Volume 6, Issue 10, October 2016 ISSN: 2277 128X
International Journal of Advanced Research in Computer Science and Software Engineering
Research Paper
Available online at: www.ijarcsse.com

Lung Cancer Detection Using Neural Networks

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Abstract: ***In today's world ,image processing methodology is very rampantly used in several medical fields for image improvement which helps in early detection and analysis of the treatment stages ,time factor also plays a very pivtol role in discovering the abnormality in the target images like-lung cancer ,breast cancer etc. this research focusses upon image quality and accuracy. image quality assessment as well as improvement are dependent upon enhancement stage where low pre-processing techniques are used based upon gabor filter within Gaussian rules; thereafter the segmentation principles are applied over the enhanced region of the image and the input for feature extraction is obtained, further depending upon the general features, a normality comparison is made .in the following research the crucial detected features for accurate image comparison are pixel percentage and masking labelling. In this research we have done classification based upon artificial neural networks which is more satisfactory than other current classification methods.***

Keywords: Lung Cancer Detection, Enhancement, Feature Extraction, segmentation,neural network

I. INTRODUCTION

Lung cancer is an ailment of strange cells duplicating and developing into a tumour. Cancer cells can be carried away from the lungs in blood, or lymph fluid that neighbours lung tissue. Lymph flows through lymphatic vessels, which drain into lymph nodes located in the lungs and in the middle of the chest. Due to the fact that natural flow of lymph out of the lungs is toward the centre of the chest so it is often observed that the lung cancer spreads towards the centre of the chest. The phenomenon of Metastasis occurs when a cancer cell leaves the site where it began and moves into a lymph node or to another part of the body through the blood stream [1]. Cancer that starts in the lung is called primary lung cancer. There are varied types of lung cancer, and these are divided into two major categories: non-Small cell lung cancer and small cell lung cancer, non-small lung cancer can be further divided into three subtypes: Adenocarcinoma, Squamous and large cell carcinomas. Diagnosed cancer cases in 2008 revealed that Lung cancer affected 297 (13.1 %) males and 59 (2.5%) females with a male to female ratio of 5:1 . Lung cancer ranked second among males and 10th among females [2]. Enumerations given below provide give a general description of lung cancer detection system that contains four elementary stages. The first phase focusses upon taking a collection of CT images (normal and abnormal) from the available Database from IMBA Home (VIA-ELCAP Public Access) [3]. The second phase applies several techniques of image enhancement, to get best level of quality and clearness. The third phase applies image segmentation algorithms which play an effective role in image processing stages, and the fourth phase obtains the general features from enhanced segmented image which gives indication of cancer affected i.e abnormal or not cancer affected i.e. normality of images.

Stage 1-ct scan image is taken as input
Stage 2-image enhancement
Stage 3-image segmentation
Stage 4-feature extraction

II. RELATED WORKS

In various researches image processing techniques have been used to predict the lung cancer. Sharmaet.al.(2011) used lung CT scanned images extracted from NIH/NCI Lung Database Consortium and proposed an automatic computer aided diagnosing system for detection of lung cancer by analysing these lung CT images. The authors of the paper have used various steps for the detection of lung cancer. Firstly, lung region was extracted from the computer tomography image using several image processing techniques such as bit image slicing, erosion and wiener filter. In the first step the bit image slicing technique was used to convert the CT images into a binary image then after extraction the region growing segmentation algorithm was utilized for segmenting the extracted lung regions. After segmentation of lung region they used rule based model to classify the cancer nodules. Lastly, a set of diagnosis rules were generated from the extracted features and with the help of diagnostics indicator. 80% accuracy was achieved using the proposed system. Anam Tariq et.al. (2013) has developed a computerized system, that was detected the lung nodules with the help of CT scan images. The computerized system comprise of two stages, first stage is lung segmentation and enhancement and

second one is feature extraction and classification. The threshold segmentation technique was applied, for removing background and extract the nodules from an image. When segmentation and extraction were completed, then a feature vector was used to -calculate the anomalous region. After that the regions were classified using neuro fuzzy classifier. This system gives the facility to detect the smallest nodules which lead to prior diagnosis of lung cancer.

