

Chapter 77

Lung Disease Classification by Novel Shape–Based Feature Extraction and New Hybrid Genetic Approach: Lung Disease Classification by Shape–Based Method

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ABSTRACT

The purpose of the chapter is to present a novel method to classify lung diseases from the computed tomography images which assist physicians in the diagnosis of lung diseases. The method is based on a new approach which combines a proposed M2 feature extraction method and a novel hybrid genetic approach with different types of classifiers. The feature extraction methods performed in this work are moment invariants, proposed multiscale filter method and proposed M2 feature extraction method. The essential features which are the results of the feature extraction technique are selected by the novel hybrid genetic algorithm feature selection algorithms. Classification is performed by the support vector machine, multilayer perceptron neural network and Bayes Net classifiers. The result obtained proves that the proposed technique is an efficient and robust method. The performance of the proposed M2 feature extraction with proposed hybrid GA and SVM classifier combination achieves maximum classification accuracy.

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INTRODUCTION

The lung diseases are one of the major health challenges faced in the world. The lung diseases are diagnosed and treated by the physician with the use of imaging modalities like chest X-Ray, CT scans and the required medications. According to Susanstrandring (2005) majority of the lung diseases fall into three major categories

1. Obstructive lung diseases such as asthma, bronchiectasis, chronic bronchitis, etc.
2. Restrictive lung diseases include sarcoidosis, amyotrophic lateral sclerosis, chronic pleural effusion, kyphoscoliosis, etc.
3. Pulmonary vascular diseases or pulmonary embolism, pulmonary artery hypertension, etc.

Mehta, P.J. (2001) discussed smoking, infections, inhaling polluted air and genetics are responsible for most lung diseases that affect any age group of people. The continued ill health in lung problem, if left untreated for a long time will lead to major problems. Computer programs are supporting doctors in diagnosing the diseases. The medical diagnostic software serves as a consultant to the physician. Computer technology can be used to detect the complexity of the disease, thus reducing the number of transience. The software system deals with medical data and knowledge domain in detecting the diseases. With regard to a limited medical staff, an automated system can significantly decrease the manual labor involved in diagnosing the lung diseases with additional care. For assisting the doctors in rapid finding of the diseases, the proposed work has been carried out in an appropriate manner

This chapter focuses on assisting the doctors to diagnose the lung diseases, by a computed approach in a more precise manner. The normal lung and diseases such as pleural effusion, emphysema, bronchitis and pneumonia are suggested in this work as these diseases require CT imaging for diagnosing and these diseases are some of the most common lung diseases which affect the human community widely. Data collection is done. Preprocessing of the images is performed by median filter and morphological smoothening. Feature extraction is done by the proposed shape based filter method, feature selection is performed by a novel hybrid feature selection method and the classification is performed by SVM, MLP and Bayes Net classifiers. The proposed feature extraction method deals with the shape based methods. The moment invariants method, proposed multiscale filter method and the combination of the both methods M^2 feature extraction are used for feature extraction. The genetic algorithm promises convergence but not optimality. The choice of stopping the genetic algorithm is not well-defined and there is no guarantee of optimality of successive runs of the GA. The proposed hybrid GA outstands well than the genetic algorithm as the search space is limited to a small area for best search and thereby top ranked features are selected. The classification accuracy, sensitivity, specificity and F-measure values are calculated for each classifier.

OBJECTIVE OF THE CHAPTER

The objective of the work is as follows

- To apply the proposed shape based feature extraction technique for extracting the features of normal lung CT images and lung diseases, namely bronchitis, emphysema, pleural effusion and pneumonia.

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