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Abstract

Medical image processing has become an active research topic in recent years. The medical image processing deals with medical images to analyze the image contents intimately. Researchers have focused on developing algorithms using image processing to detect the different types of diseases, Cancer is one of them.

National Institute of Cancer listed a more than three hundred various types of cancers. Among the deaths caused by cancer, lung cancer swallows the most as it is detected late in its natural course. Research on early detection of lung cancer has been continued over the last few years. A lot of different types of problems have been addressed during this period.

Numerous techniques to diagnose lung cancer such as Chest Radiograph (X-ray), Computed Tomography (CT), Magnetic Resonance Imaging (MRI scan) etc are available. However, most of these techniques are time consuming as well as expensive. Sometimes nodules may be missed by the radiologists. It enthuse researchers to focus to detect the lung cancer in its early stage to increase the chance of survival in a patient. This research will exhaust on these issues.

To overcome the problems, the field of medical imaging initiated CAD (Computer-Aided Diagnostic) systems which may assist medical expert to recognize and categories the dilemma in a precise manner. This study has chosen the CT images. Preprocessing of the acquired original image is needed due to the poor quality of the image. Therefore, for designing of this CAD, a system has to pass preprocessing steps namely gray scale conversion, noise removal, thresholding, morphological processing and feature extraction.
The original image has been converted to gray scale image for processing of the image. The histogram of the image has been obtained to estimate the type of noise present in the image. Then the most suitable filter has been chosen by two quality matrices i.e. Peak Signal to Noise Ratio (PSNR) and Mean Square Error (MSE). It is found that filters having higher PSNR and lower MSE values perform better. Wiener filter offers higher PSNR and lower MSE than the median filter and average filter when tested upon secondary data sets as well as on primary datasets. Thus, wiener filter has been chosen to remove the noise from the image. After the removal of the noise, obtained filtered image is used to get a binary image with pixel 0 and 1 respectively. It separates the image into foreground and background and facilitate in extorting the nodule from the image.

Still some unwanted information is there in the image. To get rid of these, morphological processing has to been done, which enhance contrast, thin regions, or perform skeletonization on regions.

Preprocessing helps to find the Region of Interest (ROI) followed by feature extraction. Only useful features are identified for analysis and diagnosis such as area, perimeter, shape complexity, solidity, aspect ratio, circularity, contrast, and compactness. After the completion of segmentation and extraction process, feature vector was created. This process is continued by neural network classifier to classify the region as abnormal or normal. Features extracted from the first stage act as the foundation of the classification stage.

Suspicious areas are represented in the form of outlined image which prompts a message box. The researchers have done lots of work in the field of medical image processing especially for the case of lung cancer, in which different architectures of neural networks have been used as a classifier. It has been found from the literature that most of the studies have used Feed forward neural network for their analysis and very less work have been reported for Radial basis function neural network. Also, a less work has been done on chest imaging. Therefore, the present work will emphasize on Radial basis function
neural network architecture for the analysis of lung cancer and the results will be compared with the Feed forward neural network. Radial basis function neural network have proved to be better in terms of high accuracy, sensitivity and specificity.

On the basis of these procedures, finally the CAD system has been prepared in the form of GUI. A single CT scan image is loaded, saved and copied in the GUI. Then, the copied image is passed through the whole interface to get whether the image is normal or have some suspicious areas. The classification of the nodule is done as benign or malignant. The proposed GUI facilitates the radiologists for the second opinion. In this manner, this thesis will contribute to medical field.