuhuang Zhou, Shuicai Wu and Yanhua Zhangproposed the paper [4] on automatic liver segmentation using graph cuts. In this paper, a novel method was proposed for automatic delineation of liver on CT volume images using supervoxels-based graph cuts. Limitation of this study is that the number of datasets for evaluation is small. O.Gambino and et al proposed the paper [6] on automatic liver segmentation based on region growing. In this paper an automatic texture based volumetric region growing method for liver segmentation is proposed. The major drawback of this method is under segmentation near liver boundaries.

Jeongjin lee, NamKug Kim, Ho lee, JoonBeomJinwon, Yong moon shin, Yeong Gil Shin and Soo-hongkim proposed a paper [8] on efficient liver segmentation using a level-set method. But in this method it is difficult to distinguish ambiguous boundary between liver and heart caused a false positive error growing method. L. Suhuai proposed a paper [7] called Review on the methods of automatic liver segmentation from abdominal images. In gray level based method, if difference between source and target is small and it is less efficient. P. Campadelli, E. Casiraghi, and A. Espositoproposed this paper [11]. Designing interactive segmentation methods for digital volume images is difficult, mainly because efficient 3D interaction is much harder to achieve than interaction with 2D images. In live wire segmentation method performance lacks when it comes to segmentation and causes errors.

So the purpose of this paper is to overcome the mentioned drawbacks and to provide an easy and efficient method to extract the liver from CT images. Out of many modalities we have Preferred CT i.e., Computed Tomography because it provides detailed 3D pictures, faster compared to other modalities, best spatial resolution and good accuracy.

II. METHODS

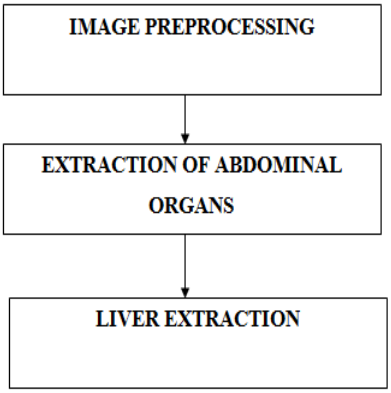

Figure 1: Flow of Execution

The Figure 1 shows the flow of execution of the proposed methodology. The first step is image preprocessing, here the input is data set provided by us. Image preprocessing is removal of distortion, noise or unwanted data. Here the input DICOM image is converted into required gray scale format. In the second step extraction of abdominal organs, the proposed method uses seed point in such a way that it will always be present within the liver region. Using this seed point, we will use pixel value of seed point and move through each pixel in original image if the pixel value is same then we will copy value to a black image. This will result in an image with liver and other small portion which has same pixel value. Then in the third step is liver extraction, we will apply region growing method by using seed point location to extract liver.

III. RESULT

Figure 2: Input Image Matrix

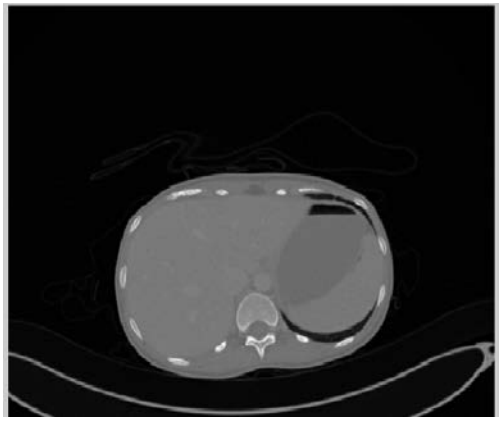

Figure 3: Preprocessed image

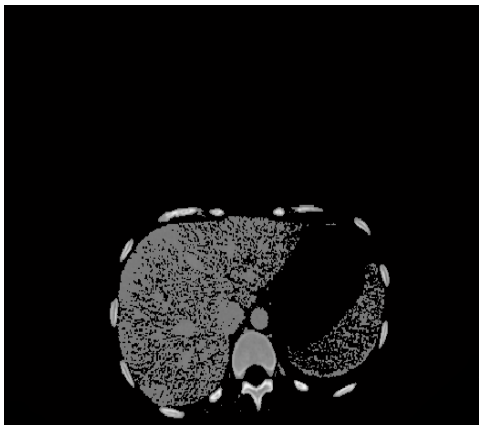

Figure 4: Extracted abdominal Organs

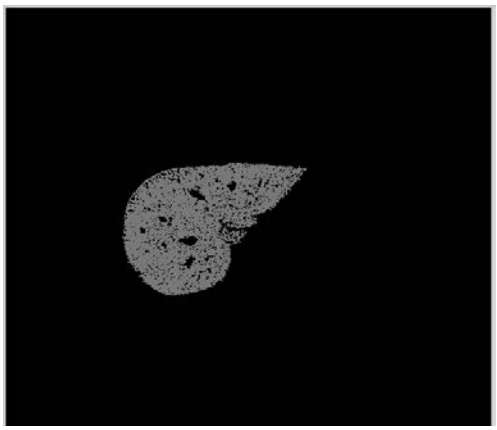

Figure 5: Extracted Liver

The input image is a 3D DICOM image as shown in Figure 2.The image is preprocessed and converted into gray format i.e., shown in Figure 3. The proposed method uses seed point in such a way that it should be present in liver region. The so obtained pixel value of seed point is compared with that of original image and if matches then copied into new matrix which results in delineation of abdominal organs as shown in Figure 4. Now the liver is delineated referring Figure 5.Using region growing method by giving seed point location.

IV. CONCLUSION

A method for the detection of the liver is proposed here. A complete technique has been defined for liver extraction from CT images. The proposed method is applied on the gray scale image and it relies on connected pixel components in an image. The proposed approach is not limited to the liver, can be enhanced to detect veins, lobes and lesions. We believe that our technique outperforms those presented in the literature; nevertheless this technique is simple, easy to implement and gives accurate results.

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