DETECTION OF BRONCHOGENIC CARCINOMAUSING X-RAY IMAGE

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ABSTRACT

The bronchogenic carcinoma serves as the leading cause of death among all the other types of cancer. It affects not only a particular age group but almost all age group persons. The lung tumor detection method is mainly used to detect the presence of the exact location of the tumor and to calculate the area of the tumor. Here the x-ray image is used to detect the presence of the tumor. The X-ray image is chosen as input because of its ability to radiate at low levels without causing any harm to the human body. X-ray is the most reliable and safe image processing technique available in the medical field. Here the segmentation and enhancement methods are carried out using FCM and adapthisteq algorithm. These techniques play a major role in the detection of any foreign material like tumor cell in the body. These methods are used to obtain the high accurate result, which provides the exact location and area of tumor, with the least error possible. The location of the tumor and its area is calculated so that the lung cancer can be detected and cured in its early stage itself. Generally the CT is used for tumor detection but here the x-ray image is preferred because of its low radiating capacity. Here the x-ray image is chosen such that it can undergo many image processing techniques.

Keyword : *Bronchogenic carcinoma, image processing, tumor cell, FCM, Adapthisteq,etc.*

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1. INTRODUCTION

Cancer is the most common and dangerous disease found in almost all parts of the country and among different age groups. Lung cancer plays a major role in causing increased death rate among all the other types of cancer. Using the biomedical image processing technique, the presence of the tumor in the lungs is detected for identifying the lung tumor in its early stage itself. In previous technique, the affected lung lesion image was taken as the input and image was automatically segmented according to the lung parenchyma[1].Here the lung lesion is segmented using the automatic region growing method which acts in the three-Dimensional space by making use of the distance constraint and the growing degree constraint. Then Gaussian filter was used to calculate the gradient magnitude of every pixel found in the segmented lung parenchyma image. The gradient magnitude calculation is mainly used to identify the destination pixel. Then, using the toboggan algorithm four connected neighbor pixels of the destination pixel are detected, so that original pixel can be targeted for further analysis. The process is repeated until all the pixels found in the given input image or segmented. Originally the toboggan algorithm was used to improve the image enhancement of the considered image and the local minima pixel of that image was presented for normal image calculation. The original toboggan algorithm was not able to differentiate the normal lung parenchyma from the affected lung lesion parenchyma. The existing image processing system consists of the detailed description regarding the segmentation framework of the enhanced toboggan algorithm. In this technique the segmentation process is carried out without any human interference. The new toboggan algorithm compares the values of the gradient magnitude with the new elements that are already found in the empty stack, which are pre-defined. [8]After this process the original parenchyma tissues and noise are removed from the given input image, highlighting the affected lung lesion. Based on the area of the lung lesion parenchyma (i.e.) the affected area of the lung, obtained from the new enhanced toboggan algorithm. The optimized segmentation result is obtained by a lung lesion refining method. The main disadvantage of this method is that it considers only the affected lung region as the input for the segmentation process and shows the severity of the affected region.

To overcome this disadvantage we make use of this x-ray to detect the presence of the tumor and to calculate the area of the tumor. Here the X-ray image is used to identify the presence of the tumor. Generally the CT image is used for the image processing technique, but the CT scan is costly process so we go for the image processing and segmentation technique, using X-ray image. The X-ray image is selected to be the input for processing; this is because of the reason that the X-ray has low radiating capacity and does not produce any harm to the body. Here the CT image is replaced with the X-ray image. The X-ray image is chosen instead of X-ray because generally the patient data is stored in the image format in the hospitals before it is being processed into the X-ray (i.e.)for easy processing of the data. Here the input is segmented using the Fuzzy C Mean algorithm so that it is useful for easy identification of the tumor in the lungs.

2. INPUT ANALYSIS

The X-ray image of the patient for whom the presence of the bronchogenic carcinoma has to be detected is taken as the input image. The input image is first converted into the equivalent gray scale image using the gray scale conversion mechanism. The given input image is obtained in the three dimensional which consist of some values of the R,G&B pixels, so we convert it into the gray scale image which is a two dimensional form of image (i.e.)the values that are not found within the range of the gray scale values are neglected. To obtain the gray scale value of the image we add the values of the red, green and blue pixels and divide it by three. It is represented as:

$$\text{Gray scale} = (R+G+B)/3 \qquad (1)$$

Equation (1) shows that the contribution of each color is of different wavelength leading to different pixel values. The value of the pixels are obtained according to their contribution in the three dimensional image. This average value is considered to be the equivalent gray scale value of the input image.

