

Automated Segmentation of Lung Regions and Detection of Lung Cancer in CT scan

Sasidhar B, Ramesh Babu D R, Bhaskarao N, Basheer Jan

Abstract— Automated segmentation and detection of lung cancer is important to assist radiologist. In this paper, there are two steps involved: a. Automated Segmentation of lung regions b. Automated Detection of lung cancer. To speed up the process of detecting lung cancer, segmentation of lung region plays an important role.

Index Terms— Lung Regions, Lung Cancer, Connected Components, Thresholding

I. INTRODUCTION

The death in lung cancer is more than any other cancer in both men and women [1]. In lung cancer, an estimated 159,480 deaths, accounting for about 27% of all cancer deaths, are expected to occur in 2013[1]. Here, We are using Computed Tomography(CT) modality in detecting lung cancer. The Automated Segmentation of lung region and detection of lung cancer is an important task to assist radiologist for better diagnosis of lung cancer. We, Propose an algorithm for the automated detection of lung cancer. Here, there are two steps involved a. Automated segmentation of lung regions to speed up the process of finding lung cancer b. Detection of lung cancer using an automated approach. We used the images from LIDC(Lung Image Database Consortium)[4].

II. PROBLEM STATEMENT

An automated approach of detecting lung cancer will assist the radiologist for better diagnosis of lung cancer. The radiologist can take good decisions in finding lung cancer.

III. PROPOSED METHOD

Here, there are two steps involved in this paper

A. Automated segmentation of lung regions:

This step plays an important role in detecting lung cancer. This step reduces the time in finding lung cancer from the CT image. This step helps in extracting lung nodules to classify as benign or malignant without searching the entire image for the lung nodule. Given an image, extract lung parenchyma by using a threshold of -420 HU [2]. To convert from HU(Hounsfield) to Gray level value, use $GrayLevelValue = 1024 + HU[2]$. Apply closure operation with the disk structuring element of radius 2 to close area of 2. find the connected components of all the areas in the image and then extract the two largest areas of the connected component.

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Apply the closure operation with the disk structuring element of radius 12[2] to close larger areas and fill the holes inside the two connected components. Superimpose the resultant image with the given image to extract lung region.

The algorithm for the segmentation of lung region is as follows:

1. Read a dicom lung image using `dicominfo()` and `dicomread()`.
2. Apply Thresholding to segment lung parenchyma as shown in the Fig.2.
3. Clear image border using `imclearborder()` to get Fig.3.
4. Apply closure operation with disk which is of radius 2 using `imclose()` to get Fig.4.
5. Label various connected components using `bwlabel()`.
6. Find the two largest areas from Fig. 4 to get Fig. 5.
7. Apply closure operation with disk which is of radius 12 and fill image holes to get Fig. 6 by using `imfill()`.
8. Super impose the image of Fig. 6 with fig. 1 by using `find()` to get Fig.7.

B. Automated Detection of Lung Cancer:

Given the lung regions, extract lung nodules using the threshold of -150 HU[1]. The majority of Malignant tumor will be larger in size[3]. Use the area as the feature to extract lung cancer. Extract the connected component whose area is large. Superimpose the extracted lung cancer with the fig.7. Locate the extracted lung cancer on the original image.

The steps involved in this algorithm are

1. Use threshold to extract lung nodule.
2. Extract cancerous lung nodule from non-cancerous lung nodules using the area as the feature to identify lung cancer.
3. Locate the extracted lung cancer on the original image Fig.1 using `bwperim()[5]`.

