Lung Field Segmentation Techniques using Digital Image Processing

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Abstract - In this review paper we study lung field segmentation techniques using digital image processing. Lung field dissection segmentation in chest radio graphs(CXRs)stays an essential pre-processing step in automatically analyzing such images.We present a technique for segmentation of the lung field based on a high-quality boundary map identified by an effective contemporary border detector, a structured edge detector (SED). A SED is previously trained to identify lung limits with manually outlined lung areas in CXRs.Then, the masked and tagged boundary map transforms an active contour map (ACM). Finally, the contours with the greatest rate of trust in the ACM are obtained as lung contours following filter phases based on Gussian and dilate features. Our method is evaluated for abnormal lung images from the chest x-rays and also the computational time is reduced and is proved to better that segmentation based on universal contour map.

Keywords - chest radiography, lung field segmentation, boundary detection, structured edge detector

I. INTRODUCTION

Recently, image processing techniques are widely used in several medical areas for image improvement in earlier detection and treatment stages, where the time factor is very important to discover the abnormality issues in target images, especially in various cancer tumours such as lung cancer, breast cancer, etc. Image quality and accuracy is the core factors of this research, image quality assessment as well as improvement are depending on the enhancement stage where low pre-processing techniques is used based on Gabor filter within Gaussian rules. Following the segmentation principles, an enhanced region of the object of interest that is used as a basic foundation of feature extraction is obtained. Relying on general features, a normality comparison is made [1]. Image is the main source of human access and exchange of information. The application of digital image processing in medical engineering is very extensive, and the result is very effective [1]. Medical digital image processing can reduce the effect of noise, enhance the image and improve its quality. Processed images can accurately reflect the focus of disease and visually communicate medical and pathological information of the image [2].

Image processing is one of the core areas used for various domains to identify cancer affected regions in lungs of MRI images. Identification of cancer affected parts in lung is mainly initiated with image processing techniques such as noise removal, feature extraction, identification of affected regions and possible comparison with historical data of lung cancer. Usually, digital image processing follows many techniques to unite different shapes in image into single unit. In this article, it is followed with clever bit technique for identifying particular region in the lung image. The region identified through the segmentation technique can be viewed from different angles and with different lighting. The basic advantages in choosing the technique is to identify, colour difference between cancers affected region and those not affected parts by finding the intensity of images [5].

II. LITERATURE REVIEW

Pictures are the most common and convenient means of conveying or transmitting information. A picture is worth a thousand words. Pictures concisely convey information about positions, sizes and inter-relationships between objects. They portray spatial information that we can recognize as objects. Human beings are good at deriving information from such images, because of our innate visual and mental abilities. About 75% of the information received by human is in pictorial form [1]. Image processing is spreading in various fields. Image processing is a method which is commonly used to improve raw images which are received from various resources. It is a technique to transform an image into digital form and implement certain actions on it, in order to create an improved image or to abstract valuable information from it. It is a kind of signal dispensation where image is an input and output are also an image or features related with image. The purpose of image processing is distributed into several groups which are given below [2]. The image processing is an analysed and manipulation of a digitalized image, especially in order to improve the quality of image processing. DIP technique can be applied in variety of different fields such as Diagnostic image analysis, Surgical planning, Object detection and Matching, Background subtraction in video, Localization of tumours, Measuring tissue volumes, Locate objects in satellite images (roads, forests, etc.) , Traffic control systems, Locating objects in face recognition, iris recognition, agricultural imaging, and medical imaging. DIP addresses challenges and issues like that loss of image quality, to enhance degraded image. In this paper the review of literature related to DIP is discussed. The majorDIP techniquesare pre-processing, imagecompression, edgedetection and segmentation are discussed [3]. Image segmentation is a crucial process for most image analysis consequent tasks. Especially, most of the existing techniques for image description and recognition are highly depend on the segmentation results. Segmentation splits the image into its constituent regions or objects. Image segmentation can be done by various methods. Segmentation of medical images in 2D has many beneficial applications for the medical professional such as: visualization and volume estimation of objects of concern, oddities detection, tissue quantification and organization and many more [4].

