International Journal of Enhanced Research in Science Technology & Engineering, ISSN: 2319-7463
Vol. 3 Issue 1, January-2014, pp: (71-75), Impact Factor: 1.252, Available online at: www.erpublications.com

An Efficient Template matching algorithm for Lung Cancer Detection using Multi Resolution Histogram based image segmentation

K. Sankar[1], Dr. M. Prabakaran[2]
[1]Research Scholar, Department of Computer Science, Karpagam University, Coimbatore, Tamil Nadu, India
[2]Assistant Professor, Department of Computer Science, Government Arts College, Ariyalur, Tamil Nadu, India

Abstract: Various lung cancer detection procedures have been discussed earlier with image segmentation but struggles with accuracy and false positive results. We propose a template matching algorithm for LCD using multi level histogram to segment the pixels of the Lung image to increase the efficiency and accuracy with low time complexity. The proposed method has following steps: Preprocessing, Histogram generation, Segmentation, Template matching, LC identification. The input image applied with preprocessing techniques to improve the quality of image and performed histogram equalization. At the next stage segmentation is performed to group and identify the similar pixels which helps us to find the edges of the left, right lungs. The segmented features are used to extract the features of the lung image. We use template matching technique to scale the portion of the lung and the lung region is extracted. The proposed method maintains the lung image data set which is trained one and using the training set the test image portions are matched to extract the lung portions.

Index Terms: Image segmentation, Template matching, LCD, Histogram.

Introduction

The human lung gets affected by cancer which is uncurable deadly disease in the world but only curable at its early detection. There exist few diagnostic procedures for early detection of lung cancer as X-ray films of human chest, CT, MRI scans and bronchoscope and many more. These are preliminary diagnostic procedures which cannot be identified exactly but an important procedure which uses the biopsy of lung portion which is taken using a needle on the portion of lung. The lung biopsies are more difficult to analyze and needs an experienced pathologist which is difficult to get one.

The segmentation technique helps medical image solutions in higher frequency and it has more impact on medical image processing. The image segmentation process has been used in variety of medical problems from identifying born crush to brain tumors. Generally the image segmentation performs the grouping of pixels in different ways also supports the medical problems in many ways. The segmentation process and implication of segmentation has been studied in large scope for lung cancer identification by many researchers.

The histogram equalization technique helps the segmentation process for higher segmentation quality. Using the equalized histogram the uniform region of the image can be identified, also the non uniform regions can be identified. The segmentation process has also applied on the area of content based image retrieval and image classification and indexing processes.

The template matching technique which has notable impact on image processing also can be used in medical image processing. The template matching technique uses set of predefined and extracted shape features for identifying and classifying the image. The same could be used for lung cancer detection because the shape of lung cancer according to the duration of get affected can be used as a metric to support the classification. We propose a new template matching algorithm to identify the location of lung cancer using multi resolution histograms.

Related works

Many approaches has been developed to detect the lung cancer even at earlier stages , we discuss few method related to our research here.

Parallel Immune Algorithm for Lung Cancer Detection in X-Ray Images Based on Object Shared Space [1], discusses a parallel immune algorithm (IA) for detection of lung cancer in chest X-ray images based on object shared space. The template matching method is combined to the algorithm and Java Spaces is used as object shared space.

Early detection of lung cancer using chest CT image classification [2], which uses the chest computed tomography images with the help of computer aided design for lung cancer detection. They considered two main challenges like identifying the organ of interest and nodule detection using shape and volumetric features. Plano cellular lung cancer affected abnormal detection on lung radiographs is described in [3]. In this the proposed method segments the region affected as suspect by the method from x-ray image. Similarity co-efficient is computed using the structure of planocellular lung cancer. The computed similarity value will be used to conclude whether the region has affected by lung cancer.

In [4], the author presents an artificial nuro fuzzy method for lung cancer detection. It has hop field neural network based segmentation and fuzzy c means clustering for identifying the early lung cancer. The manual analysis of the sputum samples is time consuming, inaccurate and requires intensive trained person to avoid diagnostic errors. The segmentation results will be used as a base for a Computer Aided Diagnosis (CAD) system for early detection of lung cancer which will improves the chances of survival for the patient. The two methods are designed to classify the image of N pixels among M classes.

