LUNG CANCER DETECTION USING IMAGE PROCESSING AND NEURAL NETWORKS

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Abstract.

In this paper, we implement and analyze the image processing method for detection of lung cancer. Image processing techniques are widely used in several medical problems for picture enhancement in the detection phase to support the early medical treatment. In this research we proposed a detection method of lung cancer based on image segmentation. Image segmentation is one of intermediate level in image processing. Marker control watershed and region growing approach are used to segment of CT scan image. Detection phases are followed by image enhancement using Gabor filter, image segmentation, and features extraction. From the experimental results, we found the effectiveness of our approach. The results show that the best approach for main features detection is watershed with masking method which has high accuracy and robust.

Keywords—Classification; Computed Tomography; Lung cancer; Nodules; Segmentation

1. INTRODUCTION

Lung cancer is one of the major cancer death worldwide. It is the most dangourous cancer as compared to any other like Breast Cancer, Skin Cancer and many more. It is really tough to detect lung cancer in its beginning because its symptoms appear at the advanced stage where the chance of survival is very law. Every year many people die suffering from lung cancer than other cancer. There is significant reasons which shows that early detection of this cancer will increase the chance of survival. According to world health organization 7.6 million deaths are only because of lung cancer that is obtained from the latest statistics. Furthermore, the death rate from cancer are expected to rise continueslyupto 17 million worldwide till 2030[1]. There are many techniques to diagnosis lung cancer, such as Chest Radiograph (x-ray), Computed Tomography (CT), Magnetic Resonance Imaging (MRI scan) and Sputum Cytology[2]. However, most of these techniques are expensive and time consuming. In other words, most of these techniques are detecting the lung cancer in its advanced stages, where the patient's chance of survival is very low. Therefore, there is a great need for a new technology to detect the lung cancer in its early stages. Image processing techniques provide a good quality tool for improving the manual analysis. A number of medical researchers utilized the analysis of sputum cells for early detection of lung cancer[3], most recent research relay on quantitative information, such as the size, shape and the ratio of the affected cells[4].

For this reason we attempt to use automatic diagnostic system for detecting lung cancer in its early stages based on the analysis images of lung cancer of the gray level. In order to formulate it we are applying a rule which is based on the threshold technique through which we apply segmentation pre-processing technique which divide image into several steps and many steps are being applied on it by which we obtain fully diagnosis image by the help of which detection of lung cancer in early stage become easy. In image segmentation we used as the first step is image enhancement by the help of histogram Equalization we get frequency level of a image. There are many algorithms which are used in image segmentation in medical field, such as histogram analysis, regional growth, edge detection and Adaptive Thresholding [5]. A review of such image segmentation techniques can be found in [6]. For lung cancer diagnosis many authors have used colour information as the key discriminating factor for cell segmentation [7]. The analysis of sputum images have been used in [8] for detecting lung cancer; it consists of images for detecting gray level. They used analysis techniques and feature extraction for the enhancement of the images, such as edge detection, heuristic knowledge, region labelling and removing In my contribution, I approached the segmentation of lung cancer problem by using thresholding techniques: For segmentation I have used thresholding Ostu method and 2D histogram analysis. The images are obtained from hospitals [9]. However, the images arediscribed by a noisy and cluttered background patterns that make the segmentation and automatic detection of the cancerous cells very dificult. In addition to that there are many gray level in the background of the images. I aim to design a system that maximizes the true positive and minimizes the false negative to their best level. These make me to think about a pre-processing technique which can cover all these

gray levels and keep the nuclei and cytoplasm. There are several methods through which we detect cancer which are being used over decade of years.

1.2 Objective

The objectives associated with presented work are given here under

● The main objective of this work is to improve the segmentation process by comparing Two dimensional Histogram Method and Two Dimensional Ostu Method.

● The objective of the work is to perform feature extraction and get their values.

● The objective of the work is to predict from the data formed manually, person suffering from cancer or not.

● The objective of the work is to implement the work in Matlab.

● The objective of work is to analyse the work under different parameters.

