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IMAGE PROCESSING: A BETTER MEANS FOR DIAGNOSIS OF LUNG CANCER

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ABSTRACT - Among all types of cancer, lung cancer is the most common cause of death in people. To cure the disease, its detection in its earlier phase is essential. Therefore, the need to develop new techniques for the detection of cancer nodules is on an all-time increase. Image processing seems to be a supportive tool to solve this problem. The aspiration of this study is to extract the features of segmented image that differentiate one region of interest from another. Choosing minimized features would be able to improve the classification accuracy.

Keywords - Image Processing, lung cancer, nodule, accuracy, classification

I. INTRODUCTION

Multiplicative abnormal growth of cells causes cancer or tumor. Type of cancer depends in which part of the body, abnormal cells appear. A tumor may be benign or malignant, localized or invasive. According to National Institute of Cancer, more than 300 different types of cancers are listed. They are Leukemia, Skin cancer, Liver cancer, Breast cancer, Lung cancer, Colon Cancer, Brain Tumor.

Among all type of cancer, lung cancer is the most common cause of cancer deaths in the world. For the diagnosis of any type of cancer different types of modalities are available like Magnetic Resonance Imaging (MRI scan), Sputum Cytology or Positron Emission Tomography (PET), Chest Radiograph (X-ray), Computed Tomography (CT). But most of them are expensive.

In case of lung cancer, most of these modalities detect the disease in its later phase, where either the misdiagnosed disease is lung cancer or the possibility of patient endurance is very low.

Hence, a new expertise technique has to be brought up to analyze the lung cancer to detect it in early stage. Image processing techniques improve the manual analysis providing a better quality of the acquired image.

For this purpose, one must follow the preprocessing of a medical image captured by Magnetic Resonance Imaging (MRI scan), Sputum Cytology or Positron Emission Tomography (PET), Chest Radiograph (X-ray), Computed Tomography (CT). This study focuses on CT images. Preprocessing of CT images includes image enhancement, smoothing, segmentation, and feature extraction [11].

1.1 Enhancement

The goal of enhancement of the image is to get better quality of the image to improve the interpretability or perception of information in images for further processing as well as for human viewers. These images are used as input for next step. For the assessment, the relevant features are enhanced whereas irrelevant features are reduced.

However, when image enhancement techniques are used as pre-processing tools for other image processing techniques, then quantitative measures can determine which techniques are most appropriate. Examples of image enhancement operations are geometric distortion correction, enhancement in edge, contrast, noise removal, image subtraction, image zooming, pseudo-coloring.

Image enhancement techniques are grouped into two classes on the basis of their operation. They are operating directly on image pixels and on the Wavelet or Fourier transform of the image and is known as spatial and frequency domain methods respectively [1] [4].

1.2 Segmentation

Isolating an image into constituent, non-overlapping areas is known as segmentation. These areas are standardized with respect to few characteristic such as texture or intensity [12].

I.3 Morphological Operation

Morphology technique is based on shapes. The aim of these operations is affecting the form, structure or shape of an object. These operations are needed to remove unnecessary parts. Erosion, dilation, closing and opening are the basic morphological operations. They are applied on binary images for getting an illustration of the shape of region. Erosion means shrinking the

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foreground, Expanding the foreground is 'dilation', closing means removing holes in the foreground, Removing stray foreground pixels in background is opening [7].

1.4 **Feature Extraction**

The aim of feature extraction is to minimize original data set by measuring certain characteristics that differentiate one region of interest from other [2]. A feature provides a better understanding of the image and is a noteworthy piece of information extracted from an image.

II. METHODOLOGY

Obtain CT images of a patient in digital form and convert it to grayscale image [6]. Then apply preprocessing steps on these CT images. The histogram of the obtained image shows that relative contrast of intensity pixels is low and there is a need to enhance the subjective standard of the image for human observation [10].

This can be done by increasing the relative contrast. This involves image enhancement techniques to enhance the visualization of irregularities in CT images. For this purpose histogram equalization is used. The goal of histogram equalization is to obtain a uniform histogram for the output image. It provides more visually pleasing results across a wider range of images. For elimination of unnecessary background details, thresholding method is used [9].

To get rid of most of the noise speckles obtain after thresholding, median filter is used [3]. The difficulty of locating the suspected nodule region is minimized after execution of all these image enhancement techniques. It separates the suspected areas from the enhanced image [8].

The segmented lung nodule is used for feature extraction. The extracted features acts as the basis for classification process which are used to develop diagnostic rules to detect the cancer nodule [5].

Fig 1: Original Image

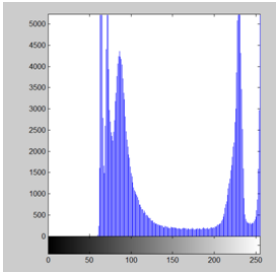

Fig 2: Histogram of Original Image

Fig 3: Histogram Equalized Image

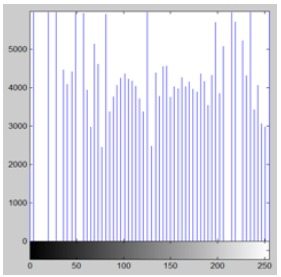

Fig 4: Histogram Equalized Image

Fig 5: Threshold Image

Fig 6: Background Removal

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Fig 7: Eroded Image

Fig 8: Suspected Nodule

III. CONCLUSION

As image enhancement deals with the improvement of visual appearance of the scene, to improve the detestability of objects so that it can be used by either a machine vision system or a human observer. To design and develop a computer aided diagnosis (CAD) system to detect cancer nodules in CT images the accuracy is needed. The detection accuracy depends on the correct classification of the suspected nodule area. By including feature extraction stage in a CAD system, the classification accuracy can be improved.

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