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REVIEW ON LUNG CANCER DETECTION USING IMAGE PROCESSING TECHNIQUE

Anam Quadri [*], Rashida Shujaee, Nishat Khan

[*] Electronics & Communication,Anjuman College of Engineering & Technology,Nagpur, India
Electronics & Communication,Anjuman College of Engineering & Technology,Nagpur, India
Electronics & Communication,Anjuman College of Engineering & Technology,Nagpur, India

ABSTRACT

This paper presents a review on the lung cancer detection method using image processing. In recent years the image processing mechanisms are used widely in several medical areas for improving earlier detection and treatment stages.Also the different procedures and design methodologies for the same have also been discussed

KEYWORDS: Cancer Detection; Image processing; Feature extraction; Enhancement , segmentation

INTRODUCTION

Lung cancer seems to be the common cause of death among people throughout the world. Cancer detected at an Early stage can increase the chance of survival among people. It is shown that the overall 5-year survival rate for lung cancer patients increases from 14 to 49% if the disease is detected at an early stage. X-ray & Computed Tomography (CT) is used to detect the disease. Computed Tomography (CT) is considered to be more efficient than X-ray. However, problem seemed to merge due to time constraint in detecting the presence of lung cancer regarding on the several diagnosing method used. Hence, a lung cancer detection system using image processing is used to classify the present of lung cancer in an CT-images. In this study, MATLAB have been used through every procedures made. In image processing procedures, process such as image pre-processing, segmentation and feature extraction have been discussed in detail. We are aiming to get the more accurate results by using various enhancement and segmentation techniques.

LITERATURE REVIEW

In [2] Nihad Mesanovic , Mislav Grgic, Haris Huseinagic, Matija Males, Emir Skejic, Muamer Smajlovic proposed CT Image Segmentation of the Lungs which uses Region Growing Algorithm.The procedure in Region growing algorithm initiates with a seed pixel, it examines other pixels that surrounds it, then determines the most similar one, and, if it meets certain criteria, it is included in the region.this process is continued and The region is iteratively grown by examining all unallocated neighbouring pixels to the region. In[3] Nikita Pandey, Sayani Nandy came up with a Proposed A novel approach for detection of cancerous cells from Lungs CT scan images. This work proposed a method that detect the cancerous cells successfully from the CT scan images by dropping the detection inaccuracy made by the physicians naked eye for medical study based on Sobel edge detection and label matrix. Sobel operator Helps to find the edges in an image; it does so by calculating the image gradient. Image gradient is defined as the change in the intensity of the image. Prof. Samir Kumar Bandyopadhyay [4] provides another method using Computer Aided Diagnosis System (CAD) for detection of edges from CT scan images of lung for detection of diseases. Fatm Taher, Naoufel Werghi and Hussain Al-Ahmad [5] deals with filtering thresholding algorithm which is used for extracting the sputum cell from the raw sputum image for lung cancer early detection. Qinghua Ji, Ronggang Shi [6] paper provides a new method of image segmentation using watershed transformation. To employ morphological opening and closing operations to process the gradient image aim to reduce the oversegmentation areas, and reconstruction of the morphological gradient can maintain the shape of gradient image. This proposed method can simplify gradient image while maintaining the contours of the exact location of the dividing line,

thereby eliminating the root causes of the phenomenon have been split. The purpose of this paper is to find the early stage of lung cancer and more precise result by using diverse enhancement and segmentation techniques.

PROPOSED WORK

The proposed work focuses on finding the tumour, premature symptoms of the diseases, appearing in patient's lungs. Available lung cancer images are passed through the system and pre-processing stage, feature Extraction stage and classification are performed.

