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GLCM Feature Analysis Using CT Images to Detect Lung Tumor

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Abstract—
In this paper a multidimensional digital image processing and manipulation approach for better visualizationof hidden diagnostic aspects of physiological structures is pre- sented. Segmentation approach is used image evaluation and classificationforradiologicalanalysisorcomputer-aidedanalysis. First, the CT images are pre-processed by segmenting the lung parenchyma from each and every slice. The area of interest (ROIs)hasbeenthenextractedfromthelungparenchyma. The extracted ROIs were labeled as cancerous or non-cancerous nodules with the help of a human knowledge base and then the LBP and GLCM (Gray Level Co-occurance Matrix) elements have been extracted from each and every ROI. The extracted features and the label of the corresponding ROI have been used totrainaSupportVectorMachine(SVM).TheCTimageto bediagnosedis firstpre-processedtoextract theROIsfrom each and every slice. The slice with the largest area is chosen as the significant slice and this slice is taken up by the feature extraction subsystem for further analysis of the nodule. The obtainedfeaturesarefedtoSVM,whichclassifiesthenodule as cancerous or non-cancerous.

***Keywords*—**ComputedTomography,GLCM,SVM.

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I. INTRODUCTION

Lung cancer is a cause for the largest quantity of deaths because cancer around worldwide. It is responsible for 1.3 million deaths worldwide yearly. Probably the most original melanoma that happens for men and women is lung cancer. The report submitted by the American cancer Society in 2003 suggests that lung cancer is the reason for approximately 13% of all cancer diagnoses and 28% for all cancer deaths. The survival rate for lung cancer analyzed in 6 years is just 15%.If the disease is recognized whilst it is still localized, this cost increases to 49%. Nevertheless, only 15% of diagnosed lung cancers are at this early stage.

Computed tomography (CT) images come as a stack of images of a couple of slices. Accordingly, processing all the slices or processing the third-dimensional (3D) reconstruction oftheCTimageiscostly.Theworksdiscussedwithinthel iteratureperformevaluationoneitherthe3Dreconstruct ion of the picture or an arbitrary slice chosen from the stack of slices. They do not shed on how the slice is chosen or whether the chosen slice is particularly significant for the analysis. For this reason, this work aims at determining the slice suitable for analysis of each and every ROI and processing this slice. In order to analyze the picture properly, lung region needs to be extracted from the CT image. The segmentation of tissue in the context of medical imaging is to define the areas representing more than a few anatomies in the image. Considering it improvements the efficiency of radiologists by allowing for more correct diagnosis and quantitative evaluation ,segmentation of lung is a nimperative stage in automatic analysis of medical images.

Developments in computed tomography (CT) have furnished a considerable opportunity in helping lung cancer sufferer getting early remedy for their illness. This because CT allows visualization of small or low-contrast nodules that would hardly ever be screened in conventional radiograms. The study provided on this paper aims to determine and describe the present approach is on automatic and semi-automatic lung nodule detection. It presents are view of the related work on nodule detection. But lung segmentation is a tough task because of the considerable overlap of soft tissues and a low contrast between the lung and neighboring organs'

gray intensities. Also, due to asymmetry in the shape of the lung, extraction of lung region becomes even more challenging.

Building up a robust approach for lung segmentation from CT images is a difficult task because of an identical intensity values between adjacent organs, geometrically complex lung structure and the injection of contrast media, which causes all tissues to have exclusive grey level values. Several artifacts of pulsation and motion and partial volume effects also expand the difficulties to hold automatic lung segmentation in CT images. The significant variations in shape and volume of the lung additionally contribute these difficulties. Therefore, lung segmentation from medical image continues to be an open concern.

Generally, methods and techniques to lung segmentation in the CT images are classified into two important categories: semi-automatic and fully automatic lung segmentation methods. Semi-automatic lung segmentation approaches require a confined user intervention to finish the task. This intervention varies from a manual selection for seed points to a manual refinement of a binary mask for the lung. The term fully auto- mated means that the lung segmentation approach is applied without any operator intervention. This kind of procedure is appreciated by radiologists considering the fact that it is free from user errors and biases, and it saves the operator from a potentially difficult work and waste time.

II. RELATED WORK

Niccoloet.Al [1]. have presented a combination of computer-aided detection algorithm for automatic lung nodule identification. They aim to evaluate the potential of combining different computer-aided detection (CAD) methods to increase the actual support for radiologists of automated systems in the identification of pulmonary nodules in CT images. Segmentation is done for the pre-processed image and features such as sphericity, radius, Shanon entropy for the inner and border voxels, standard deviation etc. using these feature vectors lung nodule is detected and classified.

Varalakshmi.K [2] proposed a hybrid approach for lung nodule cancer detection. In this paper, image is segmented the input image based on thresholding. Using Morphological operations such as filling, closing the lung field is extracted from the original image. This is because to avoid the detection of nodules at the outermost portion of the lung image. Fuzzy based neural network is used for training and classification.