Detection and segmentation of sputum cell for early lung cancer detection [5], present a framework for the detection and segmentation of sputum cells in sputum images using respectively, a Bayesian classification and mean shift segmentation.
Cell extraction from sputum images for early lung cancer detection[7], propose a Computer-Aided Design system for the early detection of lung cancer using digital sputum images. This process requires the detection of the sputum cell region in the sputum image characterized by a cluttered background. In this paper we address this problem using two different methods, namely, a Rule-based method, and Bayesian classification. We describe the two methods and we compare their performances in terms of their behaviors with respect to color representation and color quantization.

Lung Cancer Detection on CT Images by Using Image Processing [8], proposes a lung cancer detection system using image processing is used to classify the present of lung cancer in an CT-images. In this study, MATLAB have been used through every procedures made. In image processing procedures, process such as image pre-processing, segmentation and feature extraction have been discussed in detail. We are aiming to get the more accurate results by using various enhancement and segmentation techniques. Lung Cancer Detection in Chest X-Ray Images with Parallel Genetic Algorithm [10], discusses lung cancer detection in chest X-ray images with a parallel genetic algorithm (GA). The template matching method and local search techniques are combined to the algorithm and Java Spaces is used to construct the parallel system. Most of the methods noted here has the problem of false positive , which reduces the efficiency and accuracy of the detection procedure. We propose a novel approach which uses different techniques at all the stage of image processing.

Proposed Method

We propose a template matching algorithm for LCD using multi level histogram to segment the pixels of the Lung image. The proposed method has following steps: Preprocessing, Histogram generation, Segmentation, Template matching, LC identification.

Preprocessing:

At the preprocessing stage we generate the gray scale values of the original image. The generated gray scale values are then passed to the edge detection and we used sobel edge detector for the purpose of edge detection. The output image of the edge detection process is used to increase the intensity values of the original image. We increase the intensity of the detected edges in the original image.

Algorithm:
Step1: start
Step2: read input image img.
Step3;convert image into gray scale
Compute size of image img [w,h]=size(img).
For each pixel from img
$Img_{(i)}$= 0.2989 * R + 0.5870 * G + 0.1140 * B.
end
Step4: stop.

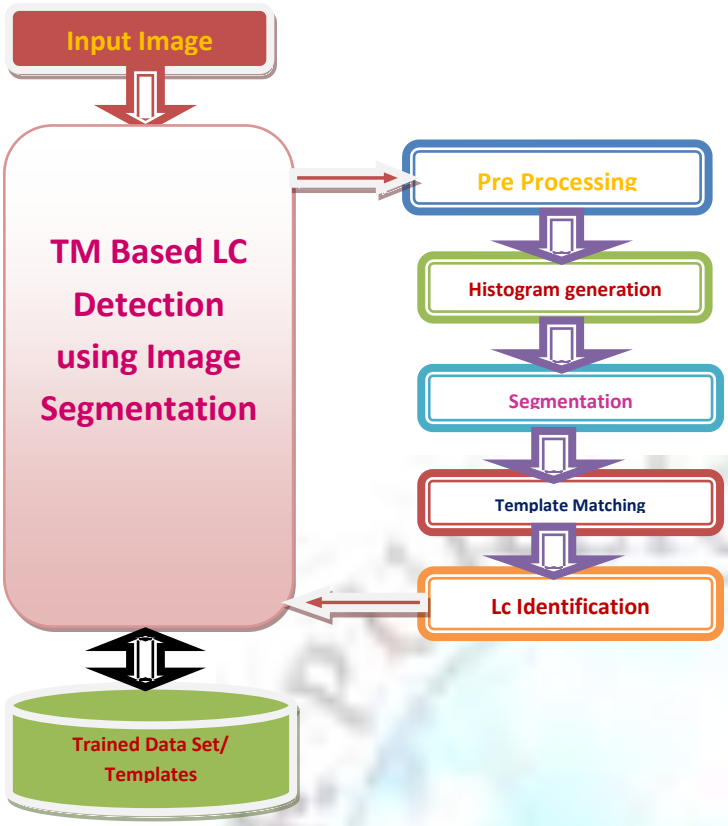

Figure1: Proposed System architecture

Histogram Generation:

At the second step we have generated the histogram value of the image, we used 64 bit histogram for our purpose. The resultant value is used for the segmentation process. Based on the result of histogram equalization the image is segmented and reconstructed to provide the resultant image. The resultant image is displayed to the user and will be allowed to provide new threshold. Based on new threshold entered the clustering process and segmentation process will be repeated to provide new result. This methodology will be repeated until the user gets satisfied.

