

# A GSM based computer aided diagnosis system for lung cancer detection

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*Abstract: In the image processing the segmentation process is useful in medical field, transport, survey lines etc. In our proposed method we segment the tumour in lungs image. The MRI scan to take the lung images, is to identify the tumour details by doctors. Our aim of this paper is to recognize the tumour in the lungs by using the image processing technique and send that details from particular number. It helps to give the initial information about tumour. This information is area, perimeter etc., of the tumour. It helps to take the initial treatment for the patient.*

**Keywords:** *image enhancement, image segmentation, feature extraction, serial interface.*

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## I. INTRODUCTION

Now-a-days increased death rate is most commonly due to cancer. There are various types of cancers. The most dangerous among all the cancers is the lung cancer. Lung cancer is a disease of growing abnormal tissues forming a tumour. It is really difficult to survive if cancer is not detected in the early stage. Pain, breathlessness, cough are some of the symptoms of lung cancer. Cancer which starts in lung is called primary lung cancer. Lung cancer is further divided into two groups: small cell lung cancer and non-small cell lung cancer. The detection of tumour goes in 3 stages after collecting CT images of normal and abnormal tissues. The first stage is to enhance the image such that it is free from noise, corruption and interference. Gabor filter shows the desired results for this stage. The second stage is to segment the image which is used to change the representation of image into a meaningful manner. We use some segmentation algorithms. The most popular segmentation algorithm is watershed segmentation. The final stage is the feature extraction, the most important stage where we can detect and isolate desired portions and features of a given image. This stage also uses some algorithms in order to extract the features. Binarization and masking approach are the common techniques used in feature extraction stage.

## II. PROPOSED WORK

In our proposed method we use the watershed algorithm to extract the region and use feature extraction for segmented area to find the tumour area in the image. It helps to identify the tumour area and

perimeter easily. The enhancement method improves the pixel quality for correct segmentation. After extracting the information about tumour we send these details by some number using the GSM kit.

## III. EXISTING METHOD

In this project as we go through three stages of image processing techniques. Those are all follows:

### Image enhancement:

The pre-processing of image starts with image enhancement, the main aim of image enhancement is to improve the perception of information which is in the images or to provide a better input for automated image processing techniques.

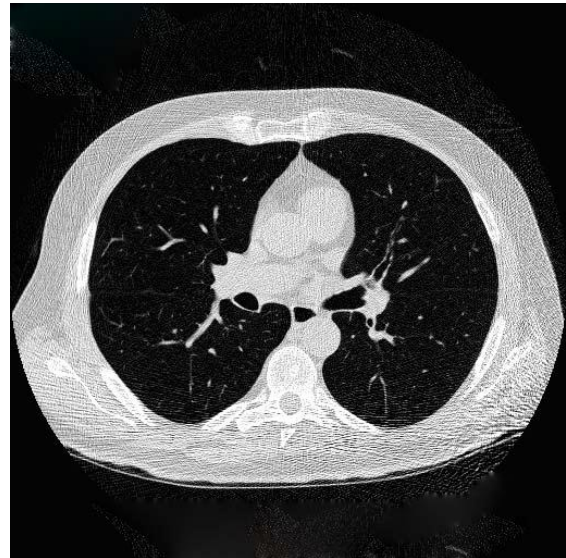
There are 3 types of image enhancement techniques that we use. They are Gabor filter; auto enhancement technique and fast Fourier transform techniques.

### Gabor filter:

A Gabor filter is a linear filter which is used for edge detection. The frequency and orientation representation of the Gabor filter is most similar to human visual system. So they have been found to be particularly for texture representation and discrimination.



(a) original image



(a) Original image

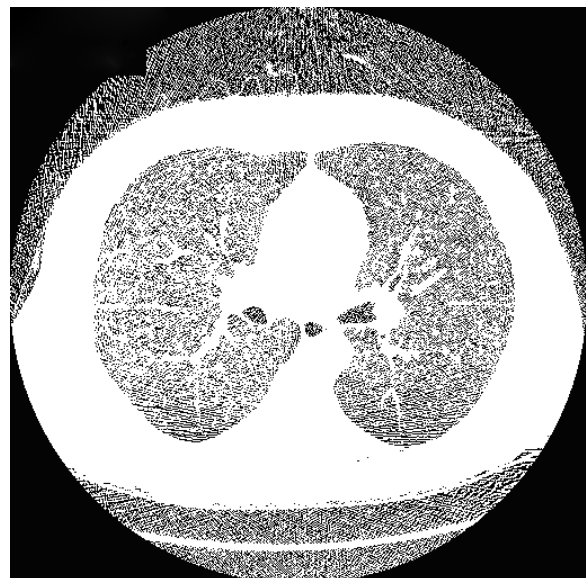


(a) Enhanced by Gabor

Auto enhancement technique has poor results compared with Gabor filtering and fast Fourier transform.

