Research Paper on Graphical User Interface Based Lung Cancer Identification Using Digital Image Processing

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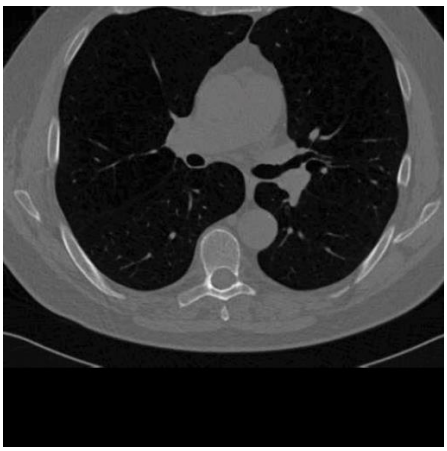
Abstract - Cancer-related medical expenses and labor loss cost annually $10,000 billion worldwide. Lung cancer-related deaths exceed 70,000 cases globally every year. Furthermore, 225,000 new cases were detected in the United States in 2016, and 4.3 million new cases in China in 2015. Statistically, most lung cancer related deaths were due to late stage detection. Like other types of cancer, early detection of lung cancer could be the best strategy to save lives. In this paper, we propose a novel neural-network based algorithm, which we refer to as entropy degradation method (EDM), to detect small cell lung cancer (SCLC) from computed tomography (CT) images. This research could facilitate early detection of lung cancers.

Keywords - *Image processing, Computed Tomography, Small Cell Lung Cancer Detection*

I. INTRODUCTION

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. According to recent surveys, cancer-related medical expenses and labor loss cost annually 10,000 billion dollars allover the world [1]–[3]. Lung cancer is a number one killer among all cancer-leading deaths, due to late stage detection and environmental conditions, such as air pollution, working conditions, life-long smoking habits [4], [5]. For instances, 225,000 new cases were detected in the United States in 2016, and 4.3 million new cases in China in 2015 [2], [6]. Like other types of cancers, early detection is viewed to be the best strategy to save lives. Computerized Tomography (CT) is 3D imaging modality which has been widely used for lung cancer screening and diagnostics. 3D images are reconstructed from thousands of 2D X-ray transmission projections. Advanced 3D reconstructions [7]–[9] were developed for better image quality and diagnostic accuracy. Most current machine learning based Computer Aided Diagnostic (CAD) researches are focusing on non-small cell lung cancer (NSCLC) [5]–[6]. CAD systems help to reduce the workload of radiologists significantly [7], [13]. So far there are very few work on small cell lung cancer (SCLC) detection, which is an extremely difficult task for human observer because the image with SCLC looks almost identical to one without. There are machine learning algorithms that may be candidates for SCLC detection task, such as convolution neural network based deep learning method [8], which starts with building neurons and layers, where a dynamic parameter set is used to calculate forward propagation. During the training process, parameters in each layer is updated by back propagation from cost function (i.e. a distance metric between forward propagation of input data and labels) . However deep learning algorithms usually requires an extremely large training dataset, which is not always available.



Img(a)

Img(b)

Figure 1. Two random CT lung images:
(a) a healthy lung image from Group 0;
(b) a cancer-detected lung image from Group 1.

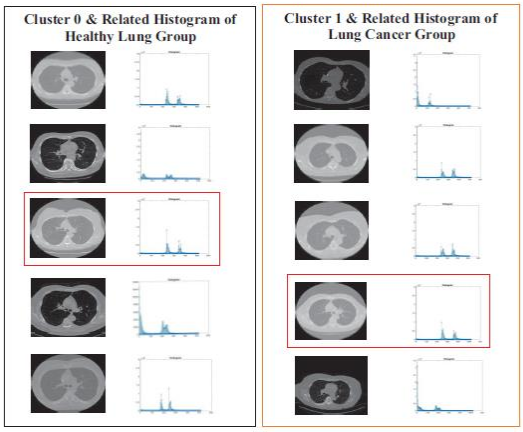


Figure 2. The histogram results for all training sets from Group 0 and Group 1; shown as the red box highlighted two images are the hardest to distinguish by human vision inspection.