III. PROPOSED METHOD

In this research, to obtain more accurate results we divided our work into the

Following three stages:

1. Image Enhancement stage: at this stage we improve the image and eradicate any kind of noise, Corruption or interference from it. The following three methods are used for this purpose: Gabor filter (has the best results), Auto enhancement algorithm, and FFT Fast Fourier

Transform (shows the worst results for image segmentation).

2. Image Segmentation stage: at this stage we divide and segment the enhanced images, the used Algorithms on the ROI of the image (just two lungs), are: Thresholding

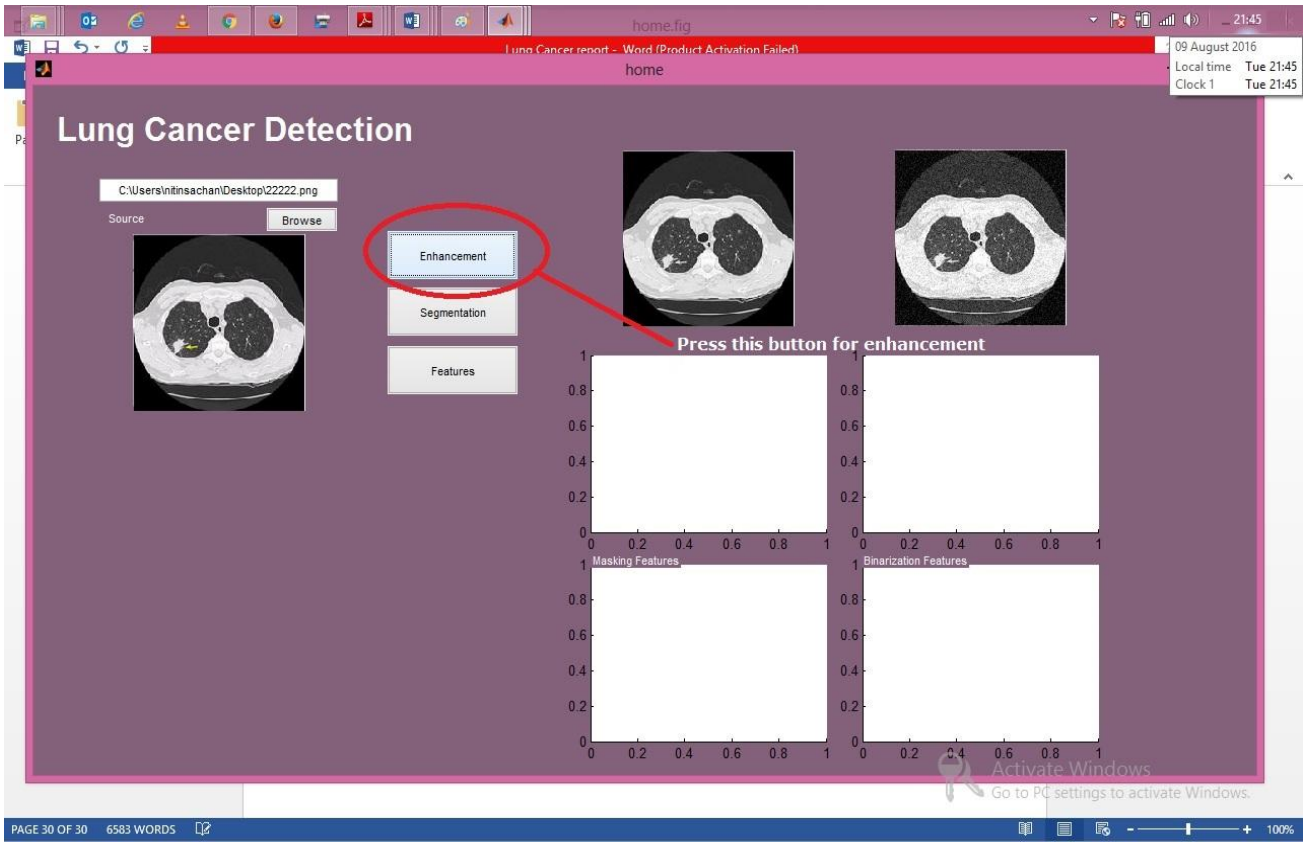
Approach and Marker-Controlled Watershed Segmentation approach (this approach give improved results than thresholding approach).

