A LITERATURE SURVEY: A NEW FUSION MODEL FOR CLASSIFICATION OF THE LUNG DISEASES USING GENETIC ALGORITHM

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Abstract— Lung is the complex organ that consists of spongy, elastic tissue equipped with structures that infuse our blood wifresh oxygen while ridding it of carbon-dioxide. Lung diseases are mainly occurred as airway disease, lung tissue disease and lung circulation disease are studied. In the computerized detection and classification of lung image five main methodologies are used. They are image preprocessing, segmentation, feature extraction, feature selection and classification. Automatic classification of lung diseases in computed tomography (CT) images is a critical diagnostic device for computer-aided diagnosis system. In this study, we propose another image based feature extraction strategy for classification of lung CT images. A novel combination based strategy was produced by joining the Gabor filter and Walsh Hadamard transform features utilizing median absolute deviation (MAD) method and consequently, it has the benefits of the both models. The system has been tried with various genuine Computed Tomography lung images and has accomplished agreeable outcomes in classifying the lung diseases.

IndexTerms—Fusion, Pre-processing, feature extraction, feature selection, classification, genetic algorithm.

I. INTRODUCTION

Lung diseases are most common medical condition to detect and diagnose in the world [1]. Ten millions of people suffer by lung disease in U.S. Smoking, genetics and infections are the most common lung disease. The lungs are part of a complex apparatus, expanding and relaxing thousands of times each day to bring in oxygen and expel carbon dioxide. The lung diseases are detected in various kinds of image based on choosing the 3D and 2D features. Some of them are Computed Tomography (CT) [2], High Resolution Computed Tomography (HRCT) [3], Multi Detector Computed Tomography (MDCT) each has special view that helps to diagnose. A lung disease affecting the airways includes Emphysema disease. Lung diseases affecting the alveoli (air sacs) include Lung Cancer.

Emphysema

Emphysema is a long-term (chronic) lung disease and a main type of Chronic Obstructive Pulmonary Disease. Individuals with emphysema experience issues breathing because of a constrained capacity to blow let some circulation into. The most common cause of this disease is smoking. It is estimated by the aberrations of PF tests [4]. Emphysema is a long-term (chronic) lung disease and a fundamental sort of Chronic Obstructive Pulmonary Disease. People with emphysema have difficulty breathing due to a limited ability to blow air out. The most common cause of this disease is smoking. It is estimated by the abnormalities of PF tests [4].

Lung Disease

There are numerous disorders when parenchyma is affected and is generally referred as diffuse parenchyma lung disease (DPLD) or Interstitial Lung Disease (ILD) [3]. The various lung diseases are:

- Lung Disease Affecting the Airways (Bronchial Signs)
- Lung Disease Affecting the Air Sacs (Alveoli)
- Lung Disease Affecting the Interstitium
- Lung Disease Affecting the Blood Vessels
- Lung Disease Affecting the Pleura
- Lung Disease Affecting the Chest Wall

II. METHODOLOGY

The most common methodology for classification of lung disease can be shown in the Fig.1.

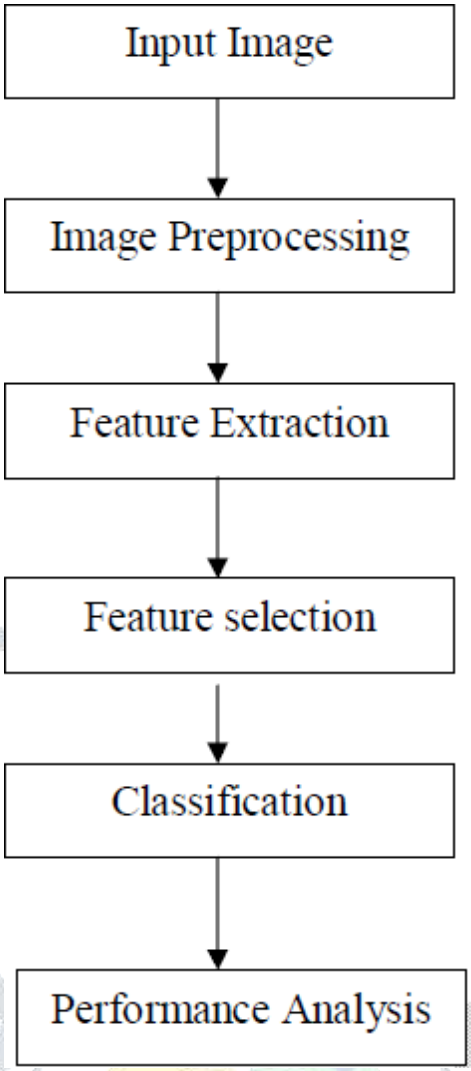

Fig 1:- Block diagram of the proposed work.

