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Lung Cancer Detection using Matlab based on Image Processing

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Abstract: ***Lung cancer is one of the world's most frequent causes of death. It is also known as carcinoma of the lung. Malignant lung tumor known as pathology tends to cause death. It can be classified by tissue abundance in the lung. Lung cancer can be classified into two classes of non-small cell lung cancer and cancer of the small cells. It forms alongside the genetic problem and the transformation of epigenetics. Most lung tumor cells grow larger and spread widely throughout the parts. CT image provides more data on the issue of detection of lung cancer by chest X-ray, but the small tumors cannot be found. One of the important techniques is the processing of images mostly used for lung cancer detection. In our proposed work we are using graphcut by use of DCE function for segmentation of foreground and background and for classification we are using image based on computer aided detection (CADe) by use of regions with CNN(Convolutional Neural Network) features.***
Keywords: Computed tomography(CT), computer-aided diagnosis (CAD), DCE function, Regions with CNN features.

I. INTRODUCTION

Image processing is a software that enables the image designed to improve its level of quality. Used to study and manage the image. Captures the input image almost clearly if it is not possible to do it properly, then it is covered up in a digital method. The main process for converting all signals from a normal image sensor into digital image sensor. They need to improve the image quality and accuracy, the main goals for preparing the image for display as background and foreground. Then it gives an output to the compressed image. It is mainly used to detect abnormalities in the lung cancer detection system and to find the tumor in - depth. In the current system this input image can be received from cameras, sensors that placed problems on satellites, aircraft and space (or) preferred small images, this technique is enhanced. Supporting a true image is an esthetic standard. Between the visual system and the digitizing device, it is more accurate. So we prefer the image processing for accuracy and easily detect the lung nodules. So we prefer the image processing for accuracy and easily detect the lung nodules, which results faster. Digital image processing has some pixels is a rastor image in a physical point. Each pixel has a variable size that is different. They usually refer to only 2-D image in image processing because it costs less than the 3-D image. Some of the image processing applications are computer graphics, medical imaging of computer vision, photo editing. We use medical imaging in our project because it gives a good result when the image process is done on it. We focus on the identification of lung nodules using medical imaging. This image can be patterned in the form of a multi - dimensional system. Lung cancer is a major disorder that affects both children and adults. We are predominantly detecting the abnormalities that can be detected by stages in the lung cancer.

