SEGMENTATION AND ANALYSIS OF LUNG NODULES

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Abstract:Lung cancer is one of the most dangerous cancers that should be detected at early as possible for increased survival rate.In the proposed system, we have designed a solution to detect lung cancers in lung CT images using image processing techniques.The major steps involved in our proposed system are image acquisition,

preprocessing, segmentation, feature extraction, and neural network detection. First the input images are acquired.Then the input image is preprocessed to increase the contrast using the histogram equalization. The grayscale image is converted to binary image for segmentation.Segmentation is done using thresholding technique.Dilation is done to expand the image.Then features are extracted from the segmented images and sent to the neural network.The network is trained using these features to detect whether the input image is cancerous or not.Our implementation of our proposed system shows satisfactory results in its performance. In future additional algorithms can be added to the system to increase its accuracy.Also this system can be altered to use in detection of other cancers.

1.INTRODUCTION

Lung cancer is a leading cause of human cancer-related deaths worldwide. Approximately 20 per cent of cases of lung nodules constitute lung cancers; thus, the detection of potentially malignant lung nodules is important for lung cancer screening and diagnostics. Lung nodules are tiny masses, and are generally spherical in the human lung.However, the anatomical structures around them, such as vessels and the adjacent pleura, can distort them. Intraparenchymal lung nodules are more likely to be malignant than those related to the surrounding structures, and according to their relative positions, lung nodules are classified into different types.

The most precise imaging tool for obtaining anatomical knowledge about lung nodules and surrounding structures is computed tomography (CT). However, analysis of CT images is difficult for radiologists in current clinical practice, due to the large number of cases. This manual reading may be prone to error and nodules may be missed by the reader, and thus a

possible cancer.Computed Tomography is steadily offering higher resolution and faster acquisition times. This has resulted in the ability to identify tiny lung nodules at earlier and potentially more curable levels, which can reflect lung cancers. None the less, hundreds of such thin sectional CT images are created for each patient in current clinical practice and are analyzed in the traditional sense. In this project a computerized system for the automatic detection of small lung nodules on the images is designed.

2.METHODOLOGY

IMAGE ACQUISITION:

Normally a special type of digital X-Ray machine is used to acquire detailed pictures or scans of areas inside the body called computerized tomography (CT). Computed tomography is an imaging procedure. In the proposed system, totally 300 Lung CT images that consists of cancer and normal image of lung from the Internet and Hospital are collected. The Lung CT images used as input are in jpeg file format.

IMAGE PRE PROCESSING:

After Image Acquisition, images are processed by the following image preprocessing steps.

1. Histogram equalization:

Histogram Equalization is a technique usually used in image processing to improve contrast in images and make images brighter. Here the intensity values which frequently occur are stretched or spread out in the image. It increases the overall contrast of the image. In short, stretching out the intensity range of image. As a result, the area in images with less contrast value acquires a higher contrast value and becomes brighter.

2. Gray scale conversion:

RGB image can be converted to gray scale image by using rgb2gray function in MATLAB. It eliminates the hue and saturation values and converts RGB image to grayscale.

3. Noise Reduction:

The system uses median filter such as medfilt2 to remove the noises. Medfilt2 is 2-D median filter which is a nonlinear operation used in image processing to reduce noises like salt and pepper. Median filter is more effective than convolution because noise reduction is efficient and edges are preserved simultaneously.

4. Smoothing:

Smoothing is also known as low pass filtering. It is done to remove noise from an image. Here a moving window is employed, which creates an effect in each pixel of the image. The moving window moves all over the image. During this process, effect in a pixel is determined using its neighbour's pixel values. Finally as a result the information is moved around the image. Smoothing prepare the images to be ready for future processing on it.

5. Binary Image:

Gray scale image which is obtained as noise free image is converted to binary image. Binary image means the pixel values are between 0 and 1.The pixel value with 0 is indicated by black color and the value with 1 is indicated by white color. The function called 'im2bw' is used to convert gray scale image into binary image.

SEGMENTATION:

The process of partitioning a digital image into multiple segments in computer vision is represented as image segmentation. Processing of an entire image is not an effective way as there are regions in images which does not contain useful information. Also the processing time is large. But when images are segmented, we can choose only the important segments and process it. An image contains a collection of different pixels. Using image segmentation, the pixels with similar attributes are grouped.