The RGB to gray scale conversion is preferred to the gray scale conversion because the image contains few R, G and B values in the given X-ray image. Each pixel found in the three layered or three dimensional image, occupies 8 bits. So, to store the image in the three dimensional space, we require 8 bits for all the three colors (i.e.) totally 24 bits are required to store he value of a single pixel found in the RGB image. By reducing the three dimensional image into two dimensional image, we reduce the size of the gray scale image by 33% of that of the original image[3]. The gray scale image now consists, only the gray scale intensity values ranging from 0 to 255. The X-ray image which is converted into the gray scale image is now made to be the input for the filtering block. The gray scale image is now processed through the media filter. The noise filtering process is mainly done to remove the unwanted corrupting pixels that appear randomly on the given input image. The noise filter used for the noise reduction technique is the median filter. The median filter plays a major role in removing the noise, in digital image processing techniques.

The median filter is a non-linear, digital filter that is used for removing salt-and-pepper noise found in the image. The salt-and-pepper noise is also also known as the impulse noise or black and white noise. The input image consists of the pixel values of a wide range. These values are represented in a matrix format. These matrix values, when passed through the median filter, are arranged in the ascending order. After such an arrangement, the median value for the represented set of matrix values, are chosen and the median value is replaced in the place of the particular pixel value. Due to the use of this method, the image is properly displayed without any form of noise.

Generally a gray scale consists of the different gray shades. When these shaded values are not represented properly, the image consists only of the black and white dots. So to avoid this problem and display the image properly, median filter is used. The median filter is chosen over the other filters because it not only removes all the noise pixels from the image but also preserves the edges if the image whereas the other filters does not help in preserving the edges of the image, instead they cause damage to the edges [4].

3.SEGMENTATION AND ENHANCEMENT

The preprocessed image obtained from the noise filter is then made suitable for the further analysis. The obtained image is then segmented into a number of images based on the iteration values. The pixel values vary over a wide range in the given image, so the image is first segmented in a particular number, according to the requirement for the segmentation and matching process. The pixels containing the same values are segmented into a particular iteration image. Similarly different pixels or intensity values are grouped under different iterations.

The segmentation process makes use of an algorithm known as the FCM (Fuzzy C' Mean) algorithm. Here the term 'C' denotes the word 'clustering'. Thus using this algorithm, the particular range of pixel value is clustered to form a group and the images are displayed according to their segmented format. The segmented images or the iterations are provided with different names,[9] for the uniqueness in the identification and segmentation. The segmented images are then displayed ina particular order to make it easy for the identification of the images which resembles the region of the tumor found in the given input X-ray image. The level of segmentation of the image depends on the severity of the problem being solved[10]. The similar group of pixel values found in the segmented image, isolates the image containing the proper view of the tumor region, from the other segmented image.

After the segmentation process, the human interference is required for taking the image processing technique to the next stage. From all the images obtained from the segmentation process, the image which is closely related to depict the presence if the tumor in the lung region is chose and fed as input of the next processing technique known as enhancement technique. The image enhancement process makes use of an algorithm called as the adaptive histogram equalization algorithm. The image enhancement is a technique which is used to sharpen the mage or improve the contrast of the image and make it suitable for further analysis..

Since contrast of an image plays a major role in estimating or determining the quality of qn image. The image enhancement technique are commonly used for removing the noise, sharpening the image or brightening the pixels of the image, but in this process we go for brightening and sharpening of the image, such that the key features of the given image are easily identified. The type of adaptive histogram technique used in the process is the contrast limited adaptive histogram equalization which involves the usage of the adapthisteq function. The usage of adaptive histogram equalization eliminates the artificially induced boundaries found in the given image. The adaptive

Histogram equalization because the adaptive histogram equalization enhances the contrast of each title of the image which represent the small regions of the image.[4] But the histogram equalization technique which works on the contrast of the entire image. This equalization process is carried out to approximately match the specified histogram values of the given image, even in the areas where the contrast is found to be homogenous in nature.

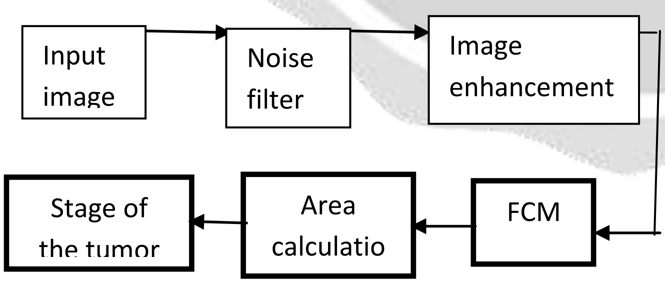

Fig.1 block diagram for lung tumor detection

Fig.1 represents the overall block diagram which shows the processes involved in the detection of the bronchogenic carcinoma.