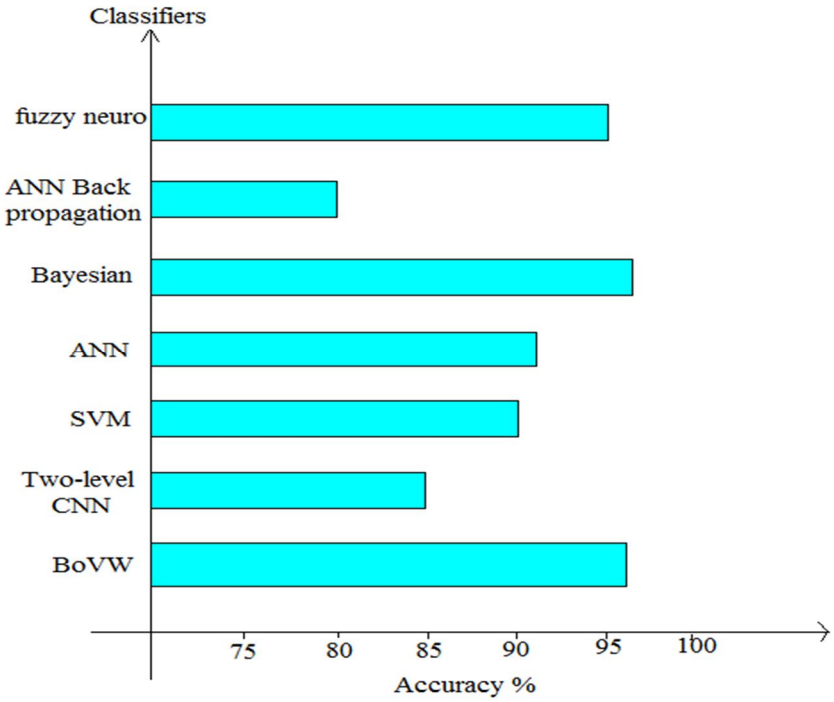
II. RELATED WORK

[1] The great improvement in accuracy of the diagnosis by the radiologist for detection of lung cancer in the form of computed tomography (CT) image. Segmentation based on graph cut is inspired because manual methods are tedious and time consuming instead of that distance-constrained energy method is used. In this paper it produces global optimum solution by spatial relationship amoung pixels and the modelling of image data. Here segmentation includes all the regions and the lung tissue from the CT image. DCE function has a significant improvement of lung segmentation using unconstrained energy function. It is best for automatic lung segmentation based on graph cut and also produce accuracy of CT image. It produces unconstrained solution based on the distance of pixels. [2] It combines two approaches namely for segmentation of objects with high capacity and it apply convolutional neural network (CNN) to bottom-up region proposals that is regions with CNN feature's (R-CNN) and other one is supervised pre-training for an auxiliary task. It uses R-CNN for accurate detection and is simple and scalable object detection and gives 30% improvement when compared with PASCAL VOC 2012. [3] Lung cancer is of different types and keep on changing with various medical factors. In this paper it identifies the lung cancer at starting stage by using an algorithm. In this input image is processed in filter segmentation and other by morphological operation on CT image. It makes use of MATLAB. It is intended to degrade high mortality rate. It makes use of various segmentation algorithm and some mathematical operations is used to give accuracy by using

MATLAB. [4] In previous computer- aided detection (CADe) is feature based and image based CADe algorithm called convolution neural network (CNN) which combines the art of deep learning schemes to detect the affected lung nodule. It is mainly based on multi-group patches of lung nodule and that image is enhanced using frangi filter and then is it combine as a two group of images by using a four channels CNN model to detect the nodule at four levels and it is used to improve the performance of lung nodule detection. Because of multi-group patches of lung nodule it reduces the time and energy and it makes error free to do further process. [5] In this paper it describes image enhancement and classification for analysis of CT image. Basically in this CT image is categorised into normal and abnormal nodule. In this classification is based on feature extraction of gray level co-occurrence matrix (GLCM) and it uses Bayesian classifier to get best classification, later FCM is used for segmentation. Implemented gives more accuracy than before used method and takes less computation time, this procedure is very helpful for earlier detection of lung cancer. [6] It makes use of non-invasive screening system to differentiate normal cell to cancer cell and it uses label free discrimination techniques. Optical absorption and transmission response can cause a change in their interaction with light. In this paper it identify and discriminate several type of normal and cancer cells are named previously. It is mainly generated by optical absorption based method and labelling of cancer free cells. Optical based method opens a new route for identification and detection of lung cancer in a label-free manner. [7] In this paper it uses two new techniques for lung segmentation with high density first technique is used to segment the outline of lungs by novel Robust Active Shape Model (RASM) and other technique is used to segment the left and right lung separately by an optimal surface finding approach. Mainly RASM is first derived from rib cage detection. Use of RASM technique is applicable and suitable for large shape models and is best component for automatic lung segmentation. It is implemented parallely and allows low computation times. [8] In proposed system it uses bag of visual words(BoVW) to classify the cancer region of lungs with the help of MATLAB. First step consists of image enhancement by histogram equalisation and it is used to increase the contrast of the image, second step is top hat filter to enhance bright spot of interest in dark background. Next step is that, segmentation it uses Otsu's threshold method and at last classification is made by BoVW classifier to detect the affected tumour region. BoVW classification technique give 96% accuracy when compared with other classifiers and it is a huge potential in the field of CAD system with high accuracy and reduces the high computational complexity. [9] To find the affected region of lung computer-aided diagonosis play a major role.in this paper first it implements image enchancement which consists of scaling, color space transformation and contrast of the image and second is segmentation techniques like threshold and marker-controlled watershed based segmentation and atlast classification is made by multi-class SVM classifier which gives high accuracy. It gives 97% of accuracy and makes use of SVM classifier. [10] In this paper we use CNN architecture for parameterized two level convolution neural networks. The output is labeled with encodings label procedure. CNN architecture was trained, tested and evaluated specifically on the problem of diagnosis and it is digitized method. In this paper we neural classification method in reducing false positive in our system. In this Bp Algorithmis used for iteratively adjust the network weights so as to minimize the total error. Fewer hidden layers, Better generalization ability. [11] This paper mainly study presents a novel computer assistant detection (CAD) System for automatically detecting. This system is based on fast localization of candidate imaging patterns y using the local scale information .In this process TIB patterns are used for quantifying and proposed the CAD system. Fuzzy connectedness (FC) image segmentation Algorithm is used to achieve successful delineations and Fc Algorithm for segmenting lung regions and B-scale Algorithm for Measurement. Local scale approach can be used frequently to measure the large regions. Scale images are introduced for large measurement. [12] CT scan is employed by radiologist to detect cancer in the body. Image processing tools can be used early detection of cancer. Harlick features and Artifical neural network are used in this. Back Propagation Algorithm is used to feed forward neural network. [13] When we track the accurate lung tumor volume changes from computed tomography CT images are essential for monitoring tumor responses to therapy. In this paper we used networks they combine multiple image and levels through residual connection to detect the tumor easily we trained the algorithms only the TCIA dataset. We have developed a multistage CNN approach for volumetrically segmenting lung tumor. ADAM Algorithm is used for initial learning Rate. [14] Lung Cancer is the most common cause of deaths not only the tremendous cause of male deaths also for female. This study mainly focused on detection of lung cancer in computed tomography scan image using artificial neural network based gray level cooccurence matrices(GLCM) feature. It is also using fuzzy clustering methods for the level of accuracy of system which has been designed. Normal database contains 50 CT images. It is classified into two group of clusters. We used preprocessing stage, image segmentation, feature extraction and learning process. [15] Lung cancer detection using computer aided diagnosis is an main part on medical application. In this study, we used computerized process for tumor detection, instead of using manual nodule we go for automated system. It consists of lung segmentation and enhancement, feature extraction and classification. Segmentation is used to separate the lung tumor. Lung nodules are detected by neuro fuzzy based classifier.

