A Review on Lung Nodule Detection Using Patched Based Context Analysis Method With Support Vector Machine

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Abstract—Earlier Prediction of lung cancer is very essential and crucial task in healthcare industry. Lung Cancer is the leading cause of death, so it is highly essential to detect and predict it at initial stage. In medical world, diagnostic imaging is an essential and important tool for early detection of diseases. Lung nodule, which leads to lung cancer disease is predicted by image processing techniques in the medical field which include the Computerized Tomography CT images. The novel classification method for four types of lung nodules are well-circumscribed, vascularized, juxta-pleural and pleural-tail respectively.

Index Terms—Lung cancer, classification,computerized tomog-raphy

1. INTRODUCTION

Lung cancer is considered to be a major cause of cancer related deaths in humans worldwide. Therefore the identifica-tion of highly potentially malignant lung nodules is essential for the detection of lung cancer disease. Lung nodules are small masses in human lung, and are spherical in shape and they are in surrounding anatomical structures, which includes vessels and the adjacent pleura. Lung nodules can be divided into four types: first is well-circumscribed (W) with nodule and the location of nodule is centrally in the lung without any connection to vasculature, second is vascularized (V) with the nodule and location of nodule centrally in the lung but closely connected to neighboring vessels, third is juxta-pleural (J) with a large portion of the nodule connected to the pleural surface, fourth is pleural-tail(P) with the nodule near to the pleural surface connected by a thin tail [1].

In order to obtain anatomical information about lung nodules and the surrounding structures, Computerized Tomography (CT)images were used because it is having good imaging modality. In current clinical practice, interpretation of CT im-ages is challenging for radiologists due to the large number of cases [1]. This paper is organized as follows. Section II covers literature review pertaining to lung nodule detection using vari-ous classifiers. Section III explores the proposed methodology. Section IV covers the material and methods.Ssection V covers the work carried out. section VI covers the conclusion.

2. LITERATURE REVIEW

Fan Zhang et.al proposed a novel classification method for lung nodule. This method consist of three main stages: Adap-tive patch-based division,feature set was introduced, contextual latent semantic analysis based classier was designed for the estimation of the relevant images [1]. M.H Hasna et.al pro-posed supervised classification method for lung nodule LDCT images. The proposed method can overcome the problem of the lung nodule overlapping with the adjacent structures. The proposed system preprocesses the image and extracts the features. These features were used for classification of lung nodules into four categories: juxta-pleural, well-circumscribed, vascularized and pleural-tail, based on the extracted informa-tion. Finally, Decision trees classier was used for classification purpose of lung nodules [2]. Ravivarman. R et.al proposed three main procedures which were used by combining the anatomical structures and nodules. The amplification of the input image gives the required process of the segmentation. Adaptive patch-based division method was used, which is used for multilevel partition. Scale-Invariant Feature Trans-form descriptor (SIFT) is used in the feature set for getting the information for the input image. Probabilistic estimation was applied for the classification and analysis procedures[4]. Hidateka Arimura et.al discussed the computerized scheme for automated detection of lung nodules in low dose computed tomography images for lung cancer screening. The initial nodule candidates were identified by applying a multiple gray level thresholding technique to the different image, where most nodules were well enhanced [5]. Mr. Vijay A. Gajdhane et.al proposed the practical implementation in MATLAB, which is used through every procedure made for classification of lung nodule. In image processing procedures, process such as image pre-processing, segmentation based upon image patch division and feature extraction set have been givenin detail [6]. Sridhar. R et.al proposed texture features which was extracted for the image, Here experiment were carried in which the features are compared with given 5 sample images for classification using artificial neural network [11].

3. PROPOSED WORK

In this research work, author proposes a new image classification method for lung patches, based on an SVM and LSA classifier. Scrutiny of primary lung tumours and nodules is significant for lung cancer staging.

The task is to find positions and shape of specific pathological structures in the lungs called nodules. A lung nodule is a small mass present in the lung. It may be found on the lung part ,or the boundary part of the lung depending upon the type of lung nodule respectively. Nodules in LDCT images having important features such as it show up relatively low contrast white circular shape and it overlaps with shadows, vessels and ribs. So we can take the LDCT images for detecting the lungs. Performing Preprocessing is the initial step for detecting the lung cancer. Next we have to form the patches according to local anatomical structure and pixel values. The features will be extracted by domain specific knowledge using image processing tools in MATLAB. To predict the probability of lung cancer presence; two approaches will be used: Support vector machine (SVM) and latent schematic classifier(LSA).

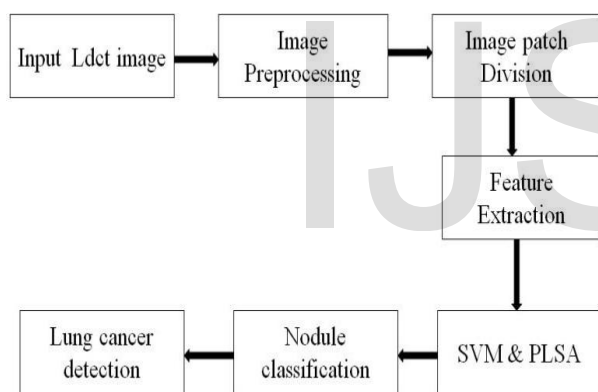A detailed architecture of the proposed system is shown in Figure1.