3. Features Extraction stage: at this stage the general features of the enhanced segmented image are extracted using Binarization and Masking Approach.

3.1 Image Enhancement

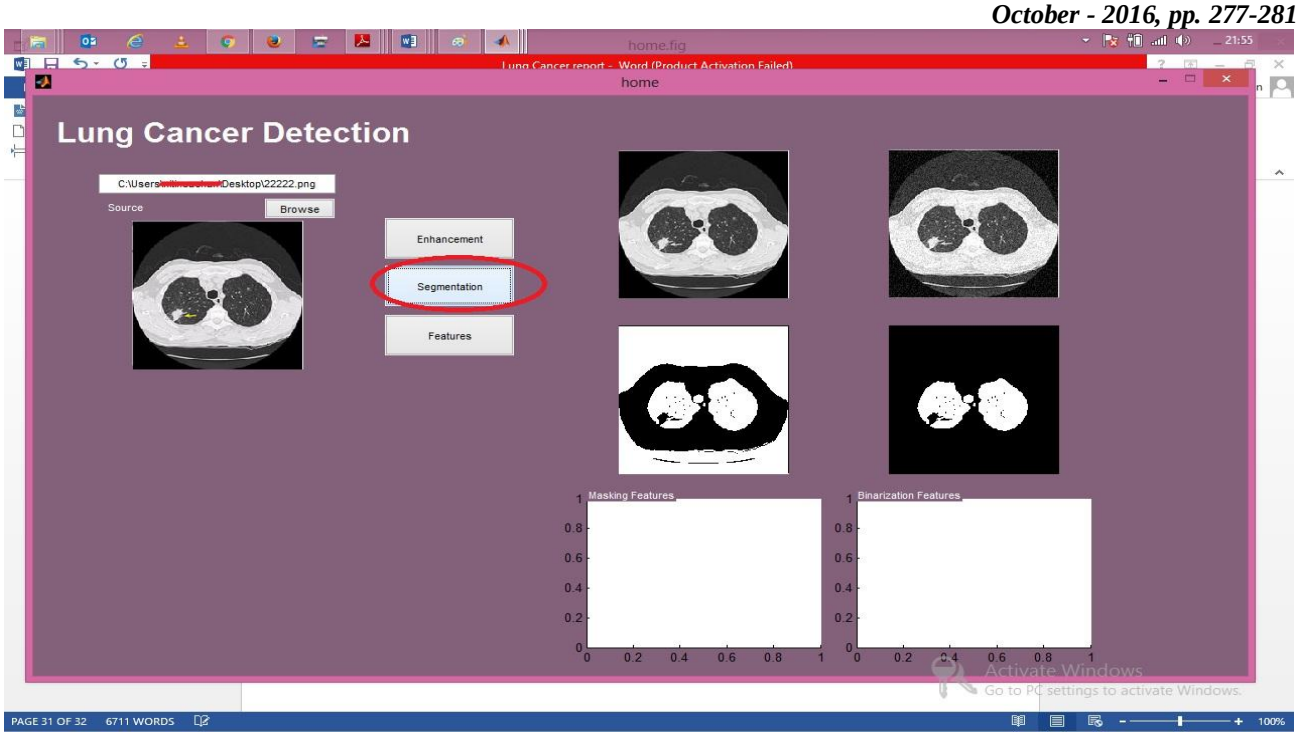
The image Pre-processing stage initiates with image enhancement; the purpose of image enhancement is to enhance the interpretability of information included in the image for human analysis, or to provide better input for other automated image processing techniques.

Image enhancement techniques can be majorly divided into two parts: Spatial domain methods and frequency domain methods. although, there is no specific rule for determining what "satisfying" image enhancement is when it comes to human perception. If it looks satisfying, it is good. However, when image enhancement techniques are used as the pre-processing tools for other image processing techniques, the quantitative measures can determine which techniques are most suited [4]. For the purpose of image enhancement we used the following three techniques: Auto-enhancement, gabor filter and Fast Fourier transform techniques.