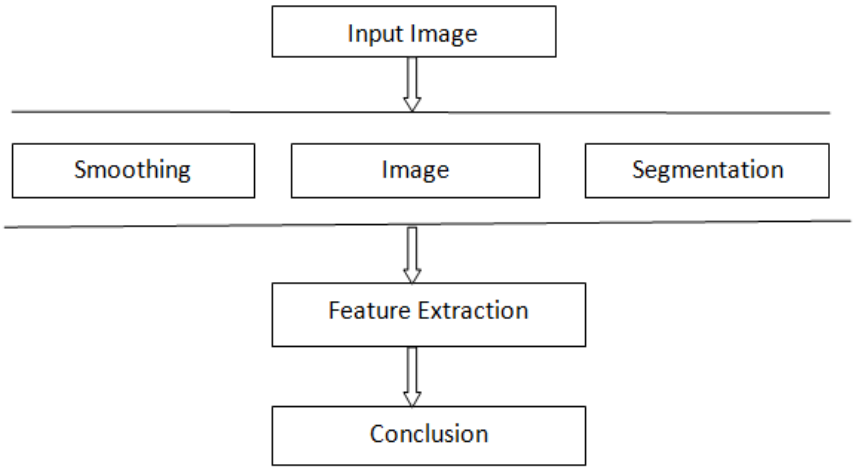

Figure 1.Block Diagram of Proposed System [1]

Image Acquisition

The first stage involves image acqusition. It starts with collecting a collection of CT images (normal and abnormal) from the available database. The second stage applies image enhancement which involves Gabor filter, auto enhancement and Fast Fourier transform techniques. The third stage consist of image segmentation algorithms which are applied to extract the affected region from the image. Thresholding and watershed segmentation algorithms which plays an effective role in image processing stages are also used in this stage. In the fourth stage, the general features of an image like average intensity, area, perimeter, eccentricity and texture features are obtained from enhanced segmented image. With the help of classifier in the classification stage tumour is classified as a normal or abnormal.

Image pre-processing

The first stage in the image Pre-processing stage is image enhancement. Image enhancement is done to provide better input for other automated image processing techniques. For this reason, images have to undergo several preprocessing process. In Image pre-processing process smoothing, enhancement, and segmentation is done.

1) Image Enhancement

Enhancement technique is used to improve the perception of information in images for human viewers, or to provide better input for other automated image processing techniques. In image enhancement stage three techniques used: Gabor filter, auto-enhancement and Fast Fourier transform techniques Image enhancement can be classified in two main categories, spatial domain and frequency domain. Here gabor filter is used for enhancement purpose as it gives better result compared to fast fourier and auto enhancement.. A Gabor filter is a linear filter whose impulse response is defined by a harmonic function multiplied by a Gaussian function. The Gabor function has been recognized as a very useful tool in computer vision and image processing, especially for texture analysis, reason being its optimal localization properties in both spatial and frequency domain. Auto enhancement, involuntarily adjusts and enhances

the image (brightness, colour and contrast) to optimum levels. Fast Fourier Transform technique operates on Fourier transform of image. And it is a faster version of the Discrete Fourier Transform (DFT).

2) Image Segmentation

Segmentation divides an image into its constituent regions or objects. The segmentation of medical images in 2D, has many useful applications in the medical field. Image segmentation is an important process for most image analysis tasks. The result of image segmentation is a set of segments that collectively cover the whole image, or a set of contours that are extracted from the image (edge detection). Each of the pixels in a region is similar with respect to some characteristic or computed property, such as color, intensity,varaince or texture. Adjacent regions may significantly differ with respect to the same characteristic(s). In image segmentation, Thresholding and watershed segmentation techniques are used. Thresholding is one of the most powerful tools for image segmentation which is a non-linear operation that converts a gray-scale image into a binary image where the two levels are assigned to pixels that are below or above the specified threshold value. The segmented image thus obtained from thresholding has the advantages of smaller storage space, fast processing speed and effortlessness in manipulation, compared with gray level image which usually contains 256 levels. Watershed segmentation extracts seeds indicating the presence of objects or background at specific image locations. The marker based watershed segmentation is capable of segmenting unique boundaries from an image.

