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An investigation of Lung Cancer Detection & classification Techniques on CT scan images

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ABSTRACT

Lung cancer is the most acute type of cancer among all the cancers with less survival rate. It is very difficult to analyze the cancer at its early stage. In the past few years, many Computer aided systems have been designed to detect the lung cancer at its early stage. The most of work is implemented on the Computer Tomography (CT) scan images because of better clarity, low noise and distortion. In this paper, various techniques has been discussed for the detection of lung cancer and to classify whether it is benign or malignant.

Keywords: Image processing, CT images, segmentation, classification

1. INTRODUCTION

Lung Cancer is the uncontrolled growth of abnormal cells, start off in one or both lungs, usually in the line the air passages. It is very difficult to analyze the cancer at its early stage. In the past few years, many Computer aided systems have been designed to detect the lung cancer at its early stage.

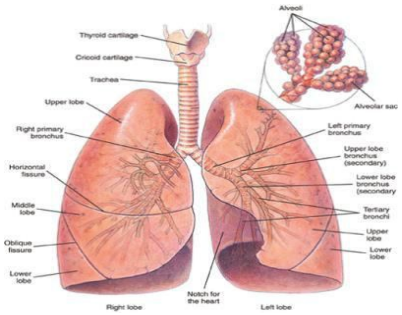

Figure1. Simple anatomy of human lungs

The abnormal cells do not develop into healthy lung tissue; they provide rapidly and form tumors. According to American cancer society the cases of lung cancer increases very rapidly and almost 14% newly diagnosed cancers are a lung cancer and also the main cause of cancer death worldwide. The previous study of diagnosis showed that the most of the lung cancer patients belongs to the age of 60 years. Lung Cancer is one of the most serious human body problems in the world. The death rate of lung cancer is Highest of all other types of cancer. The survival rate of lung cancer is very smallest among all types of cancer. So, there is a need to design a computational intelligence based approaches to detect the lung cancer because the survival from lung cancer is directly related to its growth at its detection time.

If we detect lung cancer at early stage, then there are more possibilities to survive the patients. It is also showed from previous study that cigarettes smoking are the main cause of lung cancer. It is observed that an estimated 85% of lung cancer cases in males and 75% lung cancer cases in females where cigarette smoking is the main reason. This proposed lung cancer detection and prediction system help to detect the lung cancer in its early stage and also to predict the lung cancer. Therefore, the survival rate of patient will increase. The purpose behind to designing this system is to predict and detect the lung cancer in its early stage on the basis on some factors and thresholding. We decrease the number of rule for testing in this system. This system reduce the time and cost required for various excessive medical test. The propose system is on web based due to this a rural site patient directly communicate with doctors and doctors will try to solve their questions (problems).

2. LITERATURE REVIEW

In various researches image processing techniques have been used to predict the lung cancer. Sharmaet.al.(2011) used lung CT scanned images extracted from NIH/NCI Lung Database Consortium and proposed an automatic computer aided diagnosing system for detection of lung cancer by analyzing these lung CT images. The authors of the paper have used various steps for the detection of lung cancer. Firstly, lung region was extracted from the computer tomography image using several image processing techniques such as bit image slicing, erosion and wiener filter. In the first step the bit image slicing technique was used to convert the CT images into a binary image then after extraction the region growing segmentation algorithm was utilized for segmenting the extracted lung regions. After segmentation of lung region they used rule based model to classify the cancer nodules. Lastly, a set of diagnosis rules were generated from the extracted features and with the help of diagnostics indicator. 80% accuracy was achieved using the proposed system. Annam Tariq et.al. (2013) has developed a computerized system, that was detected the lung nodules with the help of CT scan images. The computerized system comprises of two stages, first stage is lung segmentation and enhancement and second one is feature extraction and classification. The threshold segmentation technique was applied, for removing background and extracts the nodules from an image. When segmentation and extraction were completed, then a feature vector was used to - calculate the anomalous region. After that the regions were classified using neuro fuzzy classifier. This system gives the facility to detect the smallest nodules which lead to prior diagnosis of lung cancer.

3. PROPOSED SYSTEM

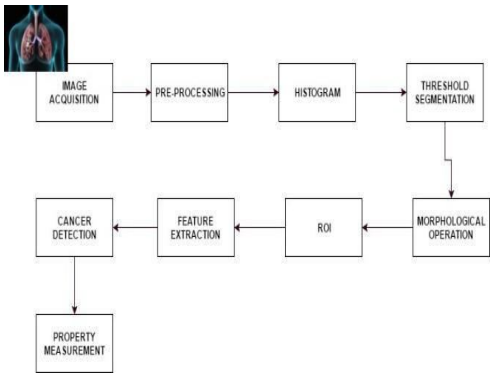

Figure 2: Block diagram for proposed system

a. Image acquisition

First collect CT scan images of lung cancer which are stored in mat lab. CT scan images have low noise so we select them. Computed Tomography having better clarity, low distortion and noise. CT scan images stored in database in JPEG/PNG format.

b. Pre-processing and histogram

Preprocessing is the process which is used to improve the characteristics of the input image.

Enhancement is used to improve the quality of images, for human viewer or to provide better input to image processing technique. We use histogram equalization technique for CT image enhancement.

c. IMAGE SEGMENTATION

Segmentation is nothing but the partition of image. Segmentation is typically use to detect object and boundaries of an image. We use threshold segmentation and morphological segmentation technique. Threshold segmentation extract seeds indication the presence of object or background at CT scan image. The marker location are then set to be regional minima typically gradient of the original input image and the morphological algorithm is applied.

- **Threshold segmentation**

Thresholding is the simplest segmentation method. The pixels are partitioned depending on their intensity value.

Global thresholding, using an appropriate threshold T

$$g(x, y) = \begin{cases} 1, & \text{if } f(x, y) > T \\ 0, & \text{if } f(x, y) \leq T \end{cases}$$

Variable thresholding, if T can change over the image. Local or regional thresholding, if T depends on a neighborhood of (x, y). adaptive thresholding, if T is a function of (x, y).

Multiple thresholding

$$g(x, y) = \begin{cases} a, & \text{if } f(x, y) > T_2 \\ b, & \text{if } T_1 < f(x, y) \leq T_2 \\ c, & \text{if } f(x, y) \leq T_1 \end{cases}$$

Otsu's method

Otsu**'**s method is aimed in finding the optimal value for the global threshold. It is based on the interclass variance maximization which is feasible method. The Otsu**'**s method can be applied also for the multiple thresholds segmentation (generally, double threshold).

d. Morphological Operations

Morphological operations are confident only on the associated ordering of pixel values, rather than their numerical values, so they are focused more on binary images, but it can also be applied to grayscale images such that their light transfer functions are unknown and thus their absolute pixel values are not taken into consideration. Morphological techniques verify the image with a small template called structuring element. This structuring element is applied to all possible locations of the input image and generates the same size output. In this technique the output image pixel values are based on similar pixels of input image with is neighbors. This operation produces a new binary image in which if test is successful it will have non-zero-pixel value at that location in the input image.

e. Feature Extraction

It is important stage in image processing technique .it detect desired portion or shape of an image. for the classification purpose we need the features as like area, perimeter, roundness, eccentricity.

f. Property measurement

In order to measure the properties of lungs cancerous region using roi (region of interest).base on the property the algorithm will classify the output images in to three different stages. (malign tumor, benign, non-tumor).

4. RESULT AND ANALYSIS

The experiments are conducted on the lung cancer detection system. The mat lab simulation output given below.