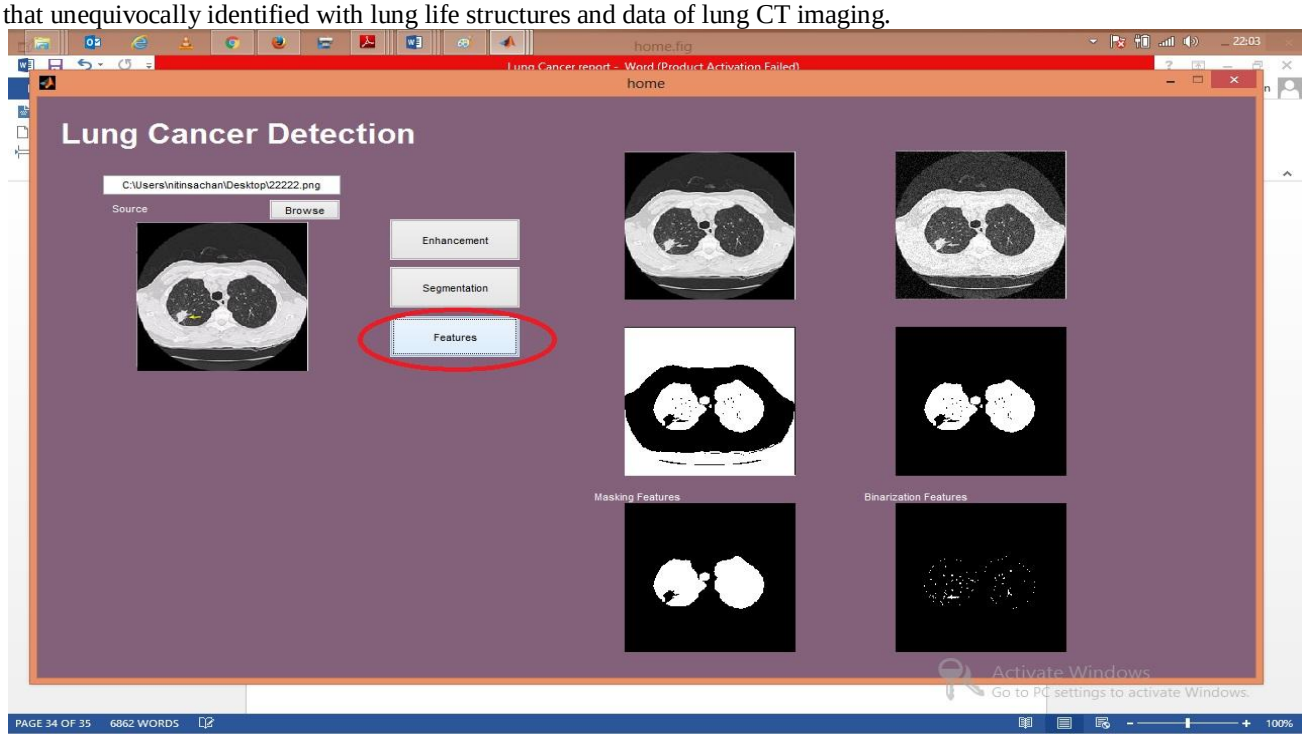
3.2 Image Segmentation

Division calculations depend on one of two fundamental properties of force qualities: brokenness and similitude. The primary classification is to segment the picture in light of sudden changes in force, for example, edges in a picture. The second class depends on dividing the picture into districts that are comparative as per a predefined measure. Histogram thresholding approach comes under this classification.



3.3 Features Extraction

Picture highlights Extraction stage is a critical stage that utilizations calculations and strategies to identify and confine different coveted partitions or shapes (components) of a given picture. To foresee the likelihood of lung disease nearness, the accompanying two strategies are utilized: binarization and masking, both techniques depend on realities that unequivocally identified with lung life structures and data of lung CT imaging.



