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Detection of lung cancer from ct image using image processing

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ABSTRACT:

Lung cancer is the leading cancer among both men and women. Detection of lung cancer is important inorder to improve the survival rate. Presence of lung cancer can be diagnosed with the help of a CT image of the lung. The proposed system is used to detect the lung cancer in three steps. The steps include preprocessing stage, feature extraction stage and lung cancer cell identification stage. First step is capturing the input image. Second step is preprocessing. Preprocessing includes two processes such as image enhancement and image segmentation. The Weibull segmentation is used to describe the texture contrast, shape, scale and texture. The output from the image segmentation goes to the feature extraction stage. These extracted features are used to identify the abnormalities in the lung.

Keywords: Lung cancer, CT scan image, Log gabor filter, Weibull segmentation**.**

INTRODUCTION:

Lung Cancer is the wild development of unusual cells, start off in one or both lungs, generally in the line the air passages. The unusual cells do not grow into healthy lung tissue; they provide fast and form tumours. According to American cancer society the cases of lung cancer increase very quickly and about 14% newly diagnose cancers are a lung cancer and also the major reason of cancer death worldwide. The earlier study of analysis show that the majority of the lung cancer patients belong to the age of 60 years.

Lung Cancer is one of the most serious human body problems in the world. The fatality rate of lung cancer is the maximum of all other type of cancer. The survival rate of lung tumour is extremely least amongst all type of tumour. So, there is a need to propose a computational intelligence based approach to identify the lung cancer because the survival from lung cancer is openly connected to its expansion at its detection time. If we identify lung cancer at early phase, then there are more potential to

survive the patients. It is also showed from previous study that cigarettes smoke are the major cause of lung cancer. It is observed that an estimated 85% of lung cancer cases in males and 75% lung cancer cases in females where cigarette smoking is the key cause.

The lung cancer discovery can be done by taking a screening using Computed Tomography (CT) Scan. The CT Scan outcome then observed on morphological guide of lung cancer as the diagnostic criteria such as the tumor size, enhancement, irregular spiculated margin , lobulated, water bronchograms, ground glass opacity, and heterogeneous density . The lung cancer identification by using CT Scan image which conducted by a radiologist may result in an error subjective by the blur of anatomical structures surrounding the lung area, the tiny size of lesion, and also the diverse experiences of the radiologist create a altered interpretation . To avoid the errors and to develop the accuracy and consistency, a computer-based digital image processing is essential as the second opinion to read the CT Scan image result. In this study, the primary stage of image processing is preprocessing to crop Region of Interest (RoI), segmentation, feature extraction and classification.

METHODOLOGY:

Lung cancer detection system can be developed by using this image processing technique. Lung cancer recognition system has three steps to discover the occurrence of cancer nodule in lung. Pre-processing, feature extraction and lung cancer cell identification are the steps. Pre-processing step include image enhancement and image segmentation. Enhancement is removing the unnecessary images and noise by the log-gabor filter. Enhanced CT image of lung is then passed through segmentation phase. The segmentation is done by the Weibull segmentation process. From the segmented output characteristics are extracted to calculate the presence of defect of lung. By means of these extracted features sort the lung as normal lung or abnormal lung.

BLOCK DIAGRAM:

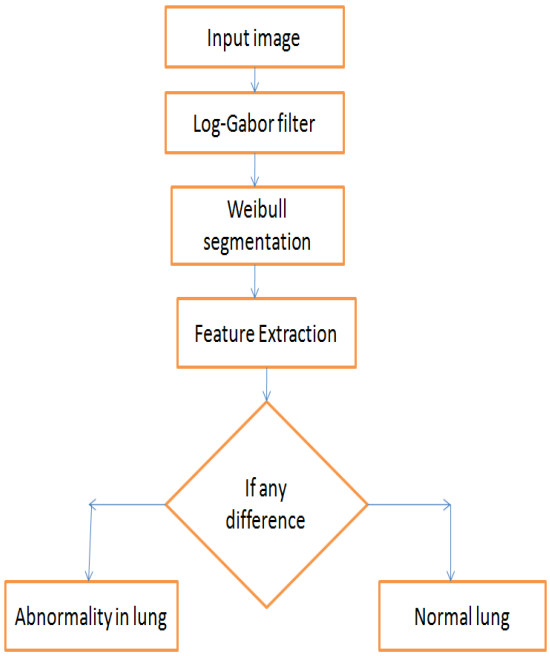

IMAGE PRE-PROCESSING:

It is the second module in lung cancer recognition system. The reason of pre-processing stage is to develop the image data by reducing the unnecessary distortion. It is

done by enhancing the data which are essential for additional processing. Image enhancement and image segmentation are the procedure performed in pre-processing stage.