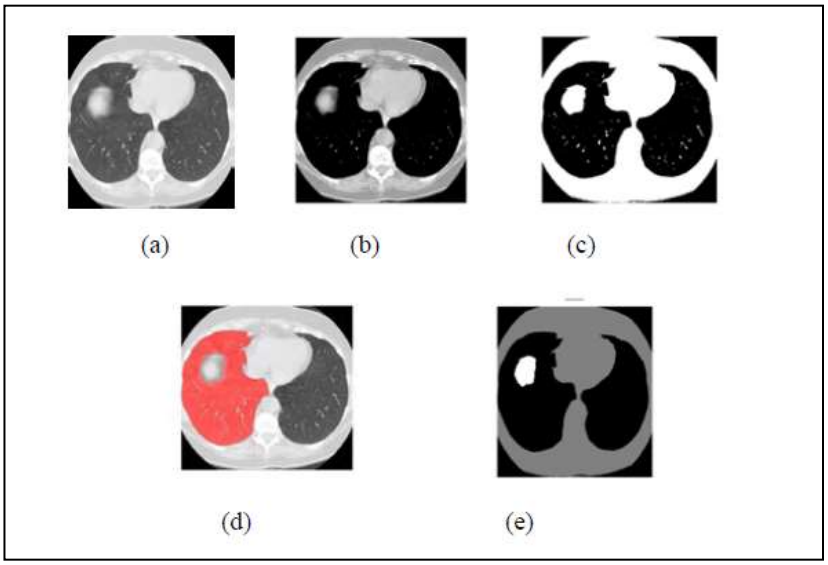

Figure 2: Segmentation steps: (a) Original, (b) Preprocessing (c) Thresholding (d) Segmenting Lung Region, (e) Showing Cancerous Nodule

Feature Extraction

The Image features Extraction stage is very important in image processing techniques which make use of algorithms and techniques to detect and isolate various desired portions or shapes (features) of an image. Feature extraction is an essential stage that represents the final results and helps in determining the normality or abnormality of an image. These features serves as the basis for classification process and is of great importance. Only these features were considered to be extracted; average intensity,area, perimeter and eccentricity. The features are defined as follows:

1) Area: it is a scalar value that gives the actual number of overall nodule pixel. It is obtained by the summation of areas of pixel in the image that is registered as 1 in the binary image obtained.

2) Perimeter: It is a scalar value that gives the actual number of the outline of the nodule pixel which is obtained by the summation of the interconnected outline of the registered pixel in the binary image.

3). Roundness: Eccentricity: This metric value or roundness or circularity or irregularity index (I) is to 1 only for circular and it is <1 for any other shape. Here it is supposed that, more circularity of the object. [1]

Classification

Lung nodule is defined as smallest growths in the lung that measure between 5mm to 25mm in size. Malignant nodules tend to be bigger in size >25mm, and have a faster growth rate. In the normal images nodule size is less than 25mm. And in the abnormal images its size is greater than 25mm [1]. In the segmentation that nodule is detected and then we use feature extraction to extract the features from that segmented image by which we can identify the stages of lung cancer. Lung nodule show up as round, white opacities on chest x-rays and computed tomography scans. Previous scan x-ray or scan and the current xray and CT-scan is used to determine if there is any change in shape, size, or appearance of the nodules. If the nodule do not grow larger after monitoring for a 2 year period, no further treatment is necessary.

CONCLUSION

Lung cancer is the most dangerous and widespread disease in the world. Depending on the stage, the discovery of the cancer cells in the lungs, gives us the indication that the process of detecting this disease at an early stage plays a very important and essential role to avoid serious stages and to reduce its percentage distribution in the world. This technique aids the radiologists and the doctors by providing more information and taking correct decisions for lung cancer patient in a short time and with accuracy. To get more accurate results, work is divided into following stages: Image Enhancement stage, Image Segmentation stage and Features Extraction stage and classification. In this paper, image preprocessing and image segmentation are implemented to obtain the diagnosis result. By following these steps, the nodules are detected and some features are extracted. The extracted features are then calculated for classification of disease stages This review gives an overview of the current detection techniques used for CT images that may help researchers when opting a given method. Certainly, lung analysis techniques have been improved over the last few decades. However, there still are certain issues to be solved such as developing new and better techniques of contrast enhancement and selecting better criteria for performance evaluation is also needed.

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