Preprocessing

Preprocessing reduce the bugs in the image, enhancing the image quality by leveling (e.g. utilizing distinctive presentation parameter) and removes the noise according to our process it will change. After the preprocessing, segmentation should be possible relying upon our procedure [5].

Feature Extraction

In common, feature extraction helps to retrieve the desired image from a extensive collection based on the features extracted from the image. The features will vary based on the image (2D or 3D). The feature extracted from the 3D image are described in [5] and 2D features in [4] [6]. Texture Descriptors helps to extract the features .In [3] described about two descriptors for extracting texture and gradient features.

Feature Selection

Feature Selection is done after the feature extraction to select the optimal features to factors for better classification [5].

Classification

Featured values are combined and calculate a feature vector to classify the given image based on the training set [4] [3]. The various kind of classification algorithms are as follows

- KNN
- SVM
- PASA
- Bayesian Classifier
- Artificial Neural Network

III. LITERATUREREVIEW

Ramandeep Kaur and Prince Verma (2015) [7] Proposed a method in which lung CT images can be classified by using the improved MLP-NN classifier. The Median filter and morphological smoothing is used for pre-processing the images .The MAD technique with Gabor and WHT is used for feature extraction the images. The genetic algorithm is used for the feature selection of the lung images. The lung can be categories as bronchitis, emphysema, pleural effusion and normal lung The CT images can be classified using the MLP and Improved MLP-NN classifier. The result is 88% for MLP and 93% for Improved MLP-NN classifiers.

Saher B. Shaker, and Marleen de Bruijne (2010)[8] Proposed a method for texture classification into three classes. The CT images can be used in the 2D .The lung can be categories as normal, centrilobular emphysema, paraseptal emphysema. The CT images can be

classified using the KNN classifier. The result is 95.2% accuracy by using the KNN classifier.

RuiXu and Yasushi Hirano (2016) [9] Proposed a method for Bag of words approach for classifying into six types of disease. The HR CT images can be used in the 2D/3D .The lung can be categories as normal, consolidation, ground glass opacity, honey combing, emphysema nodular. The CT images can be classified using the SVM classifier. The result is 95.85% accuracy by using the SVM classifier.

Panayiotis D. Korfiatis, Anna N. Karahaliou (2010) [10] Proposed a method for identification and characterization of lung parenchyma. The MD CT images can be used in the 3D .The lung can be categories as normal, ground glass, reticular patterns. The performance are evaluated in the metric of volume overlap true positive, false positive on the scanned image.

Shubhangi Khobragade, Aditya Tiwari (2016) [11] Proposed a method for classify lung nodule into three classes. The X- ray images can be used .The lung can be categories as TB, Lung cancer and pneumonia. The images can be classified using the Feed forward neural network classifier. The result is 92 % accuracy by using Feed forward neural network.

Mads Nielsen, Pechin Lo (2012) [12] Proposed a method for classify lung nodule into four classes. The CT images can be used in 2D .The lung can be categories as well circumscribed, juxta vascular, juxta pleural, Pleural tall. The images can be classified using the SVM classifier. The location on of lung nodule is found.

Yang Song, Weidong Cai (2012) [13] Proposed a method for classify lung nodule into four classes. The MD CT images can be used in 2D/3D .The lung can be categories as EC, MC, NC, NN. The images can be classified using the Bayesian classifier. The four text procedures are done for classification.

P. Bhuvaneswari (2014) [14] Proposed a method for classify lung nodule into two classes. The CT images can be used. The lung can be categories as cancer and non cancer. The Median filter is used for pre -processing the images. The Gabor filter is used for feature extraction the images. The genetic algorithm is used for the feature selection of the lung images. The images can be classified using the KNN classifier. The result is 90% accuracy by using KNN classifier.

Sunanda Biradar (2015) [15] Proposed a method for classify lung nodule into two classes. The MD CT images can be used in 2D/3D. The lung can be categories as bronchitis, emphysema, pleural effusion and normal lung. The images can be classified using the SVM classifier. The SVM polynomial gives 96.6%accuracy and SVM quadratic function gives the 92%accuracy.

C. Bhuvaneswari (2013) [16] Proposed a method for classify lung nodule into four classes The Median filter is used for pre -processing the images .The Gabor filter is used for feature extraction the images. The CT images can be classified using the Naive Bayes classifier. The result is 90% by using Naive Bayes classifier.