2. LITERATURE REVIEW

In 1960, Lusted L.B. Proposed for the first time that analyzing and recognizing the abnormal and normal photofluorography images of the chest could be conducted automatically. Hence, the analysis of medical images by computer was introduced.

Avinash.S, Dr. K Manjunath, Dr.J.Senthilkumar explained lung cancer detection method using Gabor filter and watershed segmentation techniques. To overcome the drawbacks of FFT method proposed method is explained. This new technique with Gabor filter and watershed segmentation can be used for quick detection of lung cancer [2]

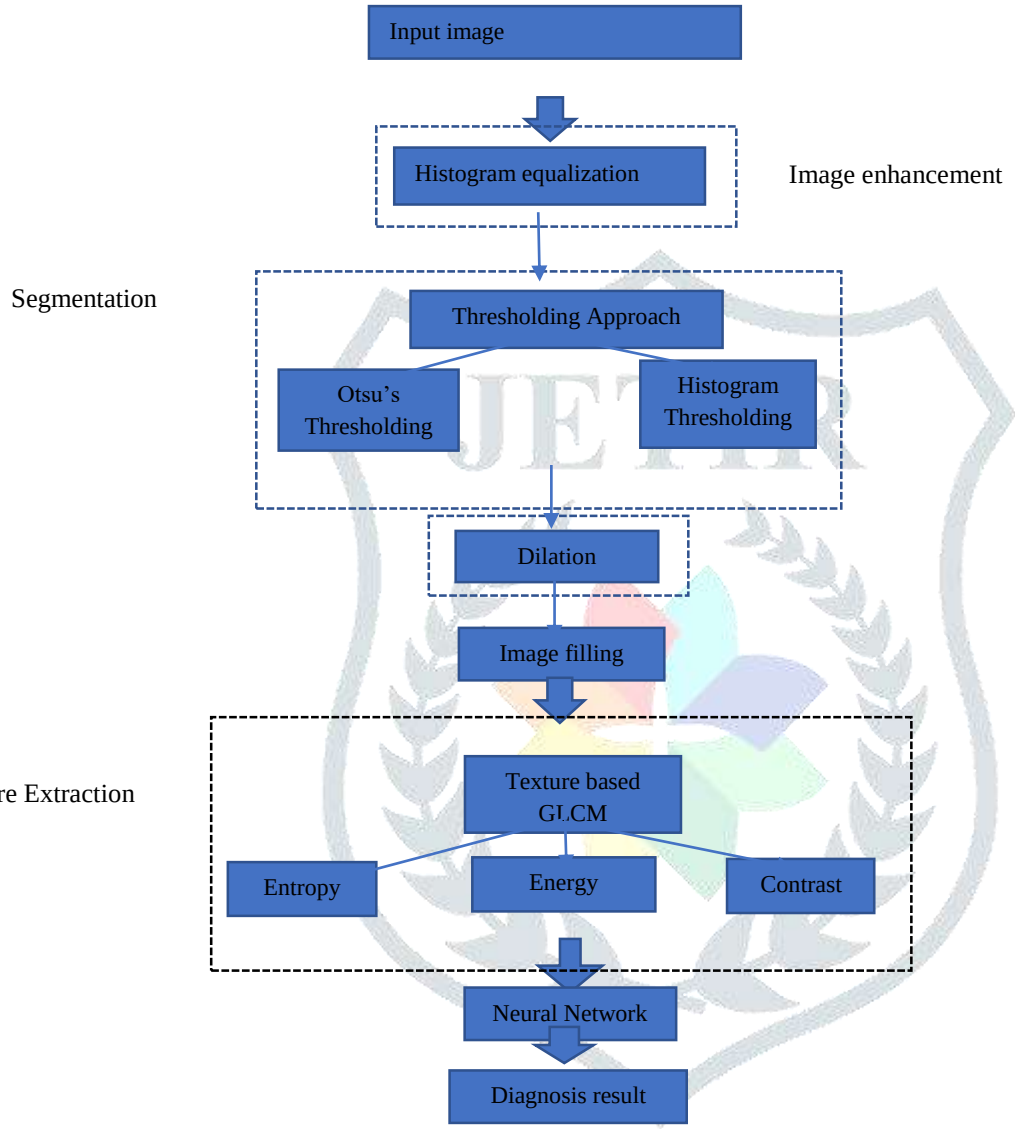
Rachid Sammouda proposed a model to segment extracted lung regions from chest computer Tomography images. In this paper three diagnostic rules are verified as well-defined filters of candidate cancerous regions from the status of candidate [4]

