

MANUAL SEGMENTATION OF HRCT LUNG IMAGE USING GAP FILLING TECHNIQUE

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ABSTRACT -More than 3 million people died of COPD in 2012, which is equal to 6% of all deaths globally that year. Lung Disease diagnosis should be given war footing importance since Chronic obstructive pulmonary disease (COPD), a lung ailment contributed to 6% of all deaths globally in 2012. About 1.6 million people died in 2012 by lung cancer which is the most common cancer worldwide. Lung Disease diagnosis, treatment planning and monitoring the treatment efficiency all depend heavily on segmentation of lung tissues from the thoracic cavity. The techniques which use computer for lung disease diagnosis, treatment planning and monitoring the treatment efficiency depend on statistical analysis of lung tissue image data to make a decision. Hence segmenting the lung tissues from the thoracic cavity is the heart of the entire process. This paper presents a simple method for segmentation of lung with the help of hard threshold and gap filling technique. This method is experimented on a set of normal and ground glass lung images. The results obtained show that the proposed method is promising for segmenting lung from thoracic cavity.

Key words:- Gap filling technique, Hard thresholding ,HRCT (high resolution computer tomography) Lung Image ,Lung segmentation, Thoracic cavity.

I INTRODUCTION

Lung Disease diagnosis should be given paramount importance for Chronic obstructive pulmonary disease (COPD), a lung ailment claimed 6% of all deaths globally in 2012 [1] About 1.6 million people died in 2012 by lung cancer which is the most common cancer worldwide.[2] Segmentation plays a vital role in medical imaging since it is an efficient technique used to extract the region of interest from an image. Segmenting the lung tissue from the thoracic cavity is of particular interest for computer aided diagnosis and treatment monitoring of lung diseases. There several segmentation techniques proposed by researchers to segment lung tissues from thoracic cavity. Preeti Aggarwal et al [3] in their paper explored extensively the role of segmentation in medical image processing. Hu et al. [4] proposed a method which uses global thresholding technique to segment lung tissues. Automatic lung segmentation was suggested by technique Nihad Mesanovic et al.[5] for lung extraction; this is mainly a region growing technique. Adaptive region growing technique was the method used by Pohle and Toennies [6] for segmentation purpose in medical images. This paper presents a simple method for segmentation of lung with the help of hard threshold and gap filling technique. This method is experimented on a set of normal and ground glass lung images. The results obtained show that the proposed method is promising for segmenting lung from thoracic cavity.

In this paper, a new method is proposed for lung segmentation from CT (computer tomography) scan images. In the proposed method, CT images of normal lungs are acquired..The acquired image is converted to gray scale. So by converting the image to gray scale, the processing time is reduced and a faster algorithm is produced. The gray image is thresholded for 128. This is done in order to extract the lung from the thoracic cavity. Thus extracted lung image is obtained. Further the complete segmented lung image is obtained by gap filling technique.

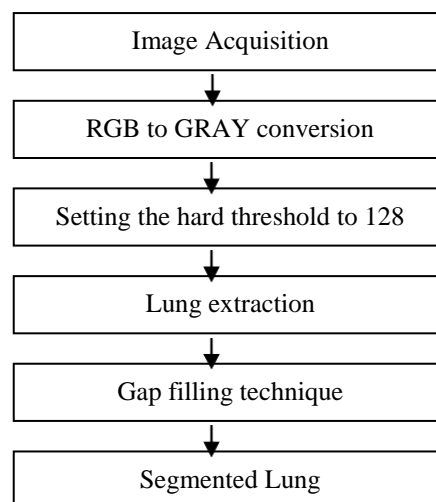


Fig 1:Flow diagram

II. METHODOLOGY

III.RESULTS

For testing the proposed method ,a set of lung images of normal and lung with ground glass abnormality images are taken.Fig.2(a), 2(b), 2(c) are the images of normal lung, extracted lung tissues without gap filled, extracted lung tissues with gap filled. Similarly Fig.3(a), 3(b), 3(c) are the images of abnormal lung with ground glass structure, extracted lung tissues of it without gap filled, extracted lung tissues with gap filled. For Figures 2(a), 3(a) a hard threshold value of pixel intensity level 128 is applied. This resulted in Figures 2(b), 3(b), the extracted lungs without gaps filled. After applying gap filling technique on extracted lungs, the lungs with filled gaps are obtained and these tissues resemble closely the lung tissues in the original image.

