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Detection and Segmentation of Lung Cancer Using Geometrical Features of X-Ray Images

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ABSTRACT

The early detection of lung cancer is a difficult task because it is one of the important problems due to the installation of complex cancer cells. It is difficult to diagnose quickly through the x-rays only, therefore enlisted this techniques such as digital technologies, becoming a process of early detection of cancer easier complicated. X-ray images contain the noise so as to contain the bones of the rib cage, as well as the bones of the sternum, which is a major obstacle to distinguish cancer, therefore used to improve the images using a filter (median) as well as the way Image segmentation and the threshold and edge, The calculate the geometrical cancer features. In this research used three images of one patient after several stages of treatment.

Keywords: *Cancer; X-Ray Image; Lung Segmentation; Geometrical Features.*

1. INTRODUCTION

Lungs are located on the lateral sides of the thoracic cavity and separated from each other by the mediastinum. As the left lung is physically smaller than the right lung This is because the right and left lungs exhibit some obvious structural differences since the heart projects into the left side of the thoracic cavit, the right lung is subdivided into the superior, middle, and inferior lobes by two fissures. The left lung has a medial surface indentation, called the cardiac impression that is formed by the heart [1].

Lung disease refers to disorders that affect the lungs, the organs that allow us to breathe. Breathing problems which are caused by lung disease may prevent the body from getting enough oxygen [2].

Lung cancer is a highly aggressive and frequently fatal malignancy that originates in the epithelium of the respiratory system. Smoking causes about 85% of all lung cancers. Metastasis, the spread of cancerous cells to other tissues, occurs early in the course of the disease, making a surgical cure unlikely for most patients [1]. X-ray imaging is the fastest, most common, and least expensive diagnostic. Production of digital X-rays from pictorial radiographs is becoming a common practice to maximize information and reduce the number of rejected X-rays [3]. X-rays are among the oldest sources of electromagnetic (EM) radiation used for imaging. The best known use of X-rays is medical diagnostics [4].

2. METHODOLOGY

Analysis of tissue is a process which is very successful in the diagnosis of medical images of abnormal lung tissue and for this reason we need the help of x-rays and digital image processing, which is the way of modern diagnosis defect. The steps to detect the cancer are:-

1-Cancelling the rips which appear white on the lungs this can make a me sticks in detecting the cancer by subtracting the background of the lung image from the cancer.

2- Dividing the lungs which carry the cancer into two parts (normal and abnormal). And taking calculated of cancer and geometrical features.

3-When we specify which part hold the cancer we process the images by the following steps.

2.1. Image Segmentation

Image segmentation is the most difficult task in image processing. Segmentation refers to the grouping of image elements that exhibit “similar” characteristics, i.e. subdividing an image into its constituent regions or objects [5]. The thresholding process is the simplest way to segmented the x-ray image.

2.2. Median Filter

Median filtering is a nonlinear signal processing technique which is useful for noise reduction in images [6]. It is the best-known order-statistic filter, which replaces the value of a pixel by the median of the intensity levels in the neighborhood of that pixel.

2.3. Thresholding

Thresholding is one of the simplest segmentation methods. It can extract the object from the background by grouping the intensity according to the threshold value [7].

2.4. Edge detection

Edge detection is a type of image segmentation techniques which determines the presence of an edge or line in an image and outlines them in an appropriate way [8]. The main purpose of edge detection is to simplify the image data in order to minimize the amount of data to be processed [9].

2.5. Region of interest

A region of interest, is a selected subset of samples within a dataset identified for a particular purpose. The concept of an ROI is commonly used in many application areas. In medical imaging, the boundaries of a tumor may be defined on an

image or in a volume, for the purpose of measuring its size [10]. And It's property which are the statistical and Geometrical features.

3. EXTRACTING THE LUNG DISEASE

In the sample images, the background illumination is clear in the center of the image than at the other regions. The morphological opening operation is used to estimate the background illumination. Morphological in erosion followed by a dilation, the opening operation has the effect of removing object that can not completely contain the structuring element. To create a more uniform background, subtract the background image, background, from the original image, after subtraction, the image has a uniform background but is now too dark. The thresholding has been applied with adding a pseudo –color image a matrix which is RGB this identify each object in the matrix image to a different color in the associated color map matrix.

Three samples for the same patient have been taken for different time after the patient has received a treatment we have take an image for the patient after five weeks, then after two months. The geometrical features for the three images are shown in table (1) figure (1) shows the (ROI) for the cancer.