3.4 Classification using neural networks

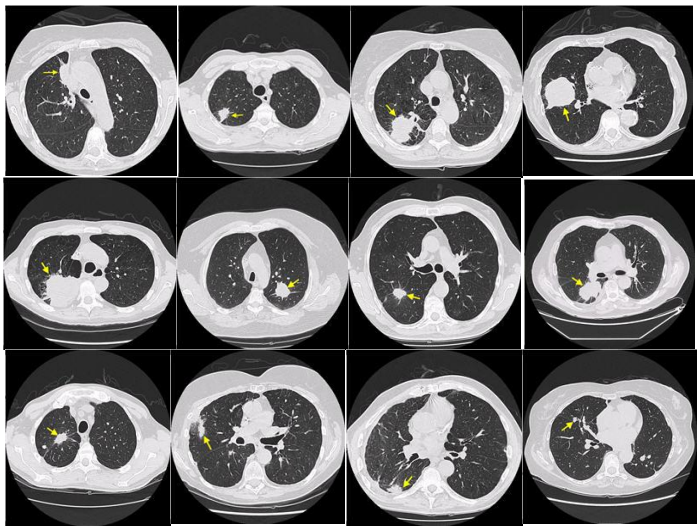
This section gives a nitty gritty depiction of the characterization phase of the framework introduced in this proposition. The section begins with a brief depiction of the info pictures given to the neural system and afterward proceeds onward to talk about the engineering, preparing, and testing of the neural system. Finally, we talk about the yield of the grouping stage in the framework (neural system).

Different picture handling methods, for example, those utilized as a part of (histogram adjustment, thresholding, and so on.) help during the time spent SNA choice. The issue of recognizing lung knobs requires a decent characterization of malignant and non-carcinogenic areas. An expansive number of non-carcinogenic districts acquired with SNA choice incorporate rib intersections, rib vessel intersections, and end-on vessels. We have to recognize these districts and separate them. In this postulation we utilized fake neural-systems (ANNs) to handle this issue.

3.5 Training Dataset

In preparing database, we are using CT scan images provided by a research centre MSKCC .

These are the preparation sets:



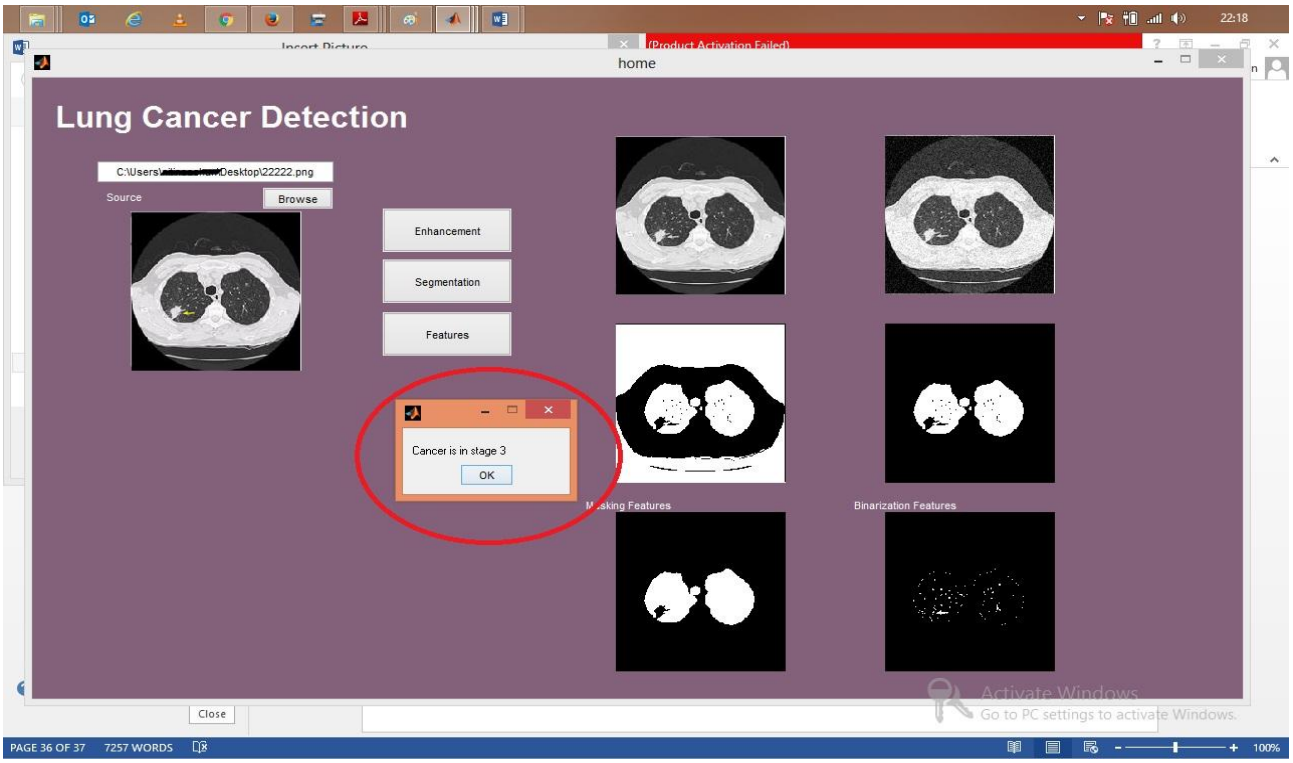
Above are the few images from the dataset.