Tejinder Kaur (2015) [17] Proposed a method in which lung CT images can be classified by using the MLP classifier. The Median filter is used for pre -processing the images. The MAD technique with Gabor and WHT is used for feature extraction the images. The hybrid genetic / particle swarm optimization algorithm is used for the feature selection of the lung images. The lung can be categories as bronchitis, emphysema, pleural effusion and normal lung The CT images can be classified using the MLP classifier.

C. Bhuvaneswari (2014) [18] Proposed a method in which lung CT images can be classified by using the Naïve Bayes and decision tree classifier. The Median filter is used for pre - processing the images .The moment invariance is used for feature extraction the images. The genetic algorithm is used for the features election of the lung images .The lung can be classifier. The location on of lung nodule is found.

Tejinder Kaur, Er. Neelakshi Gupta (2015) [19] Proposed a method in which lung CT images can be classified by using the MLP-NN classifier. The Guided filter and morphological filter is used for pre -processing the images .The Gabor filter and WHT is used for feature extraction the images. The genetic algorithm and particle swarm optimization algorithm is used for the feature selection of the lung images. The CT images can be classified using the MLP-NN classifier.

D.Kavinya (2015) [20] Proposed a method in which lung CT images can be classified by using the ant colony optimization algorithm .The adaptive wiener filter and Laplacian filter is used for pre -processing the images .The conflict wavelet function and moment invariants is used for feature extraction the images. The lung can be categories as cancer, pneumonia; normal lung. The CT images can be classified using the SVM using ant colony optimization algorithm classifier.

F Chabat, D M Hansell, G Z Yang (1999) [21] Proposed a method for classify lung nodule into three classes. The CT images can be used. The lung can be categories as under attenuated, normal and hyper attenuated. The images can be classified using the perfusion gradient classifier.

Marios Anthimopoulos (2016) [22] Proposed a method for classify lung nodule into 7 classes. The CT images can be used in3D. The lung can be categories as healthy, ground glass opacity, micro nodules, consolidation, reticulations, honeycombing. The images can be classified using the CNN classifier. The result is 85.5 % by using the CNN classifier.

Disha Sharma and Gagandeep Jindal (2011) [23] Proposed a method for classify lung nodule into 2 classes. The CT images can be used the wiener filter and denosing filter is used for pre -processing the images .The CAD system is used for feature extraction the images. The lung can be categories as cancer and not cancer. The CT images can be classified using the ANN algorithm classifier.

FatmaTaher, Naoufel Werghi (2015) [24] Proposed a method for classify lung nodule into two classes. The CT images can be used .The lung can be categories as cancer and not cancer. The images can be classified using the rule based classifier. The result is 93% and 90% for rule 1 and rule 2 P. B. Sangamithraa, S. Govindaraju (2016) [25] Proposed a method for classify lung nodule into 2 classes. The CT images can be used the wiener filter and median filter is used for pre -processing the images. The gray level costumes matrix is used for feature extraction the images. K-means clustering is used for segmentation. The lung can be categories as tumour and normal. The CT images can be classified using the back propagation network classifier.

C. Bhuvaneswari (2014) [26] Proposed a method for classify lung nodule into three classes. The CT images can be used the novel shape bases i.e. multi scale filter is used for pre - processing the images .The genetic algorithm is used for feature extraction the images. The lung can be categories as bronchitis; pneumonia normal lung. The CT images can be classified using the MLP-NN, KNN and Bayes net classifier. The result is 86.75, 85.2, and 83.4 using the MLP-NN, KNN and Bayes Network.

C. Bhuvaneswari (2013) [27] Proposed a method for classify lung nodule into four classes. The CT images can be used. The median filter is used for pre -processing the images .The Gabor filter is used for feature extraction the images. The clustering and segmentation is done using fuzzy c-means clustering water shaded algorithm. The lung can be categories as normal, small cell lung carcinoma, large cell lung carcinoma and non small cell lung carcinoma. The CT images can be classified using the Naive Bayes and random forest classifier.

Conclusion

This paper presents the survey on different diseases classification techniques used for lung disease. Improving Image quality and accuracy is a core factor of this study and showed the comparison. The image quality assessment and enhancement stages are adopted on pre-processing; the most commonly used technique is Gabor filter. The Region of Interest features are extracted from the segmented region. All the process gives varying results based on the techniques used. In further study changing the optimized algorithm in the methodology process will provide an improved performance. To improve recognition rate in classification process Artificial Neural Network, Bayes classifier, MLP-NN and Hybrid algorithms can also be used.

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