© 2017 IJSRSET | Volume 3 | Issue 8 | Print ISSN: 2395-1990 | Online ISSN : 2394-4099
Themed Section: Engineering and Technology

A Study of Image Segmentation and Classification of Lung Tumors

Vaibhavi Patel[1] , Prof. Bijal Talati[2]
[1]PG Student, SVIT, VASAD, Gujarat, India
[2]H.O.D., SVIT, VASAD, Gujarat, India

ABSTRACT

Lung Tumors is animportant reason of death worldwide it states to the uncontrolled progress of abnormal cells in the lung. If not treated, this growth can extentearlier the lung by process of metastasis into close-by tissue and different parts of the body. The image processing methodsused commonly in various medical areas for enlightening prior detection and handling stages, in which the time span or elapse is very essential to classify the disease in the patient as possible as fast, especially in many tumors. The method uses first detection of lung mass tissue uses segmentation techniques. Geometrical features Extraction technique used for calculating statistical features. At last, classification used to classifies the tumor. In this paper includes various segmentation, feature types and classification methods withtheir merits and demerits.

Keywords : Image Processing, Tumor Detection, Tumor Classification, Segmentation, Computer Tomography (CT)

I. INTRODUCTION

Lung tumor is furthermore seen as carcinoma of the lung.Lung cancer in particular, is one of the major causes for cancer related deaths worldwide. [1] Cancer patient has the smallest survival rate after the finding the tumor, it continuous increases the in the sum of deaths each year. Being from lung Tumor is straightforwardly depending upon identification of tumor and at its discovery time. The early detection of the tumor will increase the survival rate of the cancer patient.[3] As indicated by an overview led by The Hindu' in 2010 Cancer executed 5,56,400 individuals the nation over. The 30-69 age group accounted 71% (3,95,400) of the death. In 2010, growth alone represented 8% of the 2.5 million aggregate male passing and 12% of the 1.6 million aggregate female passing in this age gathering (30 to 69 years). At almost 23%, oral malignancy caused the most figure of passing among men. It was trailed by stomach malignancy (12.6%) and lung tumor (11.4%). Because of women, cervical malignancy was the driving reason (around 17%), trailed by breastcancer (10.2%). Consequently, from this review, it is apparent that the lung malignancy is a genuine explanation behind death what's more; its rate is expanding every year. [12]

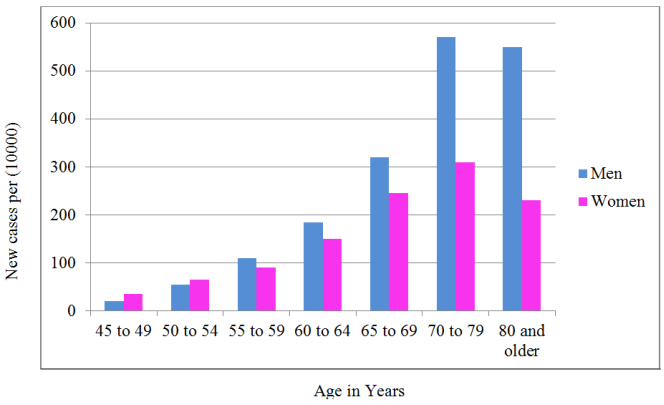

Figure 1. Death rate per year due to Lung Tumor

The bigger section (85– 90%) of occurrences of lung cancer are due to the tobacco smoke. Around 15– 25% of cases occur in people due to the second hand smoke. Another reason of occurrence lung cancer is hereditary components and introduction to asbestos and different types of air contamination. [1]

Lung tumor can be detect by taking mid-section radio outlines and enlisted tomography (CT) analyzes. [1] CT lung image is mainly used for the detecting the lung

tumor nodules. After taking CT image in the diagnosis process consist following stage,

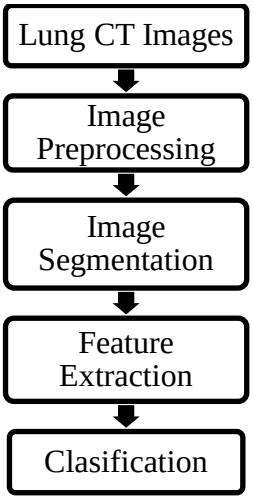

Figure 2. Lung Tumor Detection and classification system

- ✓ Image preprocessing - in these process it enhance the picture quality and removes the unwanted noise and background information.
- ✓ Image Segmentation - Image segmentation is the procedure of isolating the lung lobes from CT image and it groups the suspicious region
- ✓ Feature Extraction - After Segmentation, positive region will be extraction using the feature such as the perimeter, shape, size, area, color, etc.
- ✓ Classification - After identifying the cancerous nodule classifies the tumor types. [1][8][10]