IV. RESULTS

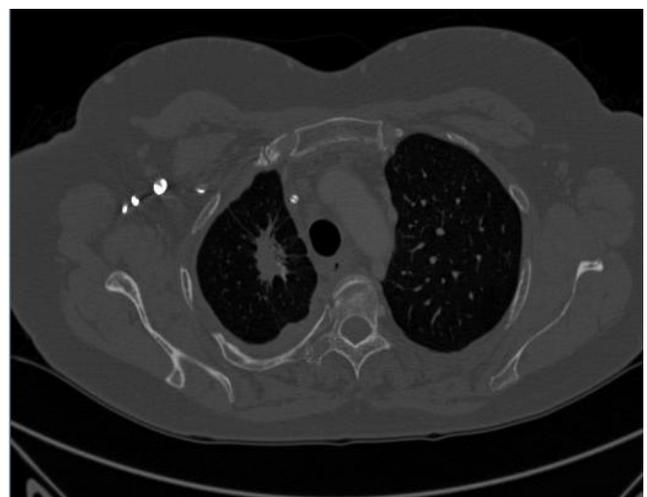


Fig. 1 Input Dicom Image

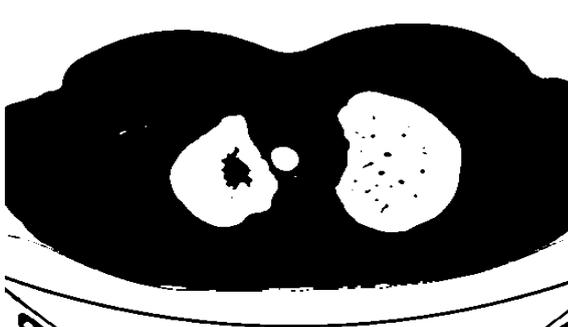


Fig. 2 Thresholded Image

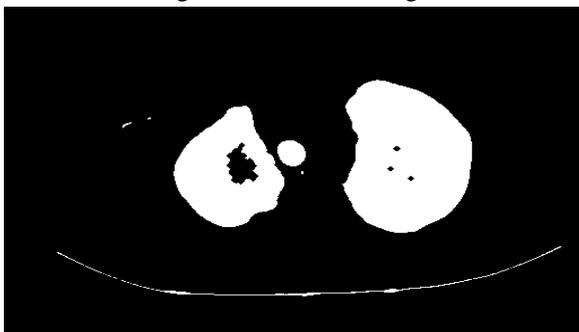


Fig. 3 Clear Image border

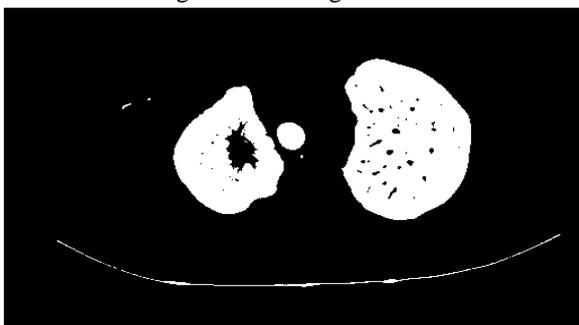


Fig. 4 Applied Closure operations

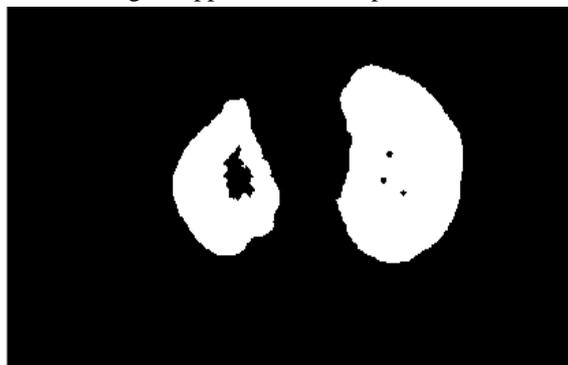


Fig. 5 Finding largest two areas



Fig.6 Apply Closure operation with 12 and fill the area inside

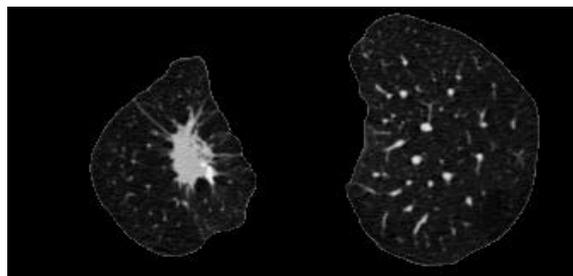


Fig. 7 Superimpose fig.6 with fig.1



Fig. 8 Use threshold



Fig.9 Identify lung cancer

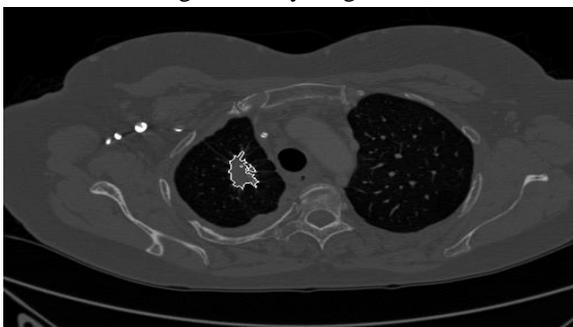


Fig. 10 Superimpose Fig. 9 with Fig. 1

V. CONCLUSION

The proposed algorithm assist radiologist for the better diagnosis of lung cancer. An Automated approach is used to detect lung cancer

REFERENCES

- [1] American Cancer Society,Cancer Facts and Figures,American Cancer Society,NewYork,NY,USA,2013.
- [2] Eng. Michael Samir Labib Habib,"A computer aided diagnosis system (CAD) for the detection of pulmonary nodules on CT scans",systems and biomedical engineering department,faculty of engineering,cairo university,Giza,Egypt,2009.
- [3] Moulay A. Meziane,"Current concepts in imaging and management of solitary pulmonary nodule",Lebanese Medical Journal 2009,Volume 57(1).
- [4] <http://imaging.cancer.gov/programsandresources/informationssystemslidc>
- [5] <http://blogs.mathworks.com/steve/2006/06/02/cell-segmentation/>