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Lung Cancer Recognition in CT Image Using Watershed Segmentation

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ABSTRACT: Lung cancer seems to be the common cause of death among people throughout the world. Survival from lung cancer is directly related to its growth at its detection time. The earlier the detection is, the higher the chances of successful treatment.. To enhance cancer detection the radiologists, uses CT scan images for inspecting the interiors of the body.Image processing techniques provide a good quality tool for improving the manual analysis. Hence, a lung cancer detection system using image processing is used to classify the present of lung cancer in an CT-images. An automatic cancer detection system is proposed to distinguish cancerous tumor from the CT scan images. The cancer detection scheme consists of four stages. They are preprocessing, segmentation, feature extraction and classification. These four levels are used in image processing to enhance the tumor identification precision. The final outcome of this paper is to find cancer detection.

KEYWORDS: Lung cancer,CT scan, preprocessing segmentation, features extraction and classification.

1. INTRODUCTION

The lungs are a pair of sponge with cone shape. The right lung has three lobes and left lung has two lobes. The right lung is larger than the left lung. The oxygen is provided to lung by inhaling process. The lungs tissue transfer oxygen to blood stream. The lung cancer is a disease of abnormal cells multiplying and growing into a tumor cancer cells can be carried away from the lungs in blood. The lung cancer often spread toward the centre of the chest because the natural flow of lymph out of the lungs is toward the centre of the chest. There are several different type of lung cancer and these are divided into main two category; small cell lung cancer and non-small cell lung cancer which has three subtypes;

Carcinoma, Aden carcinoma and squalors cell Carcinomas. It is observed that lung cancer ranked second among males and 10th among females.

In the modern age of computerized fully automated trend of living, the field of automated diagnostic systems plays an important and vital role. 596 Automated diagnostic system designs in Medical Image Processing are one such field where numerous systems are proposed and still many more under conceptual design due explosive growth of the technology today. The process of assigning a label to every pixel in an image such that pixels with the same label share certain visual characteristics is known as Image segmentation. Literature has a wide range of segmentation techniques used in lung cancer diagnosis.

Image processing has wide scope in medical image processing for diagnosing the Lung cancer. In our proposed system description of lung cancer detection system that contains four basic stages. The first stage starts with taking a collection of CT images (normal and abnormal) from the available Database from IMBA Home (VIA-ELCAP Public Access). The second stage applies several techniques of image enhancement, to get best level of quality and clearness. The third stage applies image segmentation algorithms which play an effective rule in image processing stages, and the fourth stage obtains the general features from enhanced segmented image which gives indicators of normality or abnormality of images.

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II. LITERTURE SURVEY

Deepet.al [1], in this paper, median filter is used for image pre-processing. For segmentation, Otsu's thresholding method is used. In feature extraction, physical dimensional measures and gray-level co-occurrence matrix (GLCM) method are used. Artificial neural network (ANN) is applied for classification of disease stages. CT (computed tomography) scan image is suitable for lung cancer diagnosis. This paper is to implement feature extraction and classification of lung cancer nodule using image processing techniques. To implement the algorithm, MATLAB software is developed. This technique can help radiologists and doctors to know the condition of diseases at early stages and to avoid serious disease stages for lung cancer patients.

Vijayarani et.al[2],demonstrated the features are extracted from the human facial images by using the existing Face Part Detection (FPD) algorithm and the newly proposed Gray Level Co-occurrence Matrix (GLCM) algorithm.FPD uses bounding box method and GLCM uses affine moment invariants method. Performance factors applied here are feature extraction accuracy and execution time. The implementation of this work is performed in MATLAB 7.0. Based on the experimental results, it is observed that the proposed GLCM algorithm extracted the features more accurately with minimum execution time than FPD algorithm.

Sandeep et.al[3], they mainly are concentrating on feature extraction stage to yield better classification performance. Texture based features such as GLCM (Gray Level Co-occurrence Matrix) features play an important role in medical image analysis. Totally 12 different statistical features were extracted. To select the discriminative features among them we use sequential forward selection algorithm. Afterwards we prefer multinomial multivariate Bayesian for the classification stage. Classifier performance will be analyses further. The effectiveness of the modified weighted FCM algorithm in terms of computational rate is improved by modifying the cluster centre and membership value updating criterion.