Macedo Firminoet Al[3] proposed an ovel methodology to detect the nodule part in lung image. Initially they pre- processed the input image using median filtering Enhancement Filter, Contrast Limited Adaptive Histogram Equalization Auto-enhancement, Wienerfilter, Fast Fourier Transform, Wavelet Transform, Anti-geometric Diffusion, Erosion Filter, Smoothing filters and Noise Correction. Two algorithms have been used for segmentation, thresholding and Otsus algorithm. V.Lakshmiet.Al[4] have described feature based classifi- cation of lung tissues. In this paper, they suggested a new image classification method for lung tissue patterns ,based on feature-based image patch approximation. A set of texture and gradient features are extracted for every image patch, and two new feature descriptors are proposed: 1) a new rotation- invariant Gabor-LBP (RGLBP) feature descriptor to represent rich texture elements integrating multi-scale Gabor filters and LBP histograms; 2) a new multi-coordinate HOG (MCHOG) descriptor to extract the gradient aspects at the same time accommodating rotation variance withradial specific coordinate
systems.

A segmentation approach by using Marker controlled wa- ter shed approach was proposed by Sruthi Ignatiousetal [5]. Geometric based features such as area, perimeter, eccentricity, convex area and mean intensity are extracted. These features are used for the identification and classification of lung diseases.

Binsheng Zhao et al [6] have proposed a system to identify the nodule in lung image. They have developed an advanced computerized approach for the automated detection of small nodules on chest CT images. This process uses a 3-step process, which include automated extraction of the lungs, detection of higher density structures in the extracted lungs, and removing of false-positive outcome among the many detected nodule candidates.

Tumor segmentation and classification presented by M. Gomathi and Dr.P. Thangaraj [7], once the segmentation is performed on the lung region, the features can be obtained from it for determining the diagnosis rule for detecting the cancern modules in the lung region perfectly.The features that are used to generate diagnosis rules are Area of the candidate region, maximum drawable circle (MDC) inside the candidate region, Average intensity value of the candidate region. Support Vector Machine (SVM) is trained by making use of these feature vectors to realize classification of pixels.

III. METHODOLOGY

The elemental steps in the proposed approach is segmentation. The segmented image can be given for feature extraction, thus disease portion within the lung can be identified. De-pending on the features of the disease the results can be given to patients or doctors.. The output of the segmentation is the binary image showing the disease parts. The segmented binary in age isused for the extraction of features of the disease. The features extracting for the identification of the cancer are GLCM and Geometric features.

Lot of research is being carried out on the topic of lung cancer recognition, a vital organ of human body. Here a small effort is made to describe a method to extract the lung from CT images. A GLCM based method which is adaptive to various gray intensities, for segmentation of lung and classification is being described. Figure 1 gives an illustration of the proposed work. A CT image is considered as input.

Enhanced image is obtained by resizing the original image and converted the image to gray from RGB color model. The next step is to segment the lung region. Bringing together the pixels having similar characteristics, to form a region is the basic logic.The progress of merging the pixels continues till the method encounters neighboring pixels not satisfying any of the defined conditions.

Steps involved in our proposed work,

- Read the Input image
- Segmentation
- ROI Extraction
- Feature Extraction
- Based on the extracted features, classification is done.

A. Segmentation

The segmentation subsystem segments the lung parenchyma from the chest CT slice by applying a modified version of the thresholding algorithm proposed byOtsu[8]suitedfor DICOM images. The chest CT image DICOM format is taken as input. DICOM stands for Digital Imagining and Communication in Medicine. The image is used here is a low resolution image that is low dose Computed Tomography image. The low res- olution image are difficult to process since the challenge here is to classify the lung nodules for the high accuracy. Here the DICOMimagesizeis514kb,sourced from LIDC-IRDIImage database are taken as input. The chest CT image contains lung region which is to be extracted from the background.

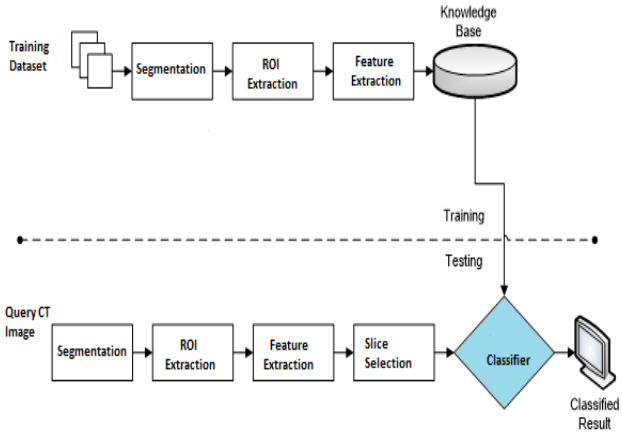

Fig.1.ProposedFrameworkforDetectionofLungDisea sefromCTImage.

B. Feature Extraction by GLCM

The GLCM method [9] calculates the grey level co-occurance approach probability Density functions for th egiven image. This method is often used for extracting statistical texture features of a digital image. From each density features, five texture elements are outlined: contrast, Angular second moment, Entropy, mean and Inverse difference moment. Con- trast is defined because the difference in intensity between the highest and lowest intensity phases in an image hence measures the neighborhood variations in the grey level.