Algorithm:

Step1: start
Step2: read input image img.
Step3: load possible intensity values Ivset={0…256}.
Step4: for each value in Ivset
Compute tp=total pixel having intensity value Ivset(i)/ total no of pixels.
End.
Step5: for each pixel p in image Img
Perform transformation by rounding the intensity values nearer.
$T(k) = \text{round}(L-1)\ \Sigma_{n=0-k}\ p_n$
Compute probability distribution.
Pn – probability distribution
End
Step 6: stop.

Template Matching:

The segmented features are used to extract the features of the lung image. We use template matching technique to scale the portion of the lung and the lung region is extracted. The proposed method maintains the lung image data set which is trained one and using the training set the test image portions are matched to extract the lung portions.

Algorithm:

Step1: start
Step2: read histogram equalized image img.
Step3: read template set Ts.
Step4: for each template from Ts
Identify matching with the segmented results sg.
End
Step5: compute the closeness measure.
Step6: select top closure values.
Step7: extract the lung region.
Step8: stop.

LC Detection:

Now we have all the features of the lung and we have left and right image as extracted through template matching. With the extracted lung portion we compute the intensity analysis to find out the region where the cancer cells are found. The cells affected by cancer have difference in the intensity values which is used to separate the region affected by cancer. The difference will become noticeable at segmentation process, but we use template matching to get all the portions first then identify the location where it gets affected.

Algorithm:

Step1: start
Step2: read the extracted region of lungs.
Step3: for each portion of lungs
Identify pixel with intensity different and neighbors.
Identify edges using sobel edge detector.
End.
Step4: mark the region .
Step5: stop.

Results and Discussion

The proposed methods have been implemented using matlab and have used 2000 images as data set where 75% as training and remaining as test image. The proposed method has produced efficient results on both time and space complexity with higher accuracy in LCD.

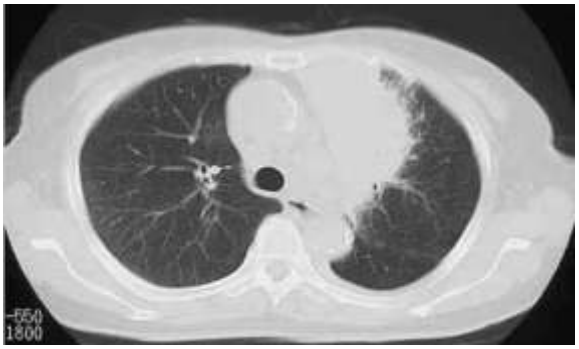

Figure 2: shows the gray scaled input image

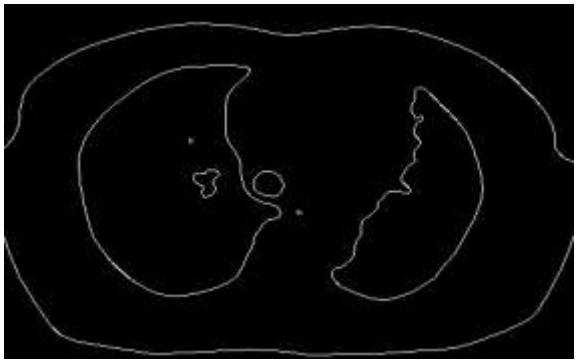

Figure 3: shows the edge detected image.

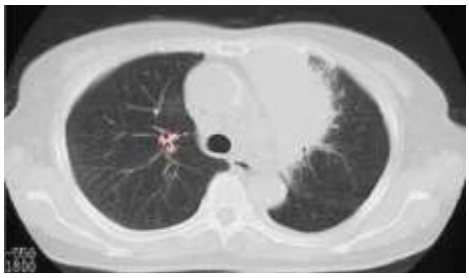

Figure 4: shows the cancer detected image.

