LUNG CANCER DETECTION

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Introduction

Cancer is one of most dangerous disease that causes deaths . Data obtained from Global Burden Cancer shows that in 2012 there are 14.1 million cases of cancer in the world, with lung cancer occupies the first position with a percentage of 13%. While the number of cancer deaths was recorded 8.2 million deaths, with lung cancer cause of death in first place with a percentage of 19% . The detection of lung cancer with general image processing techniques in CT scan data with good results and accuracy.

Scope of the Project

In this project, we implement and analyse the image processing method for detection of lung cancer. Image processing techniques are widely used in several medical problems for picture enhancement in the detection phase to support the early medical treatment. In this research we proposed a detection method of lung cancer based on image segmentation. There are four stages to determine whether there is a lung cancer or not. The first phase is we get CT scan image data. The second phase, we implement image enhancement to improve quality of image. The third phase is image segmentation which is an important step in the detection of cancer. The fourth stage is feature extraction that is give us a conclusion whether there is a lung cancer or not.

Methodology

Image Acquisitions

The imagery used is from CT scan database. The database for this project is taken from a free public source available at Cornell.edu, we have taken the “Public Lung Cancer Database”.
Now in this database there are data available for 10 patients, for each patient there are 250 images by the stages of the cancer(the CT scans have been captured over time for the particular patient).

Gabor Filter

Gabor filter named by Dennis Gabor, is a linear filter is used for edge detection. Representation of Garbor filter similar to the human visual system. In the spatial domain, 2D Gabor filter is a Gaussian filter function modulated by a sinusoidal function . In the process of this cancer detection imagery used is a 2D image, so using 2D Gabor filter.

$$G(\sigma,\theta,\lambda,\psi,\gamma;x,y) = \exp^{\frac{-(x'^2+\gamma^2 y'^2)}{2\sigma^2}} \cdot cos(2\frac{x'}{\lambda}+\psi)$$

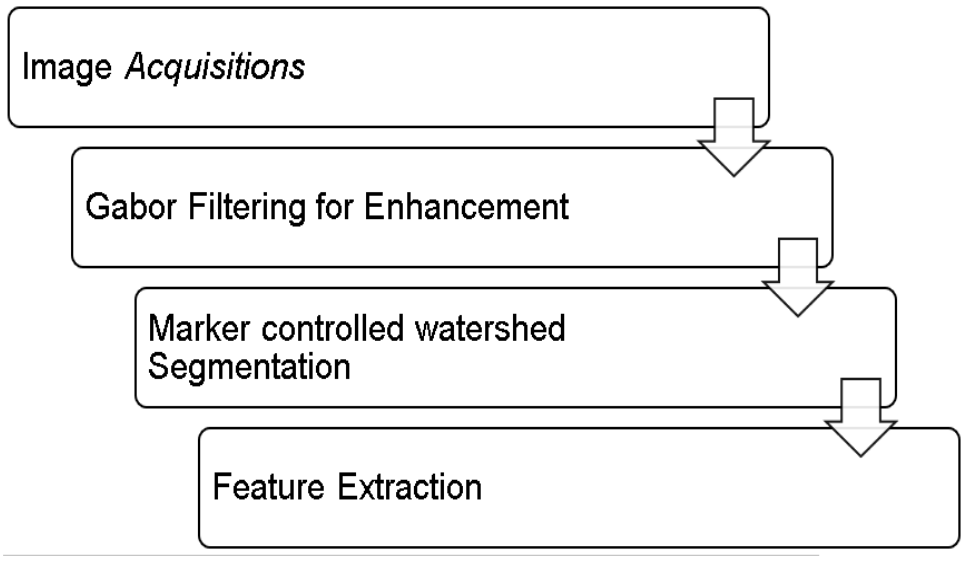
Marker Controlled Watershed

There are two main approaches in segmentation, including edge approach and regional approach. Watershed segmentation method combining both of this approach. Watershed method is a powerful method to get fast segmentation results. The basic idea of segmentation watershed transformation comes from geography, where an image is viewed as an earth surface (topography) with gray level as a measure surface height.

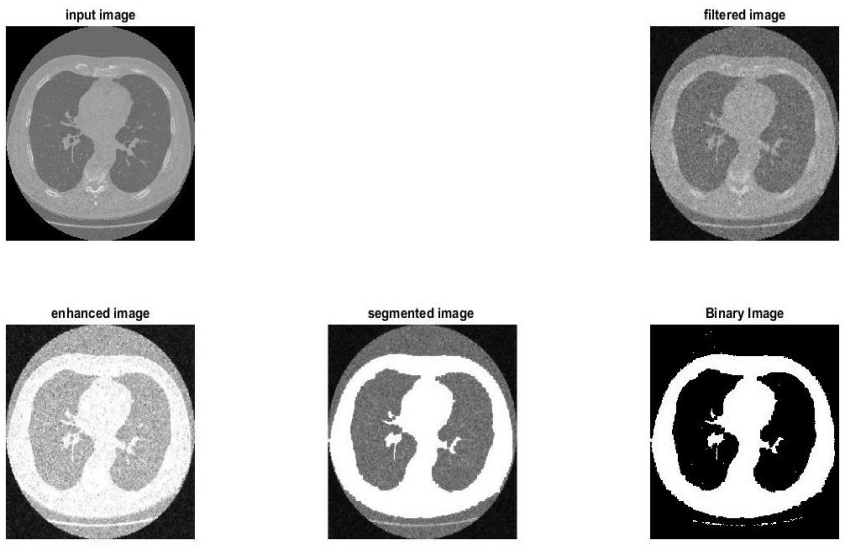
Binarization

Binarization is the process of changing the color of the pixel values into two classes , such as black and white. After getting the quantity of black and white pixels on segmentation results, then we compared it with a threshold value to determine the the condition of lung (normal or cancer). The threshold value is obtained from observations on normal lung. The threshold value that is used in this research is 17178,48. If the number of black pixels more than the threshold, then we conclude the lung is normal, otherwise the lung is cancer.

Flowchart



RESULT



Detection result of five sample patients.

Patient	Black pixels	conclusion
1	28504	normal
2	26661	normal
3	18673	normal
4	10399	cancer
5	13865	cancer

Conclusion

In this study we implement and evaluate image segmentation method for analyzing lung cancer, ,Marker Controlled Watershed. The results show that Marker Controlled Watershed give us the best performance in term of segmentation result . Furthermore, in the feature extraction stage, we use color attribute for the analysis of lung cancer using binarization. Finally, the binarization method was successfully determined condition of lung (normal or cancer) from the CT scan image.

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