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LUNG LESION PARENCHYMA SEGMENTATION ALGORITHM FOR CT IMAGES

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ABSTRACT

Segmentation is a precursor for most medical image analysis and classification in Computer Aided Diagnosis (CAD). The CAD of lung CT generally segments the area of interest (lesions), which enables the physician to diagnose the disease. This project presents a fully automatic algorithm for segmenting the lung lesion parenchyma. It is based on Threshold processing and Mathematical Morphology, where Threshold is done by Absolute Threshold Value Binarization and Boundary Detect Algorithm. Further Mathematical Morphology is done by Lung Parenchyma Repair Algorithm, based on horizontal scanning which repairs the lung parenchyma boundary more accurately. Finally, it uses area property of the connected components for separating the cancerous cells (lesions) from non-cancerous tissues.

Key words: Lung parenchyma, Computer aided diagnosis, Mathematical morphology.

INTRODUCTION

A lung lesion is abnormal tissue found on or in a person's lung. It can be the result of an infection or illness. For example, some lung lesions develop because of tuberculosis or pneumonia infections. Others may be non-cancerous cysts or scar tissue. Unfortunately, however, the discovery of a lung lesion can also mean the patient has cancer. Sometimes doctors discover a lung lesion because a patient has Mycoplasma pneumonia that has persisted after initial treatment. To determine why antibiotics have failed to clear up pneumonia and make sure the patient doesn't have a more serious condition, a doctor may perform a computerized axial tomography (CAT) scan and discover a lung lesion that has formed in relation to the infection. This condition usually resolves itself on its own, though antibiotics may help some patients to recover faster. Lesions that form in relation to this type

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of pneumonia are unlikely to be cancerous. In some cases, lung lesions are actually cysts filled with air, fluid, or tissue. Usually, those that form in a person's lung are filled with air, however. There are many conditions in which lung cysts develop, but in most cases, they are not cancerous. Still, it is possible for cysts to develop cancerous cells. Sadly, some lung lesions are actually cancerous masses or tumors. The lesions may be accompanied by such symptoms as coughing, chest, pain, and shortness of breath. The parenchymas are the functional parts of an organ in the body. This is in contrast to the stroma, which refers to the structural tissue of organs, namely, the connective tissues. In cancer, the parenchyma refers to the actual mutant cells of a single lineage, whereas the stroma is the surrounding connective tissue and associated cells that support it. The symptoms of lung lesions involve difficulty in breathing, congestion and tightness of the chest, frequent discharge of phlegm, persistent coughing, and in some instances, the phlegm is blood stained. However, a key consideration in lung lesions is that the symptoms usually show only when the ailment is already in its advanced stage.

EXPERIMENTAL

Methodology

Lung along with Lesion can be more accurately segmented from lung parenchyma, which enables the doctors and radiologists to study the image more effectively. Also this method is used to detect the abnormalities, helps to provide better diagnosis to the patient and reduce the death due to cancer. The aim is to segment the lung lesion from lung parenchyma for accurate analysis of CT lung images which is vital for diagnosis and treatment of various pulmonary and pneumonic diseases. This project focuses on automatic processing of CT lung parenchyma images to segment and identify the lesions. In the method, a fully automatic algorithm for segmenting the lung lesion parenchyma is proposed.

This paper presents a new algorithm based on two binarization operations. It reduced the influence effect of lung parenchyma to the lung parenchyma boundary, made the repairing of lung regions easier. It proposes a new repairing algorithm combining with mathematics morphology, which can make the repairing of lung parenchyma boundary more accurately. Further, it uses area property of the connected components for separating the cancerous cells (lesions) from non-cancerous tissues. The sequence of steps has to be followed for the segmentation of lung from lung parenchyma is shown in the flowchart.

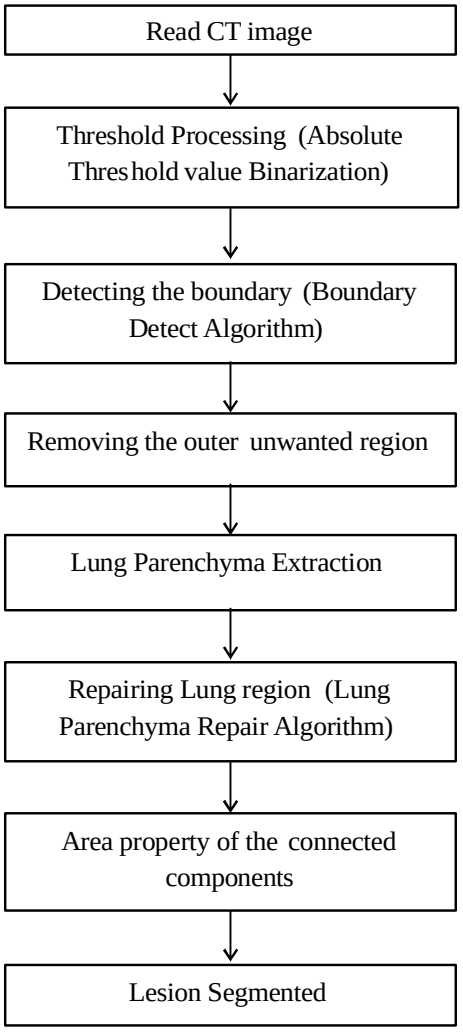

Fig. 1

RESULTS AND DISCUSSION

The various steps involved in the project are of automatic and the results are displayed below as shown in the Fig. 2. In this article the various sets of CT images are collected from the National Biomedical Imaging Archive. The various sets of images have been analysed. The sequence of images shown in the results are Original image, Thresholded image (>Th), Thresholded Image (<Th), Boundary Detected with outer unwanted region, Boundary Detected after removing the outer unwanted region, Reconstructed image, Black image, Fully black image and the Resultant Image.