III. PERFORMANCE ANALYSIS

Reference paper number	Author Name	Classification Technique	Accuracy
[8]	Thinkal Dayana Chellan	Bag of Visual Words(BoVW)	96%
[10]	Jyh - shyan Lin	Two-level CNN classifier	85%
[11]	Ulas Bagci	SVM Classifier	90.96%
[12]	Moffy Vas	ANN	92%
[13]	Heewon Chung	Bayesian classifier	96%
[14]	Lilik Anifah	ANN Back propagation	80%
[15]	M.Younus Javed	Fuzzy Neuro classifier	95%



IV. PROPOSED WORK

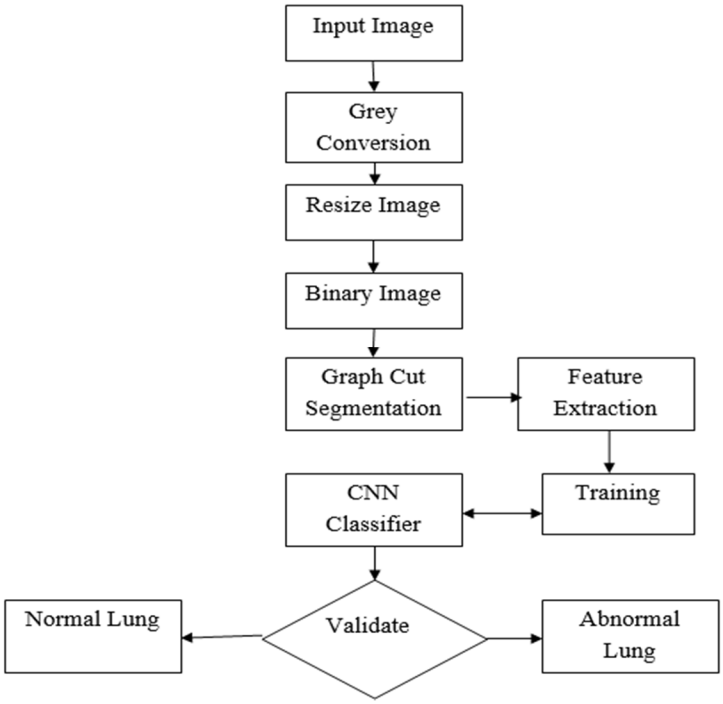
A. Methodology

Overall, there are four main processes used throughout the report; Pre-processing, segmentation, classification or training and finally the testing process. MATLAB is used in every process made throughout the project. Process involved in the lung cancer detection system for the project can be view.

B. Preprocessing

The images are subjected to pre-processing steps to remove noise and unwanted region. First, get the input image. Resize the image to the size acceptable to the processing system. Convert resized image into gray image in order to use only one color channel. Gray-scale comparison involves simple algebraic scalar operators. Gray scale image is enough to distinguish peaks of intensity. After converting the gray scale into binary image. That binary image is a digital image for each pixel with two possible values. The next thing after acquiring an image is to redimension it. Because each image has different sizes so we can resize it with the same size. They convert it to a gray scale image after resizing an input image. So features can be retrieved accurately.

C. Stages Of Lung Cancer Detection



D. Segmentation

It presents an automatic graph cut - based segmentation framework that uses a distance - constrained energy (DCE) function to produce topologically restricted solutions. This term ensures that labels are assigned only to the lung pixels even in the presence of other anatomical regions with similar lung-like patterns. The Euclidean distance was specified to make it clear that the distance referred to in this work is the distance between two points, not the distance as a measure of the difference between two regions. Any metric can therefore be used to measure the distance between points or regions. The contribution of this work is to create an automatic method of lung segmentation using Graph Cut that produces topographically restricted solutions to accurately identify the lungs in a CT image.

E. Training

We used a CNN as an approach based on arbitrary-functional extraction. We used a relatively small number of picture cases in this study. We therefore used the "AlexNet" pre-trained CNN model trained on the ImageNet dataset, which has 1,000 object categories. We also used data increase to supplement a small number of image data. With rotation and reflection, image data was increased by 8 times in the first step. Training image features were extracted using CNN in the first.