Obayyaet.al [4], in this paper, computed topographic (CT) chest images were investigated to develop an automated system to discriminate lung cancer. These were done by analyzing Data recorded for patients with benign cancer, and also patients with malignant lung cancer were taken in account. The techniques for utilized feature extraction included features derived from texture analysis based on Gray Level Co-occurrence Matrix (GLCM) of the input image, as well as features derived from curve let transform-based features. An artificial neural network (ANN) with radial basis function classifier was utilized to classify the type of cancer whether benign or malignant. The results have shown that using curve let domain features gives the highest rate to recognize lung cancer.

III. PROPOSED SYSTEM

Our Proposed system includes two modules training and testing .In Training module the cropped CT scan image is input to the system, followed by Pre-Processing to enhance the image. In next step features are extracted and passed to SVM Classifier.

In Testing module CT image is sent to Pre-Processing phase and the second part is image segmentation to extract the lung region and ROI .The third part is feature extraction and selection to extract the main features of the tumor.The last part is the classifier to discriminate the Detection of cancer or not a cancer .Below figure1 shows the block diagram of proposed lung cancer detection system.

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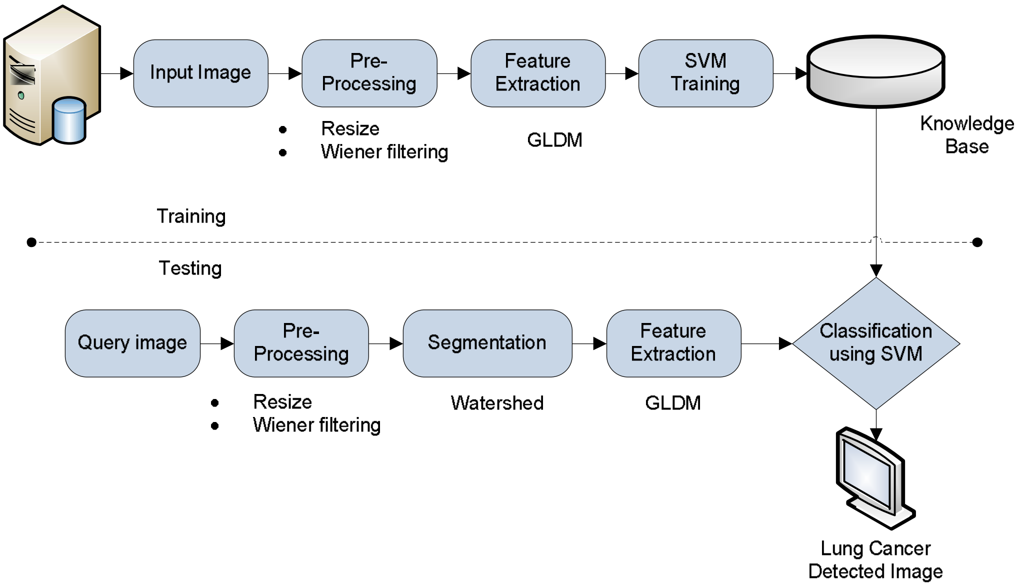

Figure 1.Block diagram of lung cancer detection module.

3.1 Pre-Processing

Medical images are corrupted with noise and artifacts due to body movements Preprocessing is done to remove unwanted noise and it gives clarity to the images at this stage where filtering is done to remove noise.In our proposed system we are using resize and Thus wiener s used to removenoise .

a) Wiener Filter:

The intention of the Wiener filter is to clear out noise that has corrupted a signal. It is based on a statistical approach. Natural filters are designed for a desired frequency response. The Wiener filter approaches filtering from different angle. One is assumed to have knowledge of the spectral properties of the common signal and the noise, and one seeks the LTI filter whose output would come as close to the original signal as possible. Wiener filters are characterized by the following.

- Assumption: signal and (additive) noise are stationary linear random processes with known spectral characteristics.
- Requirement: the filter must be physically realizable, i.e. causal (this requirement can be dropped, resulting in a non-causal solution).
- Performance criteria: minimum mean-square error.