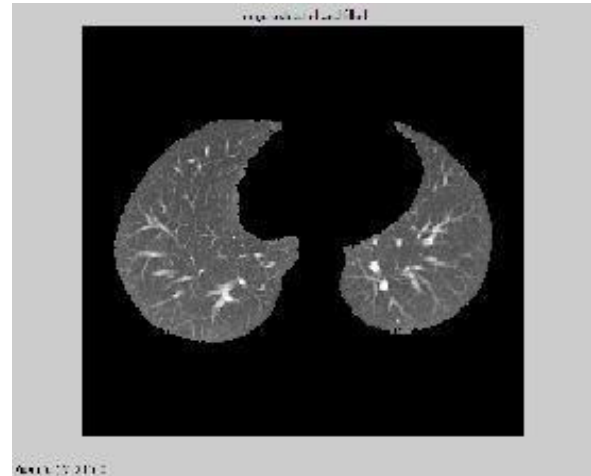


Fig2(c):Extracted lung with gap filled image

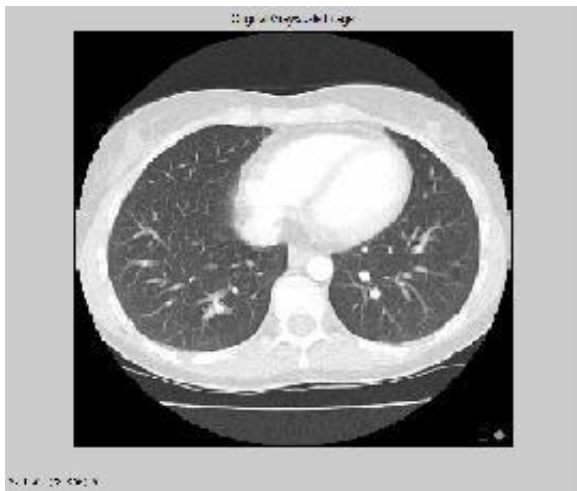


Fig2(a): Normal lung

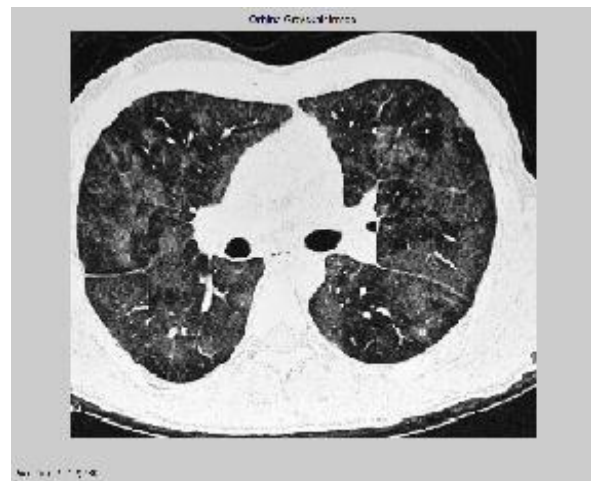


Fig3(a)Ground glass lung image

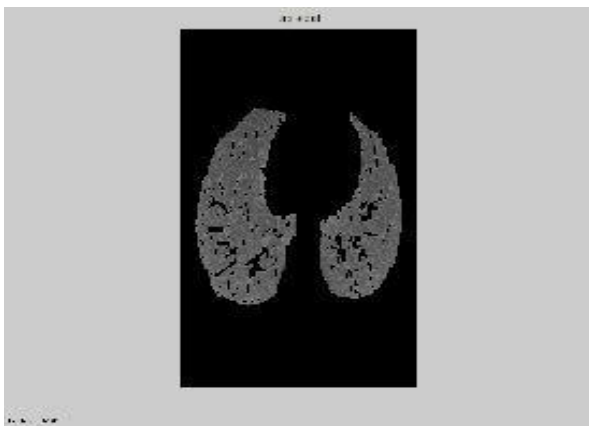


Fig2(b): Extracted lung without gap filled

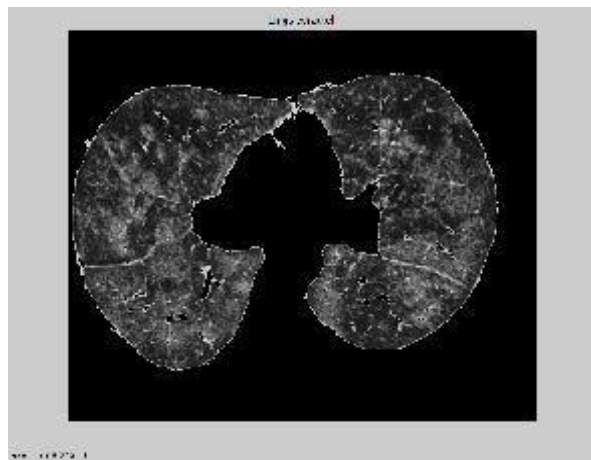


Fig3(b): Extracted image without gap filled



Fig3(c): Extracted lung with gap filled image

IV. DISSCUSION

Lung Disease diagnosis, treatment planning and monitoring the treatment efficiency all depend heavily on segmentation of lung tissues from the thoracic cavity. The techniques which use computer for lung disease diagnosis, treatment planning and monitoring the treatment efficiency depend on statistical analysis of lung tissue image data to make a decision. Hence segmenting the lung tissues from the thoracic cavity is the heart of the entire process. The method proposed in this paper is simple and depends on a hard threshold value of pixel intensity level 128. This level is chosen for the thoracic cavity of bright pixels and are of higher values than medium pixel intensity level 128. Hard thresholding pixel intensity level 128 removed the thoracic cavity along with all the other pixels having intensity value higher than 128. This leads to loss of information about lung blood vessels and pathological changes of lung tissues since blood vessels and pathological changes of lung tissues also have pixel intensity value higher than 128. This results in an error. The removed portions appear as gaps in the image. In order to fill up these gaps, gap filling technique is introduced which closes the gaps. The completely segmented lung image is now obtained.