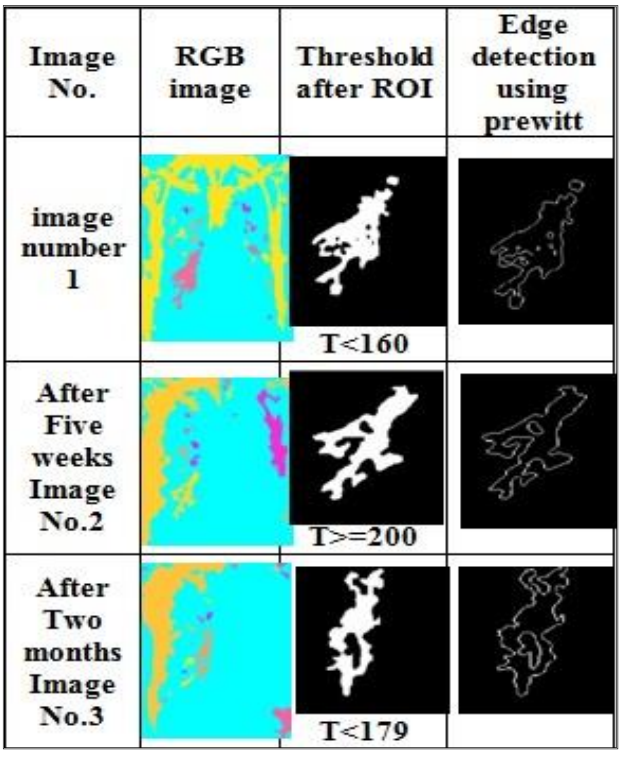

Fig. 1: The color and ROI cancer region for three cases after (Five week and two months

3.1. Geometrical Features

Once the connected components or objects in an image are labelled, each object can be isolated by its label. Thus geometrical features such as perimeter, area may be measured for individual object [6].

3.1.1 Area

Area of the segmented tumor is computed by counting, the number of pixels which have the value 1 'in the image array [11].

$$A = \sum \text{white pixel in the image} \ldots\ldots (1)$$

3.1.2 Perimeter

Perimeter property is calculating the distance between each adjoining pair of pixels around the border of the region. If the image contains discontinuous regions, then it returns unexpected results. Perimeter is calculated by counting the pixels contained only in the boundary [11].

3.1.3 Irregularity Index

Lung cancer is characterized partially by the irregularity in its tumor border. For this analysis, the irregularities in the tumor are computed by an index [12].

$$I = \frac{4\pi \times \text{area}}{(\text{perimeter})^2} \quad \ldots\ldots\ldots (2)$$

Table (1): The geometrical parameters for the Image shows in figure (1) of Cancer Cases

Image No.	area	Perimeter	Irregularity
Image No. 1	9030	1338	0.0634
After Five weeks later No.2	11088	1596	0.0547
After Two months later No.3	10038	1962	0.0328

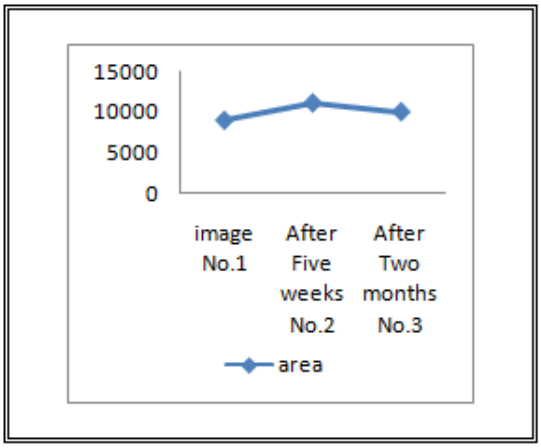

Fig. 2(a): The geometrical parameters for the Image figure (1)

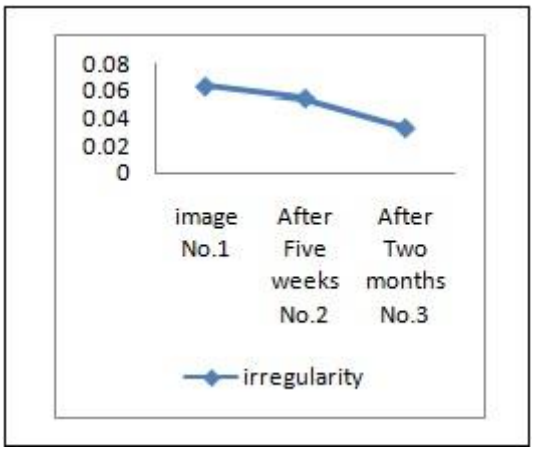

Fig. 2(b): The geometrical parameters for the Image figure (1)