III. IMAGE SEGMENTATION TECHNIQUES

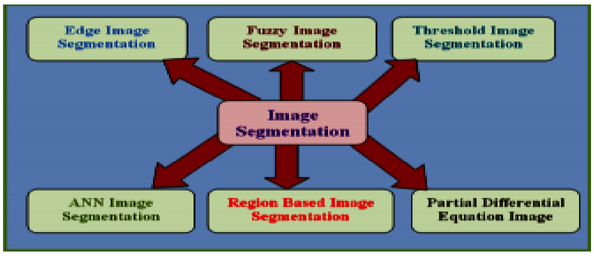
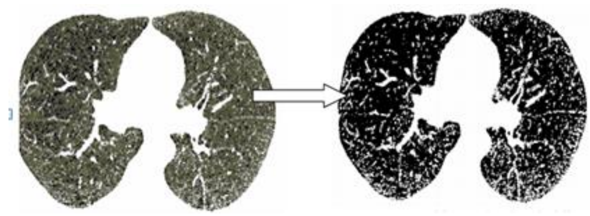


Figure 1:Image Segmentation types

Image processing follows various steps in processing cancer affected parts of lungs. Image segmentation plays a major role for every image processing process. In image segmentation process, the digitally converted lung image has to be divided into various regions. Usually an image segmentation technique identifies objects, sets boundary and identifies other relevant regions in the image. This survey focuses on various steps involved in images segmentation and researchers work on lung cancer images. The image segmentation can be categorized into six major types, which is very clearly shown below [4]. Segmentation of lung fields is particularly challenging because differences in pulmonary inflation with an elastic chest wall can create large variability in volumes and margins when attempting to automate the segmentation of lungs. Moreover, the presence of disease in the lungs can interfere with software attempting to locate lung margins. For example, a consolidation along the pleural margin of the lungs may generate an erroneous delineation in which the consolidation is treated as outside the lungs because its attenuation characteristics are similar to other aspects of the soft tissue of nearby anatomic structures [5]. segmentation refers to the process of partitioning a digital image into multiple segments (sets of pixels, also known as super pixels). Image segmentation is typically used to locate objects and boundaries (lines, curves, etc.) in images. More precisely, image segmentation is the process of assigning a label to every pixel in an image such that pixels with the same label share certain visual characteristics. The result of image segmentation is a set of segments that collectively cover the entire image, or a set of contours extracted from the image. Each of the pixels in a region is similar with respect to some characteristic or computed property, such as colour, intensity, texture All image processing operations generally aim at a better recognition of objects of interest, i.e., at finding suitable local features that can be distinguished from other objects and from the background. The next step is to check each individual pixel to see whether it belongs to an object of interest or not. This operation is called segmentation and produces a binary image. A pixel has the value one if it belongs to the object otherwise it is zero. After segmentation, it is known that which pixel belongs to which object [6]. The image Pre-processing stage starts with image enhancement; the aim of image enhancement is to improve the interpretability or perception of information included in the image for human viewers, or to provide better input for other automated image processing techniquesImage enhancement techniques can be divided into two broad categories: Spatial domain methods and frequency domain methods. Unfortunately, there is no general theory for determining what “good” image enhancement is when it comes to human perception. If it looks good, it is good. However, when image enhancement techniques are used as pre-processing tools for other image processing techniques, the quantitative measures can determine which techniques are most appropriate [4]. In the image enhancement stage, we used the following three techniques: Gabor filter, Auto-enhancement and Fast Fourier transform techniques [7].In fundamentally sick patients this obstruction can be serious prompting obscure or imperceptible lung field limits which are troublesomely recognized even by experienced doctors. This issue is enhanced if the radiographs are of low quality as gotten with a compact x-ray gadget, routinely utilized in escalated care units.This paper proposes a spearheading strategy that adapts to lung field discovery in both stationary and versatile chest radiographs by consolidating measurable gray-level force data and directional edge maps.The limits of the lung fields are approximated by back to back naturally controlled parametric bends. Traditional and cutting lung field discovery approaches address just stationary radiography, and just a couple of them adapt to pneumonic contaminations. The proposed procedure highlights unsupervised task, it isn't iterative, it isn't restricted by the patients' situating, and it is tolerant to then earnests of solidifications and limit discontinuities of the lung fields. Its execution is approved on different stationary radiographs and on a lot of versatile radiograph acquired from patients with bacterial aspiratory contaminations [8].