Image enhancement: Image enhancement is used to develop the interpretability of information in the image to the human viewers. Image enhancement is of two type, spatial domain methods and frequency domain methods. Spatial domain process deals with the pixels in the image. Enhancement is performed by altering the pixel values. That means, changing the grey level value and alter the contrast of the image. In frequency domain enhancement is achieved by varying the orthogonal transform of image. That means, based on the frequency domain the processing are performed.

Log Gabor filter: Log gabor filter was proposed by Field in 1987. Log gabor filter is the higher edition of gabor filter. Some changes are made on the gabor function is the log gabor function. Log gabor filter has two features, one is it has no DC components and the next one is the transfer function of log gabor function has an extended tail at the high frequency end.

IMAGE SEGMENTATION:

Image segmentation algorithms are based on discontinuity and similarity. These two are the properties of intensity values. The purpose of image segmentation is to partition the image into meaningful region and to identify the object or relevant information from the digital image. Image segmentation highlights the information which we are needed for further processing from the image and thus make it easy to analyze.

Weibull segmentation: Weibull segmentation is one of the segmentation method used in medical images. Distribution parameters of weibull distribution describe the texture contrast, scale, shape, and generate a six-stimulus basis for texture perception. So it can be treated as a good model. Variation in the weibull parameters produces verity of distribution, which includes exponential and Gaussian and Raleigh. In this technique the image is assumed to have a weibull distribution. A complex image is represented by Cm,n. Histogram of the resulted image is plotted and the minimum grey level value and maximum grey level value are selected from the histogram. Then according to the number of classes entered from the input the image is segmented into regions.

FEATURE EXTRACTION AND CANCER CELL IDENTIFICATION:

Feature extraction is the important stage in this work. It uses different methods and algorithms to extract the features from the segmented image. Based on the extracted features normality and abnormality of the lung are decided. The features which we are extracted are area, perimeter, and average intensity. Segmented images have only two values 1 and 0. Nodule part will be represented with value 1. Then area of the nodule can be calculated by finding number of pixel with value 1. Perimeter of the nodule means the number of pixels in the boundary region of the nodule. Average

intensity is another feature which is used for the purpose of cancer detection. Select two threshold values for mean intensity values, and then calculate the average intensity value for the candidate region. If the average intensity value is between the threshold values then this part is assumed to be cancerous otherwise not. Based on area of the nodules the cancer caused nodules are identified. If the nodule size is greater than 25mm then it is assumed as abnormal image. If the nodule size is less than 25mm then it can be assumed as a normal image.

RESULTS AND DISCUSSION:

The experiments are conducted on the lung cancer detection system (LCDS) with the inputs are CT images of lung. CT image is successfully processed by each step in lung cancer detection system and the resulted was obtained. CT image of lung is given to image enhancement technique such as log-gabor filter and the output is obtained. The resultant enhanced image is shown in Fig 1. Output from image enhancement technique is used as the input to the image segmentation module. In this work output from log gabor filter is used as input. For image segmentation weibull segmentation technique is used. Resultant output is generated and evaluated. Obtained results are shown in Fig 2.

Outputs from the segmentation techniques are processed under the feature extraction and cancer cell identification module. Cancer cell identification module identifies the cancer caused part in lung and marked with red colour as shown in Fig 3.

Fig. 1 Log-gabor enhanced image

Fig. 2 Weibull segmentation

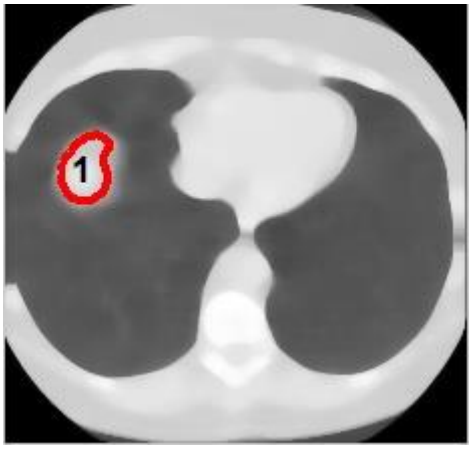

Fig. 3 Cancer cell detected

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