Thresholding Method:

The most popular and commonly used technique for segmentation of images is thresholding. It is used to separate foreground and background of an image. Thresholding is an effective way of partitioning an image. It works better in images with high contrast. Thresholding is done using the pixel values of an image. The main idea behind this technique is that pixel values of objects and the background of an image will be different if there is sharp contrast between them. The main step in thresholding is to find a threshold value. Next the process involves comparing the pixel value in the images with the threshold value. This process separates the pixels of the image into two groups.

1.Pixels with intensity value lesser than the threshold.

2.Pixels with intensity value greater than the threshold.

FEATURE EXTRACTION:

Filtering is either used in enhancement of images. Using filters, features in an image can be emphasized or removed. Filters are used in image processing either to reduce high frequencies or low frequencies. When high frequencies are suppressed, it is called smoothing. Low frequencies are suppressed to detect edges in an image. The most common filtering

technique is mean filtering. Implementation of this filter is very easy. It is used in smoothing of images. The technique behind mean filtering is to find mean or average value of neighbours of a pixel and replace the pixel value with it. This is used to eliminate pixels which do not represent the surroundings.

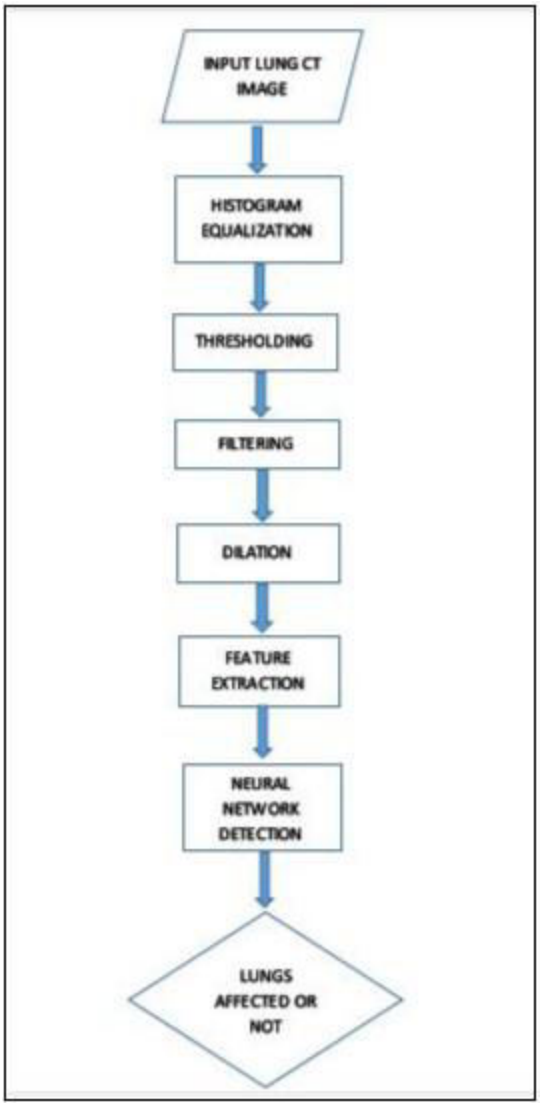
DILATION:

Dilation is a process of expanding an object in an image. It is done by expanding the image pixel. An object is expanded by adding pixels to its boundaries. Dilation uses structuring element to expand an element.

NEURAL NETWORK DETECTION:

The result from thresholding method of the Lung Cancer Detection System uses neural network which is very efficient and reliable. Followed by the feature extraction process, those features are passed through the neural network to train up the system or model for the purpose of classification or detection. The whole proposed training system of lung cancer detection consists of the following steps: Image Acquisition, Image Preprocessing, Segmentation, Feature Extraction, and Neural Network Classification.

3. FLOW DIAGRAM:



4.CONCLUSION

Lung cancer is one form of dangerous disease, so early stages must be identified. Yet lung cancer diagnosis is most challenging task. Many methods are used for the diagnosis of lung cancer from the

literature review but they have some limitations.In our proposed method, follow approaches in which the first step is binary thresholding, then extraction of features, and then use those features to train the neural network and check the neural network. The proposed system successfully identifies cancer of the lung from photographs of CT scans. At the end of the system, you can say the system is meeting the desired goal. The proposed system measures 150 types of lung CT images and achieves the result where the system's overall success rate is 96.67 percent which meets system expectations. This technique may be used in future in brain tumor diagnosis, breast cancer, etc.

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