A novel neural-network based algorithm, which we refer to as entropy degradation method (EDM), to detect small cell lung cancer (SCLC) from computed tomography (CT) images. This research could facilitate early detection of lung cancers. The training data and testing data are higher solution lung CT scans provided by the National Cancer Institute. We selected 12 lung CT scans from the library, 6 of which are for healthy lungs, and the remaining 6 are scans from patients with SCLC. We randomly take 5 scans from each group to train our model, and used the remaining two scans to test..

II. LITERATURE REVIEW

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]

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:

3.1 Pre-Processing

Extraction of images is performed accurately when the image is in binary form, i.e. a black and white image. Images in their default form are in Red Green Blue (RGB) form. This means that such images are logically represented as a combination of 3 matrices, each having a dimension of $1 \times n$, where n is the number of pixels. Such data is complex to process and therefore we convert this into a grayscale image. Grayscale images are logically a matrix with each pixel represented as a discrete level out of 0 to 255 [8]. The minimum level represents the darkest possible colour while the highest level represents the brightest colour.

3.2 Histogram Equalization

The Histogram of an image is a plot between the tones that can be represented in the image and the number of pixels that share the respective tones.

3.3 Thresholding

Thresholding is a process which is used for segmentation of an image by removing the data of pixels which are above or below a constant discrete level in a grayscale image. This constant level is called the Threshold [9].

3.4 *Feature Extraction*

The next step involves the calculation of certain properties of the objects left in the binary image. The range of the values of these properties are used to the train the neural network and ultimately for decision making. This process is called Feature Extraction.

3.5 Segmentation: Image segmentation is most essential procedure for image analysis subsequent tasks. It divides the image into multiple segments of constituent regions or objects.

3.6 Filtering An Image

Image filtering is useful for many applications, including smoothing, sharpening, removing noise, and edge detection.

3.7 Dilation

is one of the two basic operators in the area of mathematical morphology, the other being erosion. It is typically applied to binary images, but there are versions that work on grayscale images. The basic effect of the operator on a binary image is to gradually enlarge the boundaries of regions of foreground pixels (*i.e.* white pixels, typically).

3.7 Image Filling

The imfill function performs a *flood-fill* operation on binary and grayscale images.

3.8 Feature Extraction

This stage is an important stage that uses algorithms and techniques to detect and isolate various desired portions or shapes of a given image.

3.9 Neural Networks Output

Artificial neural networks are reckoning systems made up of numerous simple and highly interconnected processing elements, which process information by their dynamic state response to external inputs.

IV. RESULT

4.1 GUI Design: GUI Design of lung cancer detection

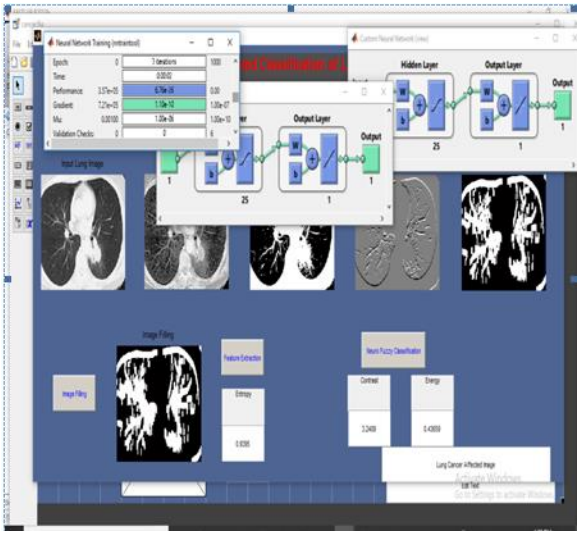


Fig 3: Result of all training from input, sample and target

V. 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.

VI. REFERENCES

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