Summrina Kanwal wajid, Kaizhu Huang, Amir Hussain, Wadii Bouliia explained feature extraction technique using Local energy-shape Histogram(LESH). For research experiments the JSRT digital image database of radio chest radiograph is selected. The enhancement of radiograph images was using a contrast limited adaptive Histogram equalization [CLAHE] approach. Simulation resultsevaluated using classification accuracy performance measure [7]

Bhagyarekha U. Dhaware, Anjali C. Pise explained lung cancer detection method using Bayesian classifier and FCM Segmentation. In this paper feature selection is based on the statistical features by applying sequential forward algorithm

3. PROPOSED METHODOLOGY

In the proposed work for designing the Intelligent CADs system are: (1) Image Acquistion (2)Image enhancement (Histogram equalization) (3) Segmentation(Thresholding approach) (4) Dilation (5)Image filling (6)Feature Extraction from CT images(5) Classification using ANN.



The dataset from lung images are collected from a database of Lung Image Consortium (LIDC). We have taken around 150 CT images which contain both male and female. The lung CT images having low noise when compared to X-ray scan image and MRI image. So, we have taken the CT imagesfor detecting of the lungs. The main advantages of computed tomography image have better clarity, low noise and distortion. Lung CT images are given as input. Dimensions of images are 512×512pixels in size with the layer thickness of $0.75 - 1.25mm$.Here 110 nodules of size less than 3mmused. There are different stages of lung cancer nodules such as pleural nodules and vascular nodules have been taken in this project work

3.1 Input Image

In this step we select a image and apply it for classification through which we get all pre-processing images.

3.2 Image Enhancement

The second we have applied is image enhancement in this step filters are being applied filters are on the images to remove some problems of images such as noise, blurring and etc. For image enhancement different types of filters are being applied on images, here we are applying filters like Historical equalization

3.2.1 Histogram Equalization

Histogram equalization is the one of the well-known methods for enhancing the contrast of given images in accordance with the sample distribution of an image.

3.3 Segmentation

Segmentation is a important step in image processing. Through the help of segmentation, images are divided to some regions that contents of each region have the same specifications. Changing the image representation for easier explanation is the mainpurpose of segmentation. Representation of segmentationis in medical images in 2D, slice by slice has many useful applications in medical world such. Image segmentation is basically used to locate objects and boundaries (lines, curves) in images. The aim of segmentation is to simplify the representation of the image into something that is more meaningful and easier to analyse. Image segmentation is basically used for assigning a label to every pixel in an image such as pixels with the same label share specific visual characteristics [9]. The output of image segmentation is a set of segments that collectively cover the whole image (edge detection). All pixels in a given region are similar with respect to some characteristic such as colour, intensity, or texture. Adjacent regions are significantly different with respect to the same characteristic.

Its algorithms are based on two basic properties of intensity values that are: discontinuity and similarity. Here we are applying thresholding approach which is one of the most powerful tools for image segmentation. The image obtained from thresholding has the advantages of smaller storage space, fast processing speed and easy in manipulation, compared with gray level image which usually contains 256 levels. Therefore, thresholding techniques have drawn a lot of attention during the past 20 years [10].

3.3.1Thresholding approach

The basic idea of applying threshold approach is to automatically select an optimal gray-level threshold values for separating objects of interest in an image from the background based on their gray-level distribution. Over several years, many technologies have been intend for selecting the threshold automatically. Sezgin and Sankur [1] gives an exhaustive description and the comparison of the performance measures performed over many image thresholding techniques. Automatic thresholding techniques can be represented as global thresholding and local thresholding. Otsu thresholding technique [2] is one of the global thresholding method and it is an effective technique [3,4,5]. In Trier and Jain's study [4], four global thresholding techniques were compared and Otsu method performed best, followed, in order, by Kapur et al.'s Entropy technique [6], Abutaleb's entropy technique [7], and Kittler and Illingworth's minimum error technique [8]. However, some issues are still on in this method.