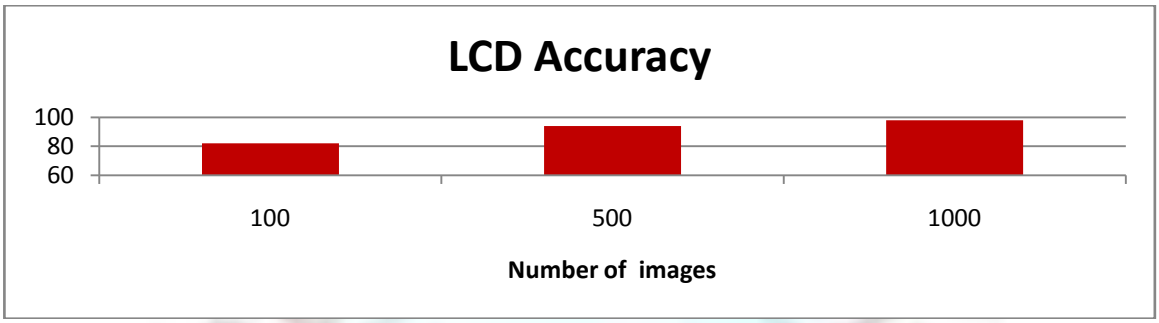

Table1: shows the LCD accuracy

The table 1 shows the lung cancer detection accuracy with number of samplea and it shows that the proposed method has good impact on LCD with growing size.

Conclusion

We proposed LCD method using template matching and multi resolution histogram for image segmentation. The proposed method has produced efficient results in all factors and the method can be further improved by extending the segmentation method with other features.

References

[1]. Peng Gang, Parallel Immune Algorithm for Lung Cancer Detection in X-Ray Images Based on Object Shared Space, Parallel and Distributed Computing, Applications and Technologies (PDCAT),pp 197-200, 2011.
[2]. Mughal.M.N. Early lung cancer detection by classifying chest CT images: a survey, INMIC , pp 67-72, 2004.
[3]. Zeljkovic, Automatic detection of abnormalities in lung radiographs caused by planocellular lung cancer, bio medical engineering, pp 69-72,2011.
[4]. Taher, Fatma, Lung cancer detection by using artificial neural network and fuzzy clustering methods, IEEE gcc conference , pp 295-298, 2011.
[5]. Werghi, Detection and segmentation of sputum cell for early lung cancer detection, Ieee image processing , pp 2813-2816, 2012.
[6]. Kancherla,Non Intrusive and Extremely Early Detection of Lung Cancer Using TCPP, Ieee computing in global information,
[7]. Donner c,Cell extraction from sputum images for early lung cancer detection, IEEE Electrotechnical conference , pp 485-488, 2012.
[8]. Chaudary, Lung Cancer Detection on CT Images by Using Image Processing, ICCS, pp 142-146, 2012.
[9]. Xiaozhou Li, Analysis on data for detection of lung cancer using serum auto-fluorescence, IT medicine and education , ITME, vol 1, pp 554-556, 2011.
[10]. Peng Gang, Lung Cancer Detection in Chest X-Ray Images with Parallel Genetic Algorithm, PDCAT , pp 189-192, 2012,
[11]. Nisar Ahmed Memon, Anwar Majid Mirza, and S.A.M. Gilani, "Segmentation of Lungs from CT Scan Images for Early Diagnosis of Lung Cancer", World Academy of Science, Engineering and Technology 20 2006
[12]. M.Gomathi, Dr.P.Thangaraj, "A Computer Aided Diagnosis System For Detection Of Lung Cancer Nodules Using Extreme Learning Machine", International Journal of Engineering Science and Technology Vol. 2(10), 2010
[13]. Disha Sharma, Gagandeep Jindal, "Computer Aided Diagnosis System for Detection of Lung Cancer in CT Scan Images", International Journal of Computer and Electrical Engineering, Vol. 3, No. 5, October 2011.
[14]. Samir Kumar Bandyopadhyay, "Edge Detection from CT Images of Lung", International Journal Of Engineering Science & Advanced Technology Volume - 2, Issue - 1, pg: 34 – 37, Jan-Feb 2012
[15]. Dr. H. B. Kekre, Ms. Saylee M. Gharge, "Image Segmentation using Extended Edge Operator for Mammographic Images", International Journal on Computer Science and Engineering, Vol. 02, No. 04, 2010.