Fig. 1. Architecture of lung nodule classification system

4. MATERIAL AND METHODS

A. Material

Here we use the input images from the Lung Image Dataset Constronium (LIDC). This dataset has the CT scanned over the lung images. It has the set of low dose CT(LDCT) scanned lung images. These datasets are accessed by the any user through the internet.

B. Methods

The first step is the preprocessing stage,it is used to remove the unwanted noise present in the original image using the weiner filtering technique.The aim to the weiner filter is to filter out the noise that has corrupted image.Wiener filters are the class of optimum linear filter, it

provides better reslt for removing noise ,design of filter is distinct.

The second step is the boundary detection using edge detection method.Canny method as well as sobel method are used to obtained the result. By comparing the output of both method ,it is found that canny edge detection method gives the better result than sobel method.

Next step is image patch division stage,here the patches were forme according to the structure and the segmentation of lungs , i.e the segmentation of left lung part and right lung part and segmentation of limbs were done. In proposed method the image is first amplifier with nearest neighbour interpola-tion with local intensity information. After the image patch division, features are extracted from the output image.Length feature, area feature and number of black and white pixel in the segmented image will be calculated in future work.
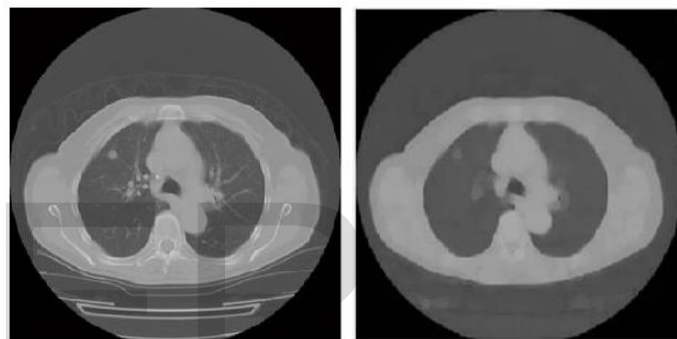

Fig. 2. Input Ldct Image, Flitered Image

Figure. 3 show edge detected image using canny and sobel edge detection method. By comparing the output of both method, it is found that canny egde detection method gives more better result.
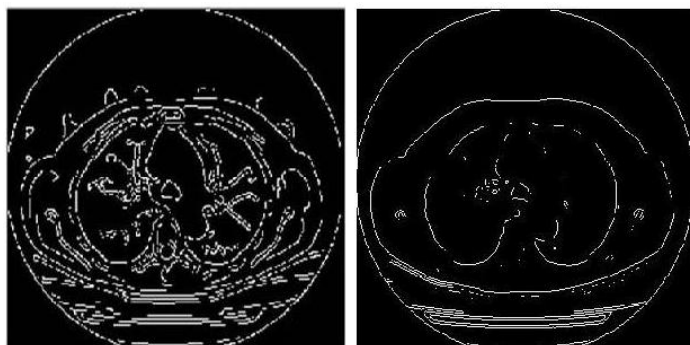

Fig. 3. Edge Detection Using Canny Method and Sobel Method

Figure. 4 shows the sharpened image and thresholed image. Sharpened image returns the enhanced version of grayscale image.It is is refer to any enhancement technique which gives the edge and fine detail for an input image. Threshold image isolates object by converting gray scale

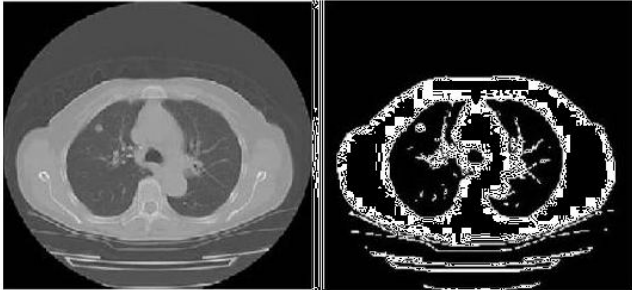image to binary image.It is used to create the binary images.

Fig. 4. sharpened image and thresholed image

Figure. 5 shows the segmented image of limbs. segmented image of left lung part(patch1) and right lung part patch2.

Fig. 5. Image patch division of limbs ,left lung, right lung

5. CONCLUSION

The detection and classification process which is to be adopted for lung nodule classification is discussed based on the available survey. This paper gives the broader description about the types of lung nodules present in our body. Proposed methodology is going to detect and segment the tumour area from the lung LDCT image. Next step will be the extracting the features, lung nodule classification, lung cancer detection. The outcome of this research work is to alert patient and doctor about lung cancer which automatically save life of human being. For this prediction, SVM and latent schematic classifier will be used in future.

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