II. TUMORS TYPES

A tumor does not mean cancer.Lung tumor is the abandoned cellsdevelopment of irregularcellsthatstart on one or together lungs; typicallyit is the cells that line the airways.If not treated, this advancement of tumor can extent past the lung by practice of metastasis into near to tissue and diverse parts of the body. Most tumors that start in the lung, identified as basic lung malignancies, are carcinoma that got from epithelial cells. [1] A lung nodule is round lesion that is mainly two types cancerous or non-cancerous. [8]

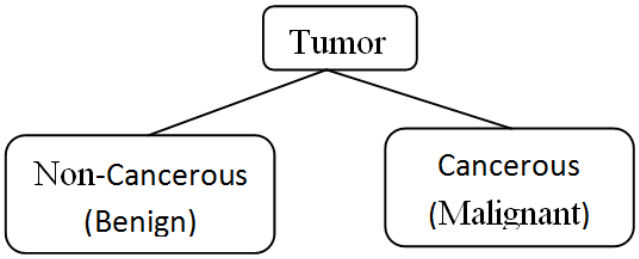

Figure 2. Tumors Types

A tumor does not mean cancer. Tumors can be not cancerous is called benign or threatening cancerous called is malignant. Benign tumor cannot harmful to the human health and it cannot spare to the other part of body. [10]

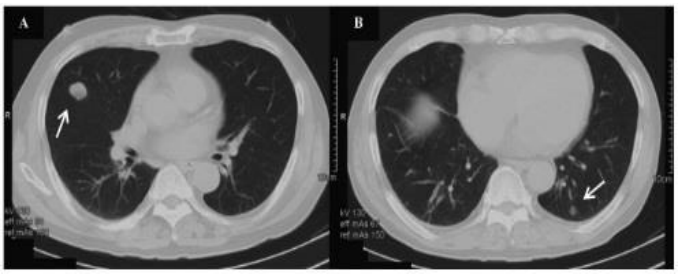

Figure 3. Benign Tumor

Not at all like benign tumors, harmful ones develop quickly, they are eager, they search out new an area, and they spread .The unusual cells that frame a threatening tumor increase at a quicker rate. [10]

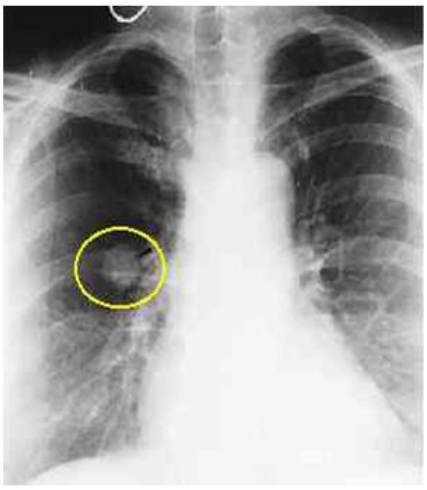

Figure 4. Malignant Tumor

Aroundnumbers of types of lung,malignancy and that is isolated with two number of fundamental types: Non-small cell and Small cell lung cancer, which has three subtypes: Adenocarcinoma, Carcinoma and Squamous cell carcinomas. [9]

III. SEGMENTATION TECHNIQUES

Main goal of segmentation isdividing and simplify the image into a meaningful structure, which is easy to understand. For the tumor detection segmentation of CT images in 2D, slice by slice has numerous valuable applications for the medical area, for example, representation and volume estimation of region of interest, location of anomalies. [3] Mainly two values of intensity is used in segmentation - discontinuity and similarity. Discontinuity defines as segment the image based on unexpected changes in intensity, for example, edges the images. Similarity classification depends on dividing the image into district regions that are comparable as per a predefined measure. In the medical application is segment the tumor part. It will identify the affected lung area with the help of these we differentiate the cancerous tumor and non-cancerous tumor. [2] Following table describes segmentation techniques with its merits and demerits, which is taken from survey.