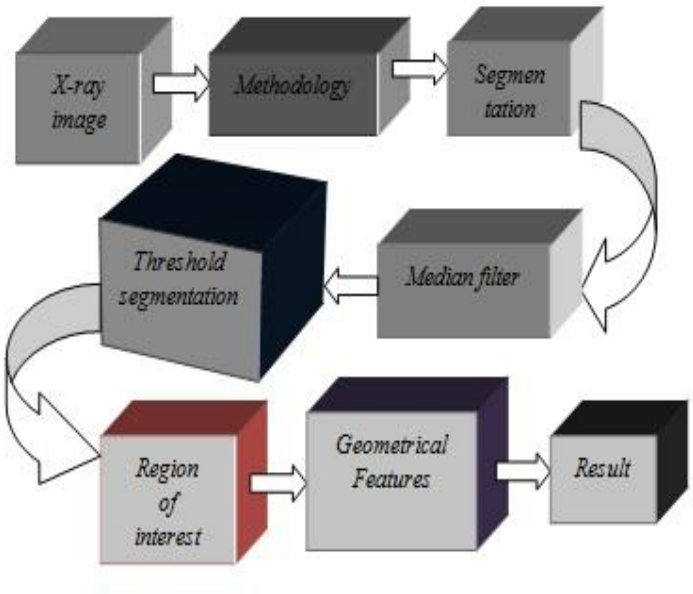

Fig (3): Shows the diagram for the assume system to detection the cancer

4. CONCLUSION

This search aim to extract the cancer from the lung by using the segmentation method and the enhancement filter (median) then the region of interest is used to get the cancer out from the rest lung. Here you will calculate the geometric features which have been calculated for the images of the three after five weeks and two months later (Table 1) shows that the value of irregularity less than five weeks later, and after two months of treatment. This indicates that the lung tissue became more regular or uniform than ever before.

REFERENCES

Michael M.[1], Valerie D. O.[2], "Human Anatomy'', [1]Glendale community college, [2]indiana university, 2006ISBN 0_07_249585_5, Qm23.2.M38 pp: 773-784.

Castellan, R. M.[1], Manrow[2],R. E. ,Richards, T. M.D.[3] and Smith, J. J. M.S.N, R.N., A.O.C.N.[4], M. White, Sc.D.[5], "Lung Disease", M.P.H. Division of Respiratory Disease Studies National Institute for Occupational Safety and Health[1], Ph.D. Associate Director, Office of Cancer Content Management National Cancer Institute[2], Medical Officer Centers for Disease Control and Prevention[3], Nurse Consultant National Cancer Institute[4], Branch Chief, Epidemiology and Applied Research Division of Cancer Prevention and Control Centers for Disease Control and Prevention[5], pp:1;November 29,2010,

Dr. K. I. Jassam[1], and professor, M. Carr[2], "REMOVAL OF RANDOM NOISE FROM CONVENTIONAL DIGITAL X-RAY IMAGES", Researcher, the Institute of Islamic Medicine for Education and Research Panama City, FL[1]. , Department of Surveying Engineering University of Maine Orono, ME[2]. USA Commission No: VII, PP: 113, 1992.

R. C. Gonzalez , University of Tennessee, R.E. Woods MedData Interactive, "Digital Image Processing", Third Edition, © by Pearson Education, Inc. Pearson Prentice Hall, Pearson Education, Inc. Upper Saddle River, New Jersey 07458,2008.

Beucher, S. "The Watershed Transform Applied to Image Segmentation", Proceedings of the Pfefferkorn Conference on Signal and Image Processing in Microscopy and Microanalysis, pp. 299–314, September 1991.

WILLIAM K. PRATT, PixelSoft, Inc. Los Altos, California, WILEY-INTERSCIENCE, " DIGITAL IMAGE PROCESSING", Fourth Edition, A John Wiley & Sons, Inc., Publication Copyright © 2007 by John Wiley & Sons, Inc., All rights reserved. Published by John Wiley & Sons, Inc., Hoboken, New Jersey. Published simutaneously in Canada.

Sitapa Rujikietgumjorn, "SEGMENTATION METHODS FOR MULTIPLE BODY PARTS", PROJECT IN LIEU OF THESIS Presented for the, Master of Science Degree ,The University of Tennessee, Knoxville,pp:8 ,July 31, 2008.

W. Frei and C. Chen, "Fast Boundary Detection: A Generalization and New Algorithm," IEEE Trans. Computers, vol. C-26, no. 10, pp. 988-998, Oct. 1977.

J. Canny, "A computational approach to edge detection," IEEE Trans. Pattern
Analysis and Machine Intelligence, Vol. 8, No. 6, pp. 679-698, Nov. 1986.

Almas Pathan1, Bairu.K.saptalkar," Detection and Classification of Lung Cancer Using Artificial Neural Network", Department of Electronics and Communication Engineering,SDMCET,Dharwad,India1almaseng@yahoo.co.in, 2bairusaptalakar@gmail.co ; International Journal on Advanced Computer Engineering and Communication Technology Vol-1 Issue:1 :ISSN 2278 – 5140.

R. C. Gozalez and R. E. Woods, "Digital image Processing" using matlab, 2nd ed, Gatesmark, USA. 202, ch. 12, pp.642-654.

S. A. Patil and V. R. Udpi, "Chest X-ray features extraction for lung cancer classification, "Journal of Scientific and Industrial Research, vol,69,pp. 271-277. April 2010.