ABSTRACT

One of the biggest challenges the world face today is the mortality due to Cancer. One in four of all diagnosed cancers involve the lung cancer, where the mortality rate is high, even after so much of technical and medical advances. Most lung cancer cases are diagnosed either in the third or fourth stage, when the disease is not treatable. The main reason for the highest mortality, due to lung cancer is because of non availability of prescreening system which can analyze the cancer cells at early stages. So it is necessary to develop a prescreening system which helps doctors to find and detect lung cancer at early stages.

Out of all various types of lung cancers, adenocarcinoma is increasing at an alarming rate. The reason is mainly attributed to the increased rate of smoking - both active and passive. So it is necessary to screen adenocarcinoma cancer.

Various modalities like light microscopy, X-ray, CT and MRI are used for the detection and diagnosis of lung cancer. Each of these has its own advantages and disadvantages. This work is to develop a low cost and effective pre-screening system which can be deployed on a wide scale. Several previous studies suggest that sputum cytology is the best and affordable method for lung cancer detection. A study on high risk population
using sputum cytology revealed that a 5 year survival rate of 54% was observed in patients who undergone pre-screening as opposed to 13% for those who never had any pre-screening. If a system is developed for pre-screening, capable of detecting lung cancer at early stages, then the survival rate can be substantially increased. The present day manual screening system makes it difficult to implement such a system due to lack of expert cytopathologists and the enormous volume of population to be screened. So an automated system which will pre-screen for malignancy is an urgent requirement of today's world.

This work aims at developing a sputum cytology image analysis system which identifies benign and malignant (Cancer) glandular cells based on the characteristics of the cells. In this proposed work, an automated lung cancer detection system is developed which segments the cell nuclei and classifies the glandular cells as benign and malignant from the given pap stained Sputum Cytology Images.

In the present work, a system for the classification of lung glandular cells for early detection of Cancer using multiple color spaces is developed. For segmentation, various clustering techniques like K-Means clustering and Fuzzy C-Means clustering on various Color spaces such as HSV, CIELAB, CIEXYy and CIELUV are used. Features are Extracted and classified using Support Vector Machine (SVM).
Then in the next work, features are extracted, classified and compared using various kernels of SVM like RBF kernel, Quadratic Kernel and Polynomial kernel. As a final work automated lung cancer detection by the analysis of glandular cells in sputum cytology images using a novel Scale Space Catastrophe Histogram (SSCH) feature is developed. Unusual nuclear texture shows the presence of malignancy in cells and SSCH-based texture feature extraction from nuclear region is done. From the input high-resolution sputum cytology image, the cellular regions are localized, then nuclei region are segmented using K-means clustering, and SSCH features are extracted using SVM and color thresholding. The experimental results are compared with other features such as Gabor filter-based gray-level co-occurrence features, Local Binary Pattern (LBP) and Complex Daubechies Wavelet (CDW) based features. The results obtained are in accordance with the dataset classified by medical experts.