Table 1. Image Segmentation Techniques with pros and cons

Segmentation Techniques	Description	pros	Cons
Gabor Filter[3,13]	Gabor function contain 1st and more than one-level decomposition in terms of logons areas. A Gabor filter is a linear with impulse response with the harmonic purpose grew by a Gaussian.	Segment text area and graphic area in simple background. Efficient Used in document Analysis.	Time consuming method. Gabor filter has Computational complexity which prevented its use in practice.
Watershed Segmentation[2,3]	Watershed segmented and Extracts seeds that show the vicinity of Questions alternately. Foundation toward particular picture. Areas need aid. Afterward situated will make territorial minima inside the topological surface.	Image split According to our demanded resolution. Handle sharp edges, topographical changes, 3D effects	Sensitive to noise Not suitable for edgeless image Note suitable for image whose boundary are very smooth
K- Means Clustering[1]	k- Means is unsupervised algorithm. Image clustering means groping the pixel according to some condition. Then k cluster center randomly chosen.The distance between the each pixel to a cluster centers are Calculated. The distance calculated.. Single pixel is compared to all cluster centers using the distance formula. The pixel is moved to parted to cluster which has shortest distance among all.	Scale Well Efficient Simple, understandable Items assign automatically in cluster.	Choosing the Wrong K All item forced into a cluster Sensitive with outlier

FCM[4,5]	SVM is the kernel selection and training of the data performs vital role in classification results. The feature values, Extracted from sample slices, are nonlinearly distributed.	Accurate Works well for noise free images.	Apriori specification of no. of clusters. increase no. of iteration. sensitive to noise.

IV. FEATURE EXTRACTION

Image feature is the one pieces of information. In the image feature extraction is the process of transfer arbitrary data like image to the relevant numeric data. This numeric data used in the classification process. Mainly feature has two types - Shape and texture. Detailed view of feature is in the following table. [7,8]

Table 2. Different Types of Feature with pros and cons

Feature Type	Advantage	Limitation
Shape		
Area, Perimeter, Major and Manor Axis [7,16]	Easy to implement, Less Complex, Less Time Consuming	Works with Binary Image only, feature value change when change image dimension
Texture		
GLCM Feature [1,5,7,8]	Computation Time is Low, Low memory Consumption	Works with Gray scale images, feature vector is low so classification accuracy will less.
Haralick Features[8]	Computational accuracy of feature vectors is high, Classification accuracy is high	Due to 13 features the computation of feature vectors is complex and time consuming.

V. CLASSIFICATION TECHNIQUES

Classification defined as the task categorizes the any of given objects within a given category called class. [8] Following table describes classification techniques with its pros and cons, which taken from survey.

Table 3. Image Classification Techniques with pros and cons

Classification techniques	Description	pros	cons
Naive Bayes[3,7]	They are the statistical classifiers. It is based on probability theory. As outcome, it provides class membership with certain probabilities. Naïve Bayesian classifier is based on Bayesian theory.	Database is less than great bias low alteration classifier like NB will work well It is Easy to implement Need less training data. simple yet powerful model They return not only the prediction but also the degree of certainty No complicated optimization required. Small memory footprint	Database is less than procreative class will work well. It cannot learn interaction between features. No occurrences of a class label. If certain attribute value together then it results zero probability Large dataset can't use it.
Neural Network[1,6,18]	Inspired from the natural neural network of human nervous	High degree of non-linearity possible. Testing process is fast.	Complex to tune parameters. More time to build model.

	system. consists of units (neurons), decided in layers, which convert an input vector into some output Generally networks are define as Feed forward, Back propagation, radial basis function, recurrent neural network, etc.	In complex domains, it provides good result. If domain is continues then it provides better result.	
Decision tree [11]	A structure mainly contains node and branches. Top most nodesare root node. Other inner nodes are test nodes on an attribute and each leaf node holds a class label.	Split the data more correctly. Handle missing values. It does not need any domain knowledge. Easy to understand. Learning and classification steps of a decision tree are simple and fast.	Rules are too much simple. Needed more training dataset. Not much useful in practical approach.
SVM (Support Vector Machine) [5,8,11,14,17]	A Support Vector Machine is a binary classifier. It use kernel function to transform low dimensional training samples to higher. Use quadratic programming to find the best classifier boundary hyper plane. It uses the kernel trick, so you can build in expert knowledge about the problem via manufacturing the kernel.	High accuracy. Easy to generate rules. Easy to understand. Most Effective methods in classification. Nice theatrical guarantee regarding over fitting. It will work well even data is not linearly divisible in the base feature space. SVM maximizes margin, so the model is more robust. SVM supports kernels, so you can design model for even nonlinear relations.	Hard to interpret Takehigh time to expect the new instance. If several key parameters are,presence then only it achieves the finest classification result. Memory intensive

VI. CONCLUSION

This paper provides various types of tumor segmentation, Feture types and classification techniques would give satisfactory results and help medical professionals with lung cancer diagnosis and ultimately save a lot of lives. Detail review includes description of different segmentation and classification methods containing its pros and cons.