4. AREA CALCULATION

The enhanced image is now made ready for calculating the area and stage of the lung tumor. The area of the lung tumor is calculatedusing given below formula:

AREA= (sqrt (p)*0.264)/100) (2)

The equation (2) represents the formula used for area calculation of the tumor where o.264 represents the resolution value of the standard camera used for capturing an image and P represents the value of the white pixel found in the image. The value of the white pixels is multiplied with the resolution value of the standard camera and the square root value taken for it. This square root value is divided by 100 to represent the area of image in centimeters.

Stages of tumor	**Tumor size**
Normal size	less than 0.1 cm
T2a	0.1cm-2cm
T2b	3cm and above

Fig.2 table for stage identification

Fig. 2 represents the tabular column which determines the stage of the tumor from the calculated area. If the area is less than 0.1 cm,[6] it denotes that the person is free of tumor. If the tumor size is between 0.1cm to 2cm, then the stage of the tumor is denoted as T2a. If the tumor size is 3cm and above, then the stage of the tumor is denoted as T2b

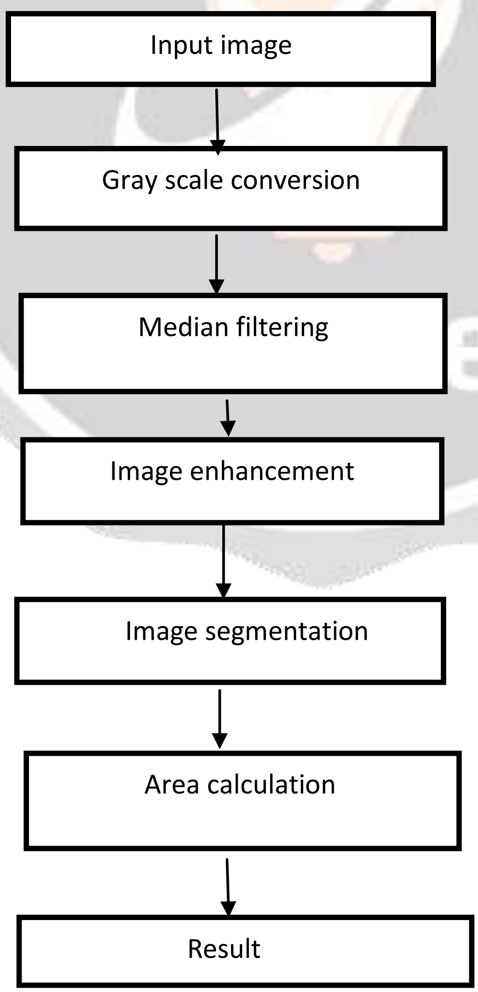

Fig.3 flow diagram for tumor detection

Fig.3 represents the flow in which the tumor detection process is carried out. Here the flow diagram not only shows the flow of the process, it also describes the order in which the detection process of bronchogenic carcinoma takes place.

5. RESULT

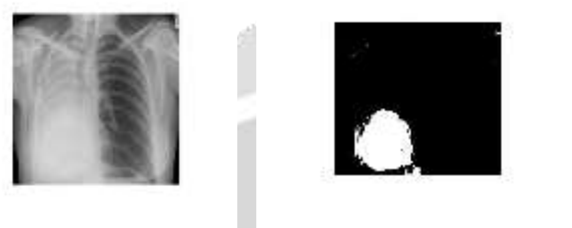

Fig.4 Input and Output for Tumor Detection

Fig.4. represents the example input image chosen for the process of the detecting the presence of tumor in the lungs. The next image found here represents the output obtained after the input image is sent through various stages of the image processing techniques. Here the result displayed shows the area calculated from the detected tumor and the corresponding stage is represented, according to the obtained tumor area.

6. CONCLUSION

This paper represents the detection process used in finding the presence of the tumor in the lungs. The input image chosen for this process is the X-ray image which consist of some RGB values. This image is then converted into the equivalent gray scale image for further analysis. Then the gray scale image is median filtered to eliminate the noise found in the image. The noise filtered image is then enhanced to improve the contrast of the image and the image is segmented into a particular number of images, depending upon the required number of iterations. This process is carried out to make the area calculation an easy one. The stage of the tumor is displayed at the output according to the area of the tumor. The result displays the area and stage of the tumor.

7. REFERENCES

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