IV. EXPERIMENT AND RESULTS

The experiments are conducted on the lung cancer detection system (LCDS) where the inputs are CT images of lung. CT image is successfully processed at each step in lung cancer detection system and the desired result is obtained. CT image of lung is given to various image enhancement techniques and the resultant output is obtained. Various image enhancement techniques used are- Gabor filter, Fast Fourier transform and log-Gabor filter.

The Output obtained from image enhancement technique is used as an input to the image segmentation module. In this work output from log Gabor filter is used as input. For the purpose of image segmentation two techniques are used, that is thresholding and marker- controlled watershed segmentation. Resultant output from both the method are generated and evaluated. Obtained results are shown in Fig Entropy values of the resultant images from both the methods are calculated. Best segmented image is found out on the basis of the entropy value. Image with higher entropy values is the best image which gives more information. Such images are with higher entropy values are much efficient for further processing. Resultant output from marker–controlled watershed segmentation provides higher entropy value as compared with the output from thresholding approach.

Outputs from both the segmentation techniques are processed separately under the feature extraction and cancer cell identification. Cancer cell identification module identifies the cancer caused part in lung and show alert of cancer stage.



V. CONCLUSION AND FUTURE SCOPE

Lung growth is a standout amongst the most hazardous maladies on the planet. Right Conclusion and early location of lung tumour can expand the survival rate. The present procedures incorporate investigation of X-beam, CT check, X-ray, PET pictures. The master doctors analyse the illness and distinguish the phase of tumour by experience. The treatment incorporates chemotherapy, surgery, radiation treatment and focused on treatment. These medicines are extensive, expensive and excruciating. Consequently, an endeavour is made to atomize this methodology to distinguish the lung malignancy utilizing picture preparing strategies. CT examine pictures are gained from different healing facilities. These pictures incorporate less clamour when contrasted with X-beam and X-ray pictures. A picture change system is creating for prior illness discovery and treatment arranges; the time component is taken in record to find the variation from the norm issues in target pictures. The CT caught pictures are prepared. The area of interest i.e., tumour is distinguished precisely from the first picture. Gabor channel and watershed division gives best results for pre-preparing stage. From the separated locale of interest, three elements are removed i.e., zone, edge and capriciousness. These three elements distinguish the phase of lung disease. The outcomes demonstrate that the tumours are of various measurements. By measuring the measurements of the tumour the lung malignancy stage can be distinguished precisely utilizing the proposed technique. The outcomes indicate great potential for lung tumour discovery at early stage. Additionally for grouping reason, Bolster Vector Machines are an alluring way to deal with information demonstrating. They consolidate speculation control with a procedure to address the scourge of dimensionality. The part mapping gives a binding together structure to a large portion of the ordinarily utilized model designs, empowering correlations with be performed. In order issues speculation control is gotten by amplifying the edge, which compares to minimization of the weight vector in an accepted system. For future work, we can execute this method on some more pictures. Expanding the quantity of pictures utilized for the procedure, can enhance the exactness. Additionally X-ray, X-beam, PET pictures can be considered for this method. Examination should be possible for all these pictures. So one can legitimize which sorts of pictures gives better result for lung malignancy discovery.

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