V. CONCUSLION

Though the proposed hard thresholding lung segmentation method is tested on a set of lung images and yielded good results, it should be tested on many more images to know about the accuracy of the proposed method. In addition whether gap filling alters the pixel intensity information of the filled portion should be analysed.

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REFERENCES

- [1] -Chronic obstructive pulmonary disease (COPD)- Fact sheet N°315-January 2015
 - [2] www.lung.org
- JOURNAL PAPERS:
- [3] Preeti Aggarwal, Renu Vig, Sonali Bhadoria, C.G.Dethe, Sept 2011. -*Role of Segmentation in Medical Imaging: A Comparative Study*, International Journal of Computer Applications (0975 – 8887), Volume 29
 - [4] S. Hu, E. A. Hoffmann, J. M. Reinhardt, "Automatic Lung Segmentation for Accurate Quantitation of Volumetric X-Ray CT Images", IEEE Transactions on Medical Imaging, Vol. 20, pp. 490-498, 2001
 - [5] Nihad Mesanovic , Mislav Grgic , Haris Huseinagic , Matija Males , Emir Skejic , Muamer Smajlovic , -*Automatic CT Image Segmentation of the Lungs with Region Growing Algorithm*
 - [6] R.Pohle,K.D. Toennies, "Segmentation of Medical Images Using Adaptive Region Growing", Department of Simulation and Graphics, Otto-von-Guericke University Magdeburg, 2001.