Furthermore, we intended do survey of optimization algorithms and select suitable one and will be implementing through appropriate software. To increase accuracy of implemented algorithm, it will be optimize with suitable optimization technique.

VII. REFERENCES

[1]. P. B. Sangamithraa, S.Govindaraju. Lung Tumour Detection and Classification using EK-Mean Clustering. In Full-text paper was peer-reviewed and accepted to be presented at the IEEE WiSPNET (2016).

[2]. Gawade Prathamesh Pratap. Detection of lung cancer cells using image processing techniques. In 1st IEEE International Conference on Power Electronics. Intelligent Control and Energy Systems (ICPEICES-2016).

[3]. Avinash. S, Dr .K .Manjunath. An Improved Image Processing Analysis for the Detection of Lung Cancer using Gabor Filters and Watershed Segmentation Technique. In IEEE International Conference on Power Electronics. Intelligent Control and Energy Systems (ICPEICES-2016).

[4]. Ezhil E. Nithila , S.S. Kumar. Segmentation of lung nodule in CT data using active contour model and Fuzzy C-mean clustering. In ELSEVIER, Alexandria Engineering Journal (2016).

[5]. U. Javed, M. M. Riaz, T. A. Cheema, H. M. F. Zafar. Detection of Lung Tumor in CE CT Images by using Weighted Support Vector Machines. In 10th International Bhurban Conference on Applied Sciences & Technology (IBCAST) Islamabad, Pakistan, 15th – 19th January, 2013.

[6]. Md. Badrul Alam Miah. Detection of Lung Cancer from CT Image Using Image Processing and Neural Network. In IEEE (2015).

[7]. Taruna Aggarwal, Asna Furqan, Kunal Kalra. Feature Extraction and LDA based Classification of Lung Nodules in Chest CT scan Images. In IEEE (2015).

[8]. Hiram Madero Orozco, Osslan Osiris Vergara Villegas, Vianey Guadalupe Cruz Sánchez, Humberto de Jesús Ochoa Domínguez, Manuel de Jesús Nandayapa Alfaro. Automated system for lung nodules classification based on wavelet feature descriptor and support vector machine. In Madero Orozco et al. BioMedical Engineering OnLine (2015)

[9]. Mokhled S. AL-TARAWNEH. Lung Cancer Detection Using Image Processing Techniques. InLeonardo Electronic Journal of Practices and Technologies (2012).

[10]. Ekta Solanki Mr. Amit Agrawal , Mr. Chandresh K Parmar. A Survey of Current Image Segmentation Techniques for Detection of Lung Cancer. In IJSRD - International Journal for Scientific Research & Development (2014).

[11]. Chaitali Dhaware, Mrs. K. H. Wanjale. Survey of image classification Method in Image Processing. In International Journal of Computer Science Trends and Technology (I JCS T), June 2016.

[12]. Sruthi Ignatious, Robin Joseph. Computer Aided Lung Cancer Detection System. In Proceedings of 2015 Global Conference on Communication Technologies(GCCT 2015).

[13]. J. Ilonen, J.-K. Kämäräinen and H. Kälviäinen. EFFICIENT COMPUTATION OF GABOR FEATURES. In 2005.

[14]. WANG Xiao-peng, ZHANG Wen, and CUI Ying. Tumor segmentation in lung CT images based on support vector machine and improved level set. Tianjin University of Technology and Springer-Verlag Berlin Heidelberg 2015.

[15]. A.Amutha, Dr.R.S.D.Wahidabanu. Lung Tumor Detection and Diagnosis in CT scan Images. InInternational conference on Communication and Signal Processing, April (2013).

[16]. Jibi John , M G Mini. Multilevel Thresholding Based Segmentation and Feature Extraction for Pulmonary Nodule Detection. In International Conference on Emerging Trends in Engineering, Science and Technology (ICETEST 2015).

[17]. Anjali Kulkarni ,Anagha Panditrao. Classification of Lung Cancer Stages on CT Scan Images Using Image Processing. In IEEE International Conference on Advanced Communication Control and Computing Technologies (2014).

[18]. Kamil dimililer, Yoney kirsal Ever, Buse Ugur. Intelligent Lung Tumor detection system On CT Images. In Springer International publishing AG (2016).