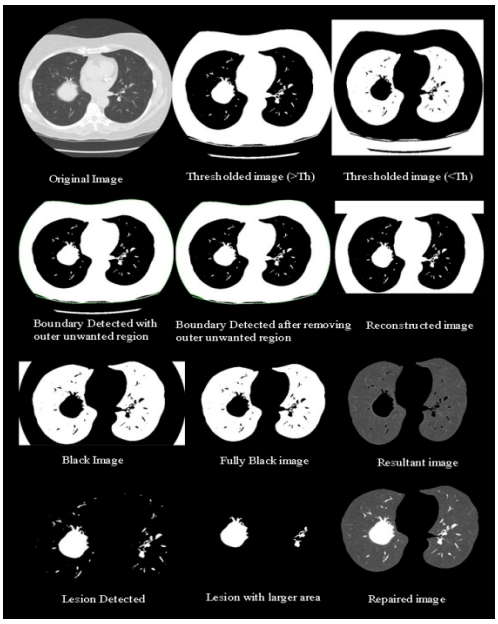

Fig. 2: Experimental Results

CONCLUSION

This project presents a new automatic segmentation algorithm of lung lesion parenchyma. The algorithm is based on the Thresholding, Boundary detection and the Repairing lung region. The thresholding is done by absolute threshold value binarization, boundary detection by boundary detect algorithm and the lung region repair by lung parenchyma repair algorithm. In each image, we remove the background interference and obtain the lung region boundary by using the boundary detect algorithm. Finally repair the lung region boundary by using Lung Parenchyma Repair Algorithm which is basically the morphological operations. The result shows that the automatic segmentation algorithm removes the background unwanted region and the interference of the trachea / bronchus within the chest. It can segment the lung regions from the chest CT images automatically and accurately. It can be used in the lung lesion automatic extraction of computer-aided diagnosis. Further lesions within the lung have been segmented and their location, area has been obtained.

REFERENCES

1. D. Wang, J. Wang, L. Yu et al., The Study of Detection Arithmetic for Pulmonary Nodules, Shanghai J. Biomed. Engg. (2005).

2. S. Hu, E. A. Hoffman and J. M. Reinhardt, Automatic Segmentation of Accurate Quantitation of Volumetric X-ray CT Images, IEEE Transactions on Medical Imaging **20**, 490-498 (2001).

3. Hu Xue-gang, Sun Hui-fen and Wang Shun, A New Algorithm of Image Segmentation Based on Graph Theory[J], J. Sichuan Univ. (Engg. Sci. Ed.) (2010).

4. Michael H. F. Wilkinson, Optimizing Edge Detectors for Robust AutomaticThreshold Selection: Coping with Edge Curvature and Noise. Graphical Models and Image Processing, **60**, 385-401 (1998).

5. Q. Li, Recent Progress in Computer-Aided Diagnosis of Lung Noduleson Thin-Section CT, Comput. Med. Imaging Graph, **31**, 248-257 (2007).

6. R. C. Gonzalez, R. E. Woods and S. L. Eddins, Digital Image Processing, Pearson Education, India (2009).

7. S. Nie, W. Li, J. Xu et al., The Auto-Segmentation Method for Lung Parenchyma of CT Image, China J. Med. Imaging Technol., 2nd International Conference on Information Management and Engineering , Chengdu (2010) pp. 704-708.

8. S. Guo, J. Zhang and Q. Zeng, Automatic Segmentation of Pulmonary Parenchyma in Thoratic CT and Computer-Aided Diagnosis, J. South China Univ. Technol. (Natural Sci. Ed.) (2008).

9. R. Shojaii, J. Alirezaie and P. Babyn, Automatic Lung Segmentation in CT Images using Watershed Transform. Gianni Vernazza. IEEE International Conference on Image Processing. Genoa, Italy, University of Genova (2005).

10. Tong Jia, Lu Meng, Dazhe Zhao et al., Automatic Lung Parenchyma Segmentation on CT Image, J. Northeastern Univ. (Natural Sci.) Shenyang (2008).

11. Yang Jia, Wu Qi-yao, Tian Jie et al The Implementation and Evaluation of Several CT Image Segmentation Algorithms[J], J. Beijing Inst. Technol. (2000).

12. Yang Xiaoqiang, LI Bin and WEI Shengmin, Method for Segmenting Medical Image Based on Anatomical Model, Space Medicine & Medical Engg., **18**, 62-65 (2005).

13. Ying Zhou, Huanqing Feng, Chuanfu Li et al., Automated Lung Segmentation in Serial Thoracic High Resolution CT Images, Beijing Biomed. Engg. (2008).

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