3.3 Segmentation

Segmentation is used to make the partition or segment the in different region; here throughout the project we proposed the watershed Segmentation. The main purpose of watershed segmentation is to find the 'watershed lines' in an image in order to separate the distinct regions.

3.2 Feature Extraction

The GLDM is based on the occurrence of two pixels which have a given absolute difference in grey level and which are separated by specific displacementδFor any given displacement vector

$$S = (\Delta I, \Delta j)$$

Let $S = (I, j) = |S(I, j) - S(i + \Delta I, j + \Delta j)|$ (1)

And the estimated probability-density function is defined by

$$(i|\delta) = \text{prob}(S_0(I, j) = 1) \qquad (2)$$

Let us consider difference = 2, d = 1 and angle = 0°; the element in the matrix is assigned the value of 13 as M (2) = 13.

3.4 Classification

To identify the nodule from different segmented region it is necessary to satisfy the criteria of maximum roundness and area in particular range, which is identifying with the help of SVM Algorithm

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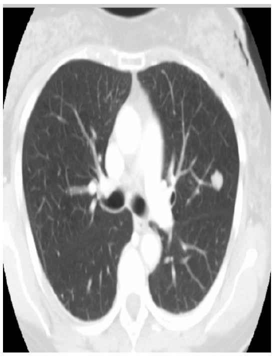
Support Vector Machines (SVMs) are supervised learning methods used for image classification. It views the given image database as two sets of vectors in an ‘ n ’ dimensional space and constructs a separating hyper plane that maximizes the margin between the images relevant to query and the images not relevant to the query. SVM is a kernel method and the kernel function used in SVM is very crucial in determining the performance. The basic principle of SVMs is a maximum margin classifier. Using the kernel methods, the data can be first implicitly mapped to a high dimensional kernel space. The maximum margin classifier is determined in the kernel space and the corresponding SVMs decision function in the original space can be non-linear. The non-linear data in the feature space is classified into linear data in kernel space by the SVMs. The aim of SVM classification method is to find an optimal hyper plane separating relevant and irrelevant vectors bymaximizing the size of the margin (between both classes).

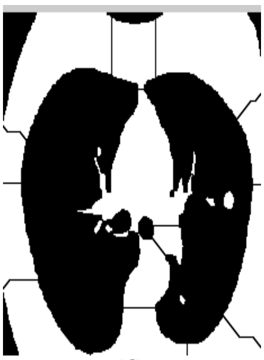
IV. RESULTS

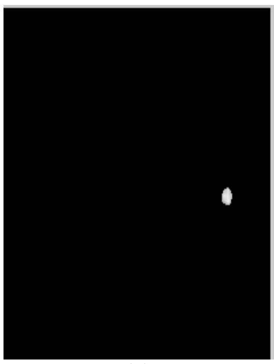
In this section explains the output of the proposed system step-by-step. The input image for the proposed system is cancer affected CT scan image of a patient. If we input a CT scan image which is not affected by the cancer our system will reject the image as not affected .In Figure2 (a) shows the input image selected by the user to our proposed system. In Pre-processingphase we resize and de-noise the image to remove the noise using wiener filter which is showed in Figure2 (b) &(c) .Third phase is segmentation we perform watershed segmentation whose results are showed below figure2 (d). After segmentation and feature extraction using GLDM and SVM classifier for detected cancer tumor region. Cancer region is detected and cancer region are showed in figure2 (e) & (f). Finally the Output image is displayed in Figure2 (g).


(a)


(b)


(c)


(d)


(e)

(f)

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(g)

Figure2: (a) Input Image, (b) Resized Image,(c)De-noised image,(d) Watershed Segment Image, (e) detected cancer region, (f) Segmented Cancer region Image (g) Marked cancer region Image.

V. CONCLUSION

This proposed system addresses the image processing techniques to recognize the lung cancer in CT images. Our proposed system develops an automatic detection of lung cancer in CT images using watershed segmentation, GLDM feature and SVM classifier. ComparativelyGLDM features give more accurate results than GLCM.The accuracy of the tumor detected is checked using SVM classification techniques.

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