IV. THRESHOLDING APPROACH



(a) **(b)**

Figure 2:Normal Enhanced image by Gabor filter and its Segmentation a) Enhanced image by Gabor b) Segmented image by Watershed

Thresholding is a non-linear operation that converts a gray-scale image into a binary image where the two levels are assigned to pixels that are below or above the specified threshold value. In this research, Otsu's method that uses (gray thresh) function to compute global image threshold is used. Otsu's method is based on threshold selection by statistical criteria. Otsu suggested minimizing the weighted sum of within-class variances ofthe object and background pixels to establish an optimum threshold. Recalling that minimization of within-class variances is equivalent to maximization of between-class variance. This method gives satisfactory results for bimodal histogram images. Threshold values based on this method will be between 0 and 1, after achieving the threshold value; image will be segmented based on it. Figure 4 shows the result of applying thresholding technique [8]. With the discoveries of seminal physical phenomena such as ultrasound, radioactivity, magnetic resonance etc., and the related advances in technologies enabling the development of modern medical instruments harnessing these physical phenomena, medical imaging has made a long stride forward during the past century [6]. Medical imaging can be used for probing into the structure, function and pathology of human beings and also other living organisms. We are able to picture the insides of living beings with such precision and details which were not even dreamt of a few decades earlier. Medical imaging tools are also being used for planning treatment and surgery as well as other imaging in biology [9].Segmentation is used to divide an image into different small regions or objects. It has many applications in the medical field for the segmentation of the 2D medical images. It is an important process for most image analysis following techniques. There are various methods available for image segmentation. In this paper, thresholding and marker-controlled watershed segmentation methods are used. Watershed transform is a common technique for image segmentation. It is a classical and effective segmentation method by which one-pixel wide continuous edge can be extracted. More importantly it has the advantage of high segmentation precision and accurate positioning. Its drawback includes over-segmentation. Generally, watershed transform is computed on gradient image, where the boundaries of the catchment basin are located at high gradient points. To overcome the drawback marker-based segmentation is applied on watershed segmented image [10].Apart from template matching technique, other techniques are being developed in image processing area. A region can also be extracted from scan images like PET image. Isolating the required area from the image that is to be examined can be performed by tracing rows and columns of that image using certain features. In Image processing, every image is observed based on the intensity values which is in the form of matrix. Also, calculation on matrix is more convenient. Finally, classifiers can be used to segregate the output results with input images and the parameters like accuracy, sensitivity and specificity can be found [8]. We present a technique for lung field segmentation that is based on a fantastic limit map identified by a productive current limit locator, to be specific, an organized edge identifier(SED). ASED is prepared in advance to recognize lung limits in CXRs with physically plot lung fields. At that point, a ultra-metric contour map(UCM) is changed from the conceal and checked limit map. At long last, the contours with the most note worthy certainty level in the UCM are extricated as lung contours.Our technique is assessed utilizing the open JSRT data base of examined films. The normal Jacquard record of our technique is 95.2%, which is equivalent with those of other best in class strategies (95.4%). The calculation time of our technique is under 0.1s for a 256×256 CXR when executed on a customary PC.Our technique is likewise approved on CXRs obtained with various computerized radiography units.The outcomes show the speculation of the prepared SED model and the convenience of our strategy.

V. CONCLUSION

Hence here we are studied High Speed Abnormal Lung Area Detection using Active Contour Map and Segmentation of the region by Structured EdgeDetector. Here we are improving the clear lung field segmentation using sed techniques. This is having many advantages here we are getting clear image and here we are using MATLAP Here it is concluded that by using the active contouring and SED-based snake segmentation method, the timing for processing will be reduced and also the segmentation will be improved by providing internal and external limits for body and lung also including appropriate abnormal pictures for better improvement, which was the disadvantage of the SED and UCM scheme.

VI. REFERENCES

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