Dilation Operation

Dilation operation is used to extract image component which is used to extract image components that are useful in the representation and description of region shape such as boundaries, skeletons

Feature Extraction

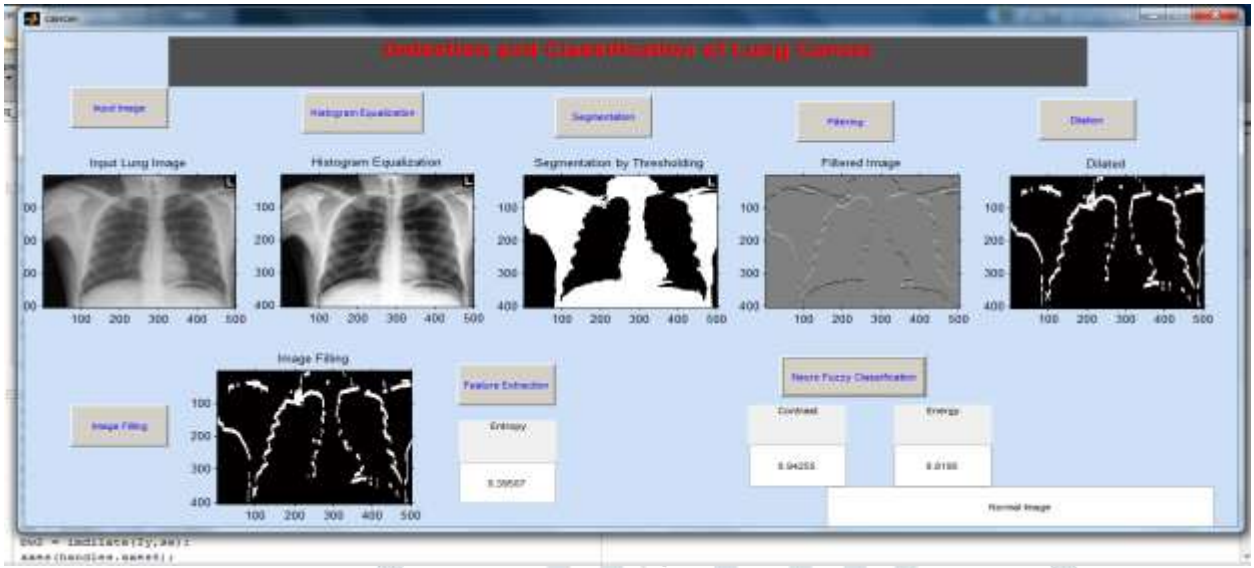
In feature extraction there are several methods through which we can detect or remove portions that are present in a image. To analyse the probability of lung cancer presence, we are applying – Gray level Co-occurrence matrix.

Neural network Training Set

Here we are applying neural network training set to get various levels of success for prediction that we have been performed in above steps. Through this we will get a prediction model which will show how much the performed job is correct. We have formed a manual dataset by that is obtained from feature extraction step. The data is based on the value of Entropy, Contrast and Energy. Through which we can predict how many person are suffering from cancer and how many are not suffering from cancer. To perform this job we have made dataset of 3 types input dataset, sample dataset and target dataset

4. Result

GUI Design: GUI Design of lung cancer detection



5. Conclusion

The presented work is the detection of lung cancer nodules by applying implementation on image pre processing and segmentation. By implementing these steps the nodules are detected and then some features are extracted. Then the obtain features are used for the classification of the disease stages. Through the obtained nodules feature more information about the condition of lung cancer at the early stages. After that we have applied prediction model by applying that we predict from the obtained dataset from feature extraction to know how many people suffering from cancer or not. This technique helps the radiologists and the doctors by providing more information and taking correct decision for lung cancer patient in short time with accuracy. Therefore, this method is less costly, less time consuming and easy to implement.

6. REFERENCES

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