C. Classification bySVM

There are in-numerous classification ways for computerized classification of samples. In this paper its decided to work with most widespread classification algorithm: SVM. The Support Vector Machine was presented by Vladimir Vapnik and colleagues[10]. Support Vector Machines (SVMs)are a rather new learning system used for binary classification. The basic idea is to find a hyperplane which separates the

D-Dimensional data perfectly into its two classes.However, Since illustration data is more often not linearly separable, SVMs introduce the idea of a kernel induced feature space which casts the information right into a higher dimensional space where the information is separable. Specifically, the predominant purpose of SVM classifiers is classification of examples that belong to certainly one of two possible classes.

IV. EXPECTED RESULTS AND DISCUSSION

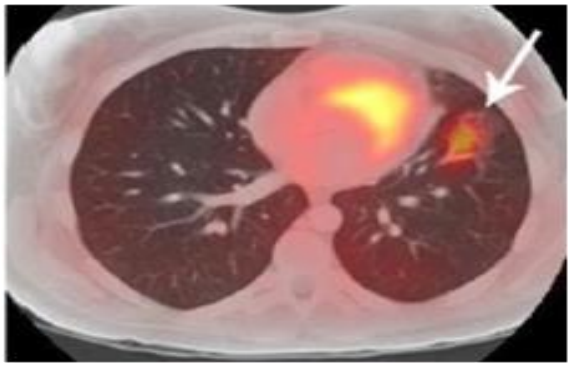

Fig.2.Inputimagecontainingtumor

Here we adapt a segmentation algorithm and features such as local Binary Pattern and gray level co-occurance matrix methodtodetectthelungcancerpartinCTimages.Figure3 shows the expected outcome of our proposed work. Figure2 is the input lung image, where the arrow mark shows the cancerous cells to be detected. As we see in the figure 3, we marked the cancer part for an easy representation.

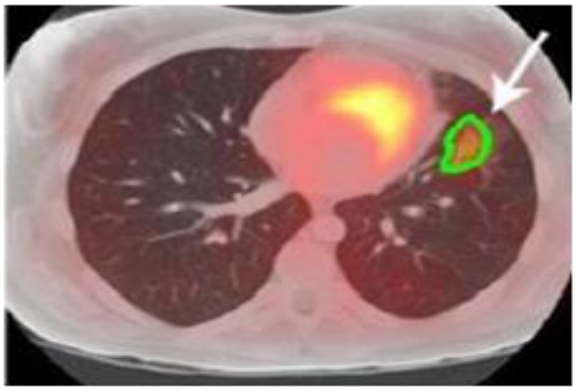

Fig.3.Expectedresultdetectingtumorcells

V. CONCLUSION

This paper presents a approach for classification of cancers in human lung using support Vector machine. The features suchasgraylevelco-occurancematrixareextractedfrom the lung images. Then, diagnosis rules are framed for the extracted features. Ultimately with the obtained diagnosis rules, the classification is performed to identify the cancer.For the reason of evaluation, the one of a kind actual time chest computer tomography images are used. The scan shows that the utilization of SVM results in better accuracy of classification.

REFERENCES

[1]. Varalakshmi.K, Classification of Lung Cancer Nodules using a HybridApproach, Volume 4, Issue 1, 2013.
[2]. Varalakshmi.K, Classification of Lung Cancer Nodules using a Hybrid
[3]. Approach, Volume 4, Issue 1, 2013.
[4]. MacedoFirmino, Antnio H Morais, Roberto M Mendoa, Marcel RDantas,HelioRHekisandRicardoValentim,Computer-aidedDetectionSystem for Lung Cancer in Computed Tomography Scans Review andFuture Prospects, 2014.
[5]. V.Lakshmi, Ms. P.Krisnaveni, and Mrs. S.Ellammal, Feature BasedClassification of Lung Tissues for Lung Disease Diagnosis, Volume 2,Issue 1, 2014.
[6]. SruthiIgnatious, Robin Joseph, Jisha John and Dr. Anil Prahladan,Computer Aided Lung Cancer Detection and Tumor Staging in CTimage using Image Processing, Australia, Volume 128, Issue 7, 2015.
[7]. Binsheng Zhao, Gordon Gamsu, Michelle S. Ginsberg, Li Jiang, andLawrence H. Schwartz Automatic detection of small lung nodules onCT utilizing a local density maximum algorithm, Volume 4, Issue 3,2003.
[8]. M.Gomathi and Dr.P.Thangaraj, An Effective Classification of Benignand Malignant Nodules using Support Vector Machine Volume 3, Issue7, 2012.
[9]. Otsu, N. A threshold selection method from gray-level histograms, IEEE Trans. Syst. Man Cy bern., 1979, 9 (1), pp. 6266.
[10]. D S Elizabeth, H K Nehemiah, C S Retmin Raj and A Kannan, Computer-aided diagnosis of lung cancer based on analysis of the significant slice of chest.
[11]. Corinna Cortes, ValdimirVapnik, Support Vector Networks", Machine Learning, 20, 273-297 (1995), Kluwer Academic Publishers, Boston.