F. Testing

CADe by use of regions with CNN(Convolutional Neural Network) features correctly detected lung nodules attached to the chest wall and mediastinum for the detection of lung nodules and was able to detect various types of nodules such as airbronchogram nodules and ground-glass opacity nodules. However, some types of nodules could not be detected due to the small number of training nodules. We evaluated some kinds of patterns such as consolidation and honeycombing to detect diffuse lung disease patterns. After training with this kind of opacity.

V. CONCLUSION

Lung cancer detection and classification of benign and malignant tumour cell is the most challenging problem due to the structure of cancer nodule, in which most cells are overlapped on each other which cannot be determined easily. Thus the image processing techniques are used now-a-days to detect the lung cancer either by using a feature based extraction or by image based extraction. Both the extraction makes use of CAD for best recognition of cancer nodules and is very useful for radiologist and researchers. Therefore image processing is used to predict the affected cell accurately by using different classifiers.

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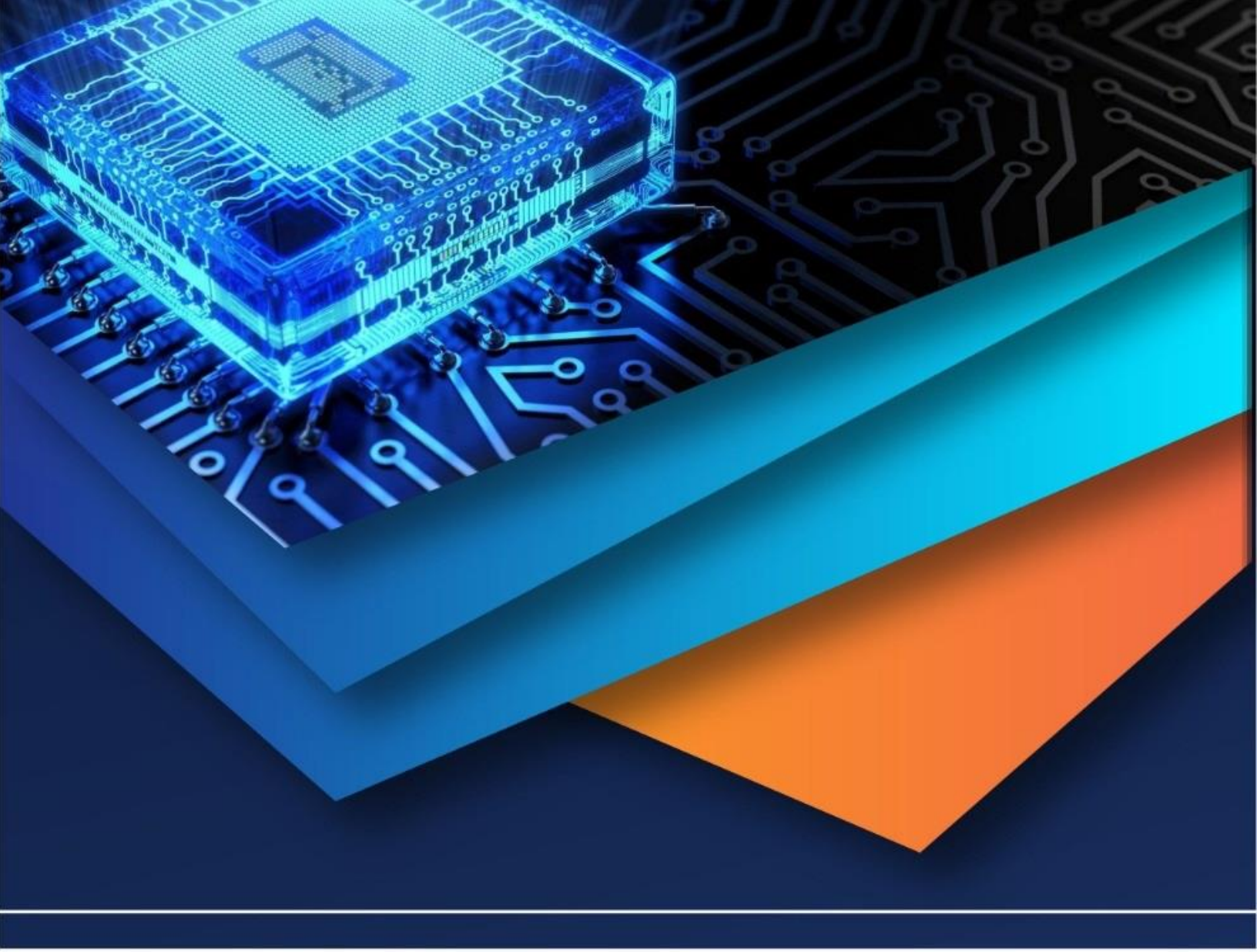

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