ABSTRACT

Lung cancer is considered as the notable cancer because it claims more than a million lives every year. The early detection of cancer can be helpful in curing the disease completely. The requirement of techniques to detect the occurrence of cancer nodule in the early stage is very much essential. There are various techniques available in the literature for the detection of cancer, but many of these techniques do not provide significant accuracy of detection. Due to the development and growth in imaging technology and computer science, interpretation of medical images has been significantly refined and has contributed to early diagnosis of cancer. Computer Aided Diagnosis (CAD) is becoming one of the most popular and effective method for diagnosing many diseases including cancer.

The modalities used for capturing the images are X-Ray, Computer Tomography (CT) scans and Magnetic Resonance Imaging (MRI) and among these CT is the standard for detecting pulmonary nodules. Thus, there is a requirement for automated or semi automated methodology in order to make use of the large amount of data obtained from CT images and to accurately interpret the individual images.

Lung nodule detection in chest Computed Tomography (CT) images becomes very necessary in the present clinical world. Computer Aided Diagnosis has been significant in the areas of research in the past two
decades. The usage of existing CAD system for early detection of lung cancer with the help of CT images has been unsatisfactory because of its low sensitivity and high False Positive Rates (FPR).

The main aim of this research is to provide a Computer Aided Diagnosis System for detection of lung cancer nodules from the Chest Computer Tomography images. The system can automatically detect the lung cancer nodules with reduction in false positive rates and it also minimizes the time taken by the radiologist for interpretation.

The scheme proposed in this thesis aims to design a good CAD system for detection of lung cancer. It consists of five phases. They are

**Phase 1:** Extraction of Lung Region from Chest Computer Tomography Images

**Phase 2:** Segmentation of Lung Region

**Phase 3:** Feature Extraction from the Segmented Region

**Phase 4:** Formation of Diagnostic rules from the extracted features

**Phase 5:** Classification of malignant and benign nodules

In the first stage of this CAD system pure basic image processing techniques are used to extract lung regions. Then, the segmentation is done using

- Fuzzy Possibilistic C-Means
• Modified Fuzzy Possibilistic C-Means

Then, the features are extracted from the segmented images and the classification are done using

• Support Vector Machine

• Extreme Learning Machine

The approaches proposed in this study are

• Segmentation of Lung Region using Fuzzy Possibilistic C-Means (FPCM).

• Segmentation of Lung Region using Modified Fuzzy Possibilistic C-Means (MFPCM).

• Classification of Nodules employing Support Vector Machine (SVM).

• Classification of Nodules extending Extreme Learning Machine (ELM).

Fuzzy Possibilistic C-Means (FPCM) is used to get good segmentation results in a short time. FPCM algorithm used in the scheme incorporates spatial information into the membership function for clustering. Modified Fuzzy Possibilistic C-Means (MFPCM) algorithm is used because it modifies the membership function according to its weight and segmentation
can be performed with better accuracy. MFPCM performs well when compared to FPCM.

For automatic detection of cancer nodules, Support Vector Machine (SVM) and Extreme Learning Machine (ELM) are utilized. SVM is used because of its simplicity and accuracy. The usage of SVM helps in better classification of cancer nodules. The main advantage of the ELM is its accuracy and short training time.

Real time lung images are used for the experimental observation of the proposed approaches. The performances of the proposed approaches are evaluated based on their accuracy, sensitivity, specificity and classification time.