**FFT:**

Fast Fourier transform operates on the Fourier transform of an image. The frequency domain is a space where each image value represents amount of intensity.



(b) Enhanced by FFT

The below table shows the comparison of the three techniques used in image enhancement. Among them Gabor filter shows the best results.

Subject	Auto enhancement	Gabor filter	FFT filter
Sub1	36.88	80.22	45.52
Sub2	46.55	79.12	50.21
Sub3	34.90	78.23	45.76
Sub4	32.23	81.43	60.87
Final average	37.64	79.75	50.59

Table 1: sub and final averages of three techniques used for image enhancement

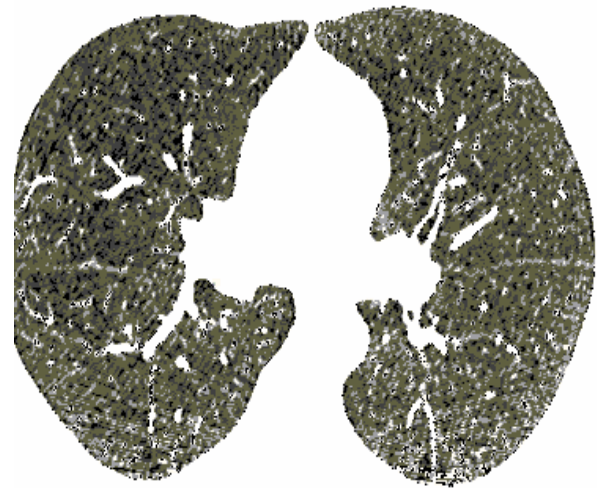
### Image segmentation:

Image segmentation is an essential process for image analysis. Many of the existing techniques for image description and recognition depend on segmentation technique. The goal of image segmentation is to simplify or change the representation of the image into a meaningful analysis. In the process of segmentation, each pixel is assigned a label of a given image such that the pixels with same label share certain characteristics. This shows that pixels in a given region are similar in specific properties like colour, intensity or texture.

Segmentation algorithms are mainly based on two properties of intensity values: discontinuity and similarity. The first property is to partition the image based on changes in intensity values. The second property is to partitioning the image based on predefined criterion.

### Thresholding approach:

The most powerful tool for image segmentation is the thresholding approach. The segmented image obtained from thresholding technique has smaller storage space, fast processing speed and ease in manipulation. This is a non-linear operation that converts grey scale image into a binary image where two levels are assigned to pixels below or above the threshold.



(a) Enhanced image by Gabor

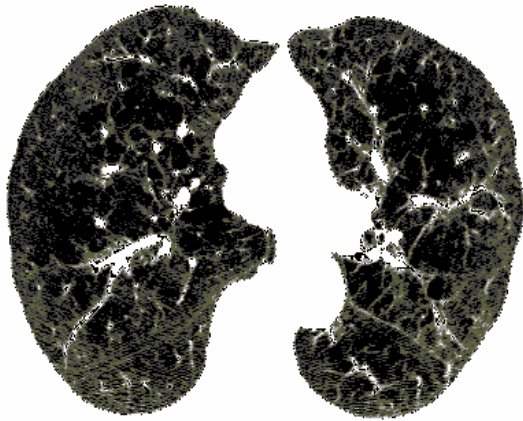


(b) Segmented image by thresholding

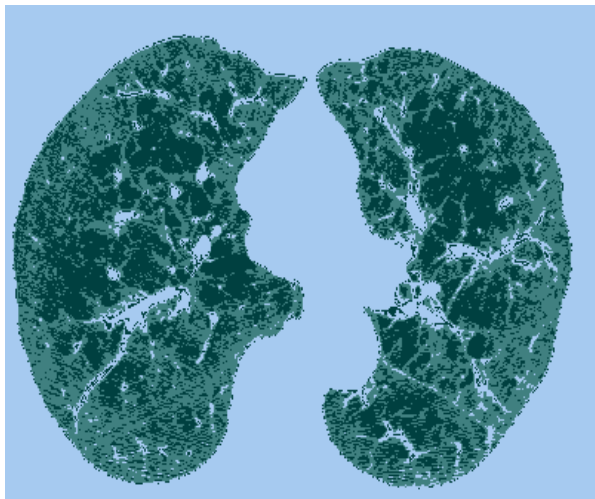
### Marker controlled watershed segmentation approach:

Separating touching objects is one of the most difficult image processing operations. Here watershed algorithm is often used. Image segmentation works according to our desired manner if we can identify background objects.





(a) Enhanced image by Gabor



(b) Segmented image by watershed

Subject	Thresholding approach	Watershed approach
Sub1	82.56	83.77
Sub2	81.34	82.12
Sub3	80.25	80.59
Sub4	79.23	82.91
Final average	80.84	82.34

Table 2: results of image segmentation

**Features extraction:**

Extracting the features of image is an important stage that uses algorithms to detect and isolate the desired portions or features of a given image. the probability of lung cancer presence can be detected by

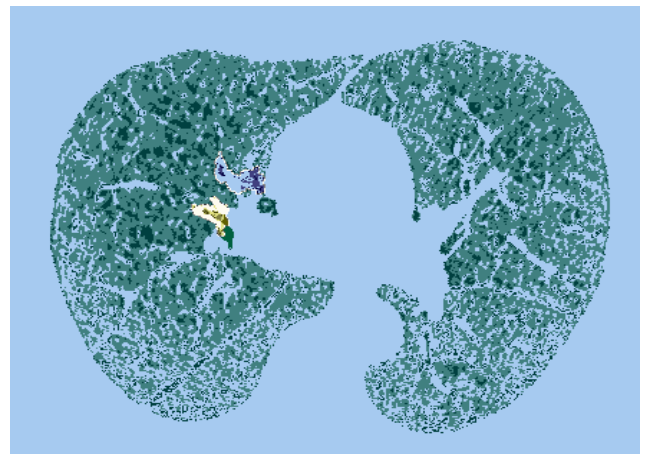
the following two binarization and masking.

**Binarization approach:**

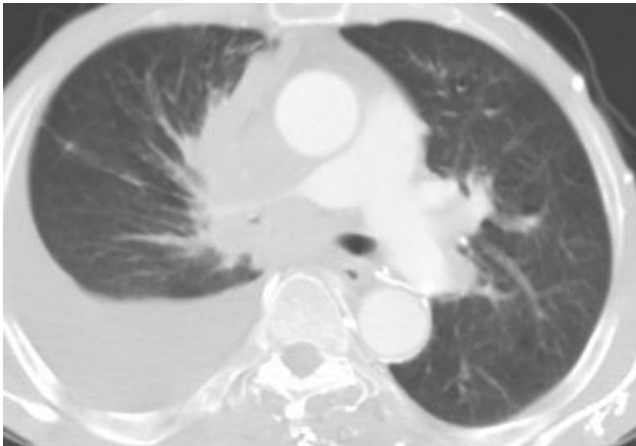
The main principle of binarization approach is that the number of black pixels is greater than the white pixels in normal lung images. So we count the number of black pixels in normal and abnormal images to get an average which is further used as threshold. So if at all number of black pixels of a new image is greater than the threshold then the image is normal, otherwise, if number of black pixels is less than the threshold then the image is abnormal.

**Masking approach:**

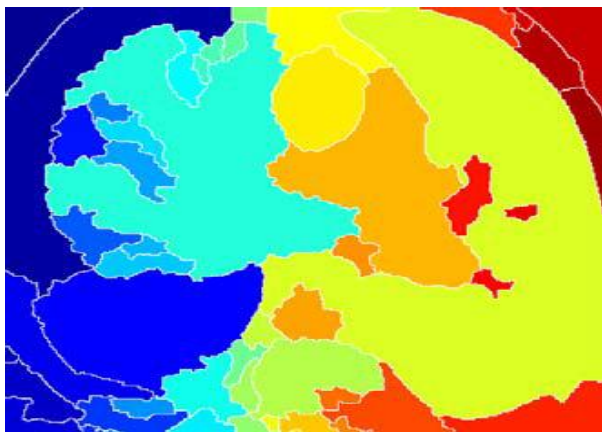
The main principle of masking approach is that there are some white masses which appear inside lungs whose increase in number in turn increase the percent of cancer. The appearance of solid blue indicates normal case whereas the presence of RGB indicates cancer.



(a) Normal image enhanced by Gabor, segmented by watershed



(b) Abnormal image



(c) Abnormality results

When the combination of binarization and masking approach are used together it leads us to take decision whether case is normal or abnormal.

#### IV.GSM BASED DIAGNOSIS

After extracting the features or physical parameters of the tumour such as area, perimeter and eccentricity etc., a COM port is connected between matlab and ARM 7 architecture based microcontroller. This provides a serial interface between matlab and ARM 7 board. The common interface used is UART.As soon as the interface is connected, on the matlab page, a notification is displayed like whether to send the extracted values or not. If the values are allowed to send, they are transmitted serially into the ARM 7

board .Then those values are sent to a desired number.

The main aim of this project is to send the extracted features of lungs to the concerned surgeon such that whenever doctor is not available, these details can be helpful for initial treatment of patient.

#### IV. CONCLUSION

We have successfully implemented the image developing techniques on MRI scan lung images to detect the abnormal tissues in cancer cells in early stage of the disease. The image obtained after segmentation is having a high accuracy. The extracted feature helps to analyze the tumors physical appearance. The COM port interface is used to transmit the physical parameters related to tumors to ARM 7 Architecture based microcontroller.

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