International Journal on Recent and Innovation Trends in Computing and Communication ISSN: 2321-8169
Volume: 4 Issue: 4 631 - 634

Image processing techniques for Lung Cancer Detection

S.Shyamala[1]
[1]M.Phil Scholar, Computer Science, Mother Teresa Women's University Kodaikanal,India
Shy_211178@yahoo.co.in

Dr. M. Pushpa rani[2]
[2]Professor and Head,Department of Computer Science ,Mother Teresa Women's University Kodaikanal, India
drpushpa.mtwu@gmail.com

Abstract— Lung cancer is one of the dangerous disease which causes cancer deaths in the world. A cancer is an abnormal growth of cells that can be typically derived from a single abnormal cell. Cancerous cells can increase and affect whole part of the lungs. So, it is important to find cancerous cells at the earlier stage and take necessary steps to cure. Now-a-days Magnetic Resonance Imaging and computed tomography (CT) are finding the application computer aided diagnosis and treatment planning. In this paper we use CT scan images. A Computed Tomography(CT) scan of the lung nodule is one of the sensitive method for detecting lung cancer. In this paper proposed different automated nodule recognition systems using image segmentation, feature extraction and processing.
Keywords: *,CT Images, preprocessing, Segmentation, Feature Extraction, Binarization*

*****

I. INTRODUCTION

Cancer denotes to the rampant growth of abnormal cells anywhere in the body.For example, Breast cancer,prostate cancer,lung cancer, and so on.Lung cancer is one of the leading cuase of death in the world[8].

Both men and women the second common cancer is Lung cancer in the US and in Europe and represents major economic issue for healthcare systems, reporting for about 12.7% of whole new cancer cases each year and 18.2% of cancer deaths.In specific, per year there are around 1,095,000 new cancer cases and 951,000 cancer-related deaths in men and 514,000 new cases and 427,000 deaths in women.[6]

Lung cancer is created by uncontrollable abnormal growth of cells in lung tissue.These abnormalities in the lung tissues are called lowLung nodules.They are usually about five millimeters to 30 millimeters in size, small and roughly sperical masses of tissue.In general,they can be categorised into four groups.1.Juxta-vascular,2. Well circumscribed,3.pleural tail and 4.Juxta Pleural[6].

Typically, a Computed Tomography(CT) scan of the lung nodule is one of the best method for detecting lung cancer. A CT scan is a painless, noninvasive diagonastic imaging procedure which creates precise multiple images

generated 3D images.The radiologists should compare the current CT scan with the previous ones when a nodule is detected on a CT scan. In earlier CT scans if the nodule has not changed in size,shape or appearance, it is tenably non-cancerous. If a lung nodule is new or has changed in size,shape or appearance, then a tissue biopsy is recommended to determine if it is cancerous[8].

There are two main computational systems developed to help radiologists.The two computational systems are: computer aided detection(CAD) and Computer aided diagonosis(CADx) systems.CAD systems detect lesions through medical images,Whereas CADx systems goal is to measure the lesions characterization, For example, checking the malignancy and staging of the cancer,CADx systems aim to improve the sensitivity,efficiency and cost effectiveness of lung cancer screening programs.The main objective of these systems is to help the radiologists in the various analysis steps and to provide him a second view to the final decisions[8].

Thus researchers are turning more and more concerned with the expansion of automated CAD systems for lung cancer. In this paper proposed various automatized nodule identification systems using image processing, segmentation and feature extraction techniques[6].

II. LITERATURE REVIEW

Whole researchers have aim to acquire such a system which predict and find the cancer in its early stages. Also tried to amend the exactness of the Early Prediction and Detection system by using preprocessing technique, segmentation technique, feature extraction and classification techniques of extracted database. The major contributions of the research are summarized below.

Dasu Vaman Ravi Prasad (2013) - In this paper image quality and exactness is the core factors of this research, image quality value as well as betterment are depending on the enhancement stage where less pre-processing techniques is used based on Gabor filter within Gaussian rules. Coming after the segmentation principles, an enhanced area of the object of interest is used as a fundamental foundation of feature extraction is acquired. Depending on general features, a usual comparison is made. In this research, the main identified features for exact images comparison are pixels percentage and masklabeling[2].

T. Sowmiya, M. Gopi, M. New Begin, L.Thomas Robinson - In this paper they described Cancer as the most serious diseases in the world. Lung cancer is one of the most harmful cancer types in the world. These type of diseases can spread worldwide by rampant growth of cells in the tissues of the lung. Through early detection of the cancer can rescue the life of the patients who suffered by this diseases. In this paper we review many aspects of data mining rules that are used for the patients for lung cancer prediction. Data mining concepts are very useful in lung cancer classification. Also we reviewed the aspects of ant colony optimization technique in data mining. Ant colony optimization is useful for diseases by increasing or decreasing the disease prediction value. This case study assorted ant colony optimization(ACO) and data mining

techniques for proper rule generation and classifications on diseases, which pilot to exact Lung cancer classifications. In addition, it gives fundamental framework for further improvement in medical diagnosis on lung cancer[1].

S Vishukumar K. Patela and Pavan Shrivastavab (2012) - In this paper authors largely focus on sufficiently great improvement in contrast of masses along with the suppression of background tissues is acquired by processing the parameters of the proposed transformation function in the definite range. The manual analysis of the sputum samples is time consuming, inaccurate and needs concentrated trained person to avoid diagnostic mistakes. The segmentation results will be used as a base for a Computer Aided Diagnosis system for early detection of cancer, which increase the chances of the patient survival. In this paper,Gabor filter is proposed by authors for enhancement of medical images. It is a good enhancement tool for medical images.[3]

III. METHODOLOGY

Figure 1 shows the proposed work for the Diagnosis of lung cancer stage:

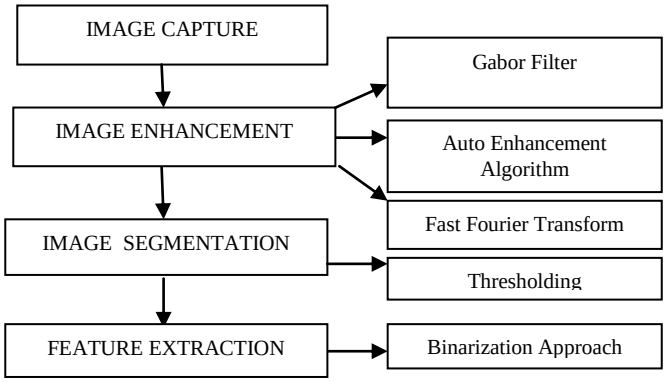


Fig.1.Lung Cancer Stages

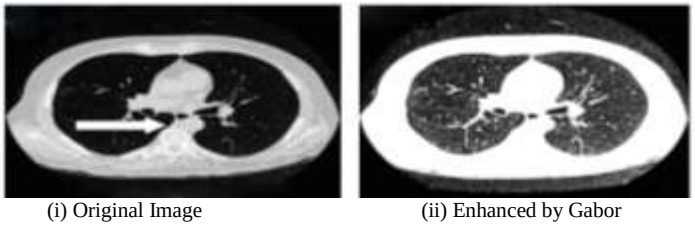
1. Image Enhancement

The image Pre-processing is the basics for image enhancement process; the main object of image enhancement is to give improvement in the interpretability or perception of information which were added in the image for human viewers, moreover the automated image processing techniques is provided with better inputs. Image enhancement techniques are divided into 2 broad categories: i) Spatial domains method, ii) frequency domains method. The image enhancement has no general theory for better understanding what "good" when it comes for human perception. If we feel good, it is also good. However, for other image processing techniques the image enhancement technique is are used as preprocessing tool, the most appropriate techniques are measures with quantitative [5].

a. Gabor Filter

The image presentation followed by Gabor function gives an excellent multiscale and local decomposition in the form of logons that are simultaneously (and optimally) localizating the space and frequency of the domains. Gaussian function multiplies the harmonic function whose impulse responses a Gabor filter is a linear filter method.

Only because of the multiplication-convolution theorem, the Fourier transform of a Gabor filter's response is the convolution of the Fourier transform of the Fourier transform of the Gaussian function and the harmonic function [6]. Figure 2 describes (i) the original image and (ii) the enhanced image using Gabor Filter[5].



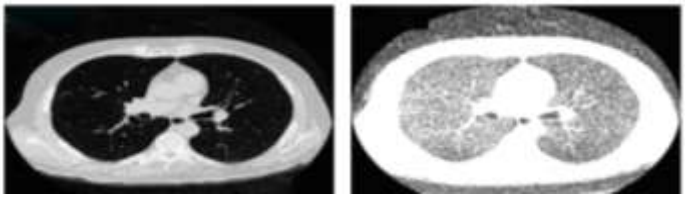
(i) Original Image (ii) Enhanced by Gabor

Figure 2.The result on application of Gabor enhancement technique [5]

The subjective observation and statistical operations such as variance calculation and mean is strongly depended by the Auto enhancement method. The enhancement percentage by this research is equal to 38.025%[5].

b.Fast Fourier Transform

In a given image Fast Fourier Transform technique operates on Fourier transform. In the frequency domain there is a space in which each image value at the image position is represented as F ie., at the amount where the intensity values in image "I" changes over a specific distance which is related to F. In image filtering Fast Fourier Transform is used (enhancement). Figure 3 describes how the effect of applying FFT on original images, where FFT method gives an enhancement percentage of 27.51%[5].



(a) Original Image b) Enhanced by FFT

Figure 3. Auto enhancement technique using FFT[5]

Table 1 shows a light on comparison of above three techniques that is used for image enhancement. The values in the Table 1, we can easily come to a conclusion that the Gabor Enhancement is the perfect and suitable technique for image enhancement.

Table 1. Sub and final averages for three techniques used for image enhancement stage[5]

Subject	Auto Enhancement	Gabor Filter	FFT Filter
Sub1	37.95	80.975	27.075
Sub2	47.725	80	36.825
Sub3	36.825	79.5	25.625
Sub4	34.775	81.8	25.175
Sub5	32.85	81.4	22.85

Final Average	38.025	80.735	27.51

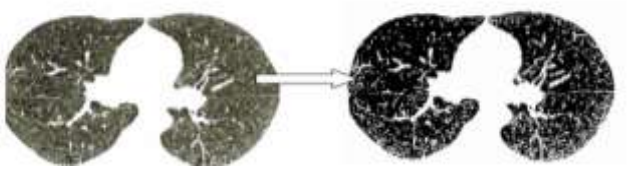
2.Image Segmentation

For most image analysis Image segmentation is an essential process to overcome subsequent tasks. In specific, the segmentation results highly depend on the existing techniques for image description and for its recognition. The images are divided into segmentation as constituent regions or objects.Medical images in 2D segmentation, slice by slice gives more information for the medical professional to come to a clear idea or suggestion such as: volume estimation and visualization of objects of accuracy, interest in finding the abnormalities (e.g. tumours, polyps, etc.), in tissue classification and quantification, and it gives more details.The aim of segmentation is to simplify or to change the representation of the images by giving something which is more agreeable and easier to analyse. For location of objects and boundaries Image segmentation is used typically (lines, curves, etc.) in images. The most important thing in the image segmentation is that the process of assigning a label for every pixel in an image where that pixels with the same label allows to share certain visual characteristics. The image segmentation results in a set of segments which collectively cover up the entire image, or an extracted from the image as set of contours (edge detection). The pixels in an area are similar with respect to some computed property or characteristic, they are colour, intensity, or texture. The neighboring regions are significantly different in respect to the same other characteristic(s).[5]

a.Thresholding approach

In image segmentation Thresholding tool pays a vital role. The great advantage of Thresholding is that the segmented image obtained occupies only smaller storage space, increases the processing speed and it gives way for manipulation, when compared with gray level images which normally contains 256 levels. For the past 20 years, thresholding techniques have captured a place in drawing a large amount of attention in the medical fields. In a Thresholding process a non-linear operation converts where a gray-scale images into a binary images where the two levels were assigned to pixels that are above or below the specific threshold value. In this researchers, Otsu's method were used in (gray thresh) function to compute the global image threshold are used. Threshold selection is the basis of Otsu's method by statistical criteria.

To establish an optimum threshold the object and background pixels with variances minimizing the weighted sum of within-class as suggested by Otsu. Recalling that maximization of between-class variance is equivalent to minimization of within-class variances. Satisfactory results are found bimodal histogram images by using this method. Threshold values assigned on this method are between 0 and 1, image will be segmented based the threshold value achieved on it. Figure 4 shows the result of applying thresholding technique.[5]



(a) Enhanced image by Gabor b) Segmented image by thresholding

Figure 4. Normal enhanced image by Gabor filter and its segmentation using thresholding approach.[5]

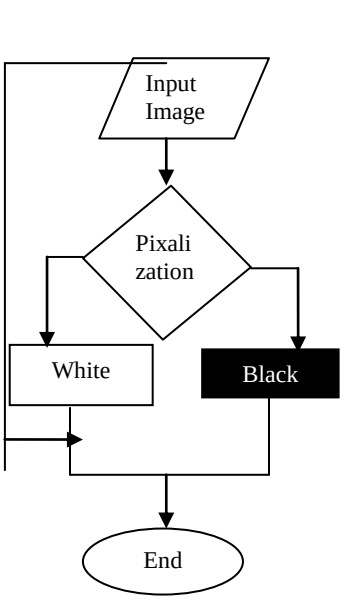
3.Feature Extraction

For a given Image the Image features Extraction is an important stage in that algorithms and techniques are used to detect and isolate various desired shapes or portions (features). To identify the presence of lung cancer, the below mentioned method is used: masking and binarization, both of these methods are based on facts that mostly relates to lung anatomy and information of lung with CT imaging.

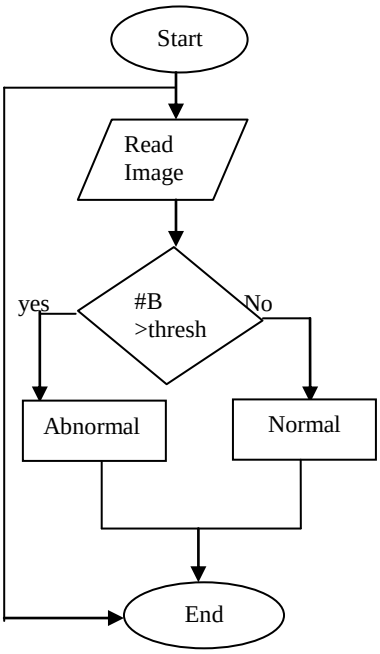
a.Binarization Approach

Binarization approach is based on the facts that the number of black pixels found is much greater than white pixels found in normal lung images, on counting the black pixels we can identify the normal and abnormal images which can be used later as a threshold, on such counting if the number of the black pixels of a present image is greater that of the threshold, then it shows that the present image is normal, or otherwise, if the number of the black pixels is much less than the threshold, it shows that the present image is abnormal.

The threshold values that were used in the research is 17178.48 and True acceptance rate (TAR) is (92.86%) and false acceptances rate (FAR) is (7.14%). Figure 6 shows the procedure in binarization method and figure 7 shows binarization check method of a flowchart.[5]



Method Procedure for Binarization[5]



Check method flowchart for Binarization.[5]

IV.Conclusion

For earlier disease detection and for immediate treatment the image improvement technique plays an advance role; the time conception was taken into consideration to identify the abnormality issues in targeted images. The core factors of this research is to produce image quality and accuracy, enhancement stage as well as image quality assessment where followed on low pre-processing techniques based on Gabor filter method which is well within Gaussian rules. For segmentation principle the proposed technique is efficient in the region of interest foundation and for feature extraction. When compared to other used techniques the proposed technique gives very accurate results.

REFERENCES

[1] T. Sowmiya, M. Gopi, M. New Begin L.Thomas Robinson "Optimization of Lung Cancer using Modern data mining techniques." International Journal of Engineering Research ISSN:23196890)(online),2347-5013(print)VolumeNo.3,Issue No.5, pp : 309-3149(2014)

[2] Dasu Vaman Ravi Prasad,"Lung cancer detection using image processing techniques", International journal of latest trends in engineering and technology.(2013).

[3] S Vishukumar K. Patela and Pavan Shrivastavab, "Lung A Cancer Classification Using Image Processing", International Journal of Engineering and Innovative Technology Volume 2, Issue 3, September 2012.

[4] Neha Panpaliya, Neha Tadas, Surabhi Bobade, Rewti Aglawe, Akshay Gudadhe, "A Survey On Early Detection And Prediction Of Lung Cancer", International Journal of Computer Science and Mobile Computing, Vol.4 Issue.1, January- 2015, pg. 175-184.

[5] Mokhled S. AL-TARAWNEH, "Lung Cancer Detection Using Image Processing Techniques", Leonardo Electronic Journal of Practices and Technologies, ISSN 1583-1078, Issue 20, January-June 2012 p. 147-158.

[6] 6.H.Mahersia,M.Zaroug and L.Gabralla, " Lung Cancer Detection on CT Scan Images: A Review on the Analysis Techniques", International journal of Advanced Research in Artificial Intelligence, vol. 4, no 4, 2015

[7] 7.veerakumar Kuppusamy and Ravichandran C Gopalakrishnan, " Feature Extraction Based Lung Nodule Detection in CT Images", International Journal of Applied Engineering Research ISSN 0973-4562 Volume 11,N0 4(2016)

[8] 8.Hiram Madero Orozco, Osslan Osiris Vergara Villegas, Vianey Guadalupe Cruz Sanchez,Humberto de Jesus Ochoa Dominguez and Manuel de Jesus Nandayapa Alfaro' "Automated system for lung nodules classification based on wavelet feature descriptor and support vector machine", Madero Orozco et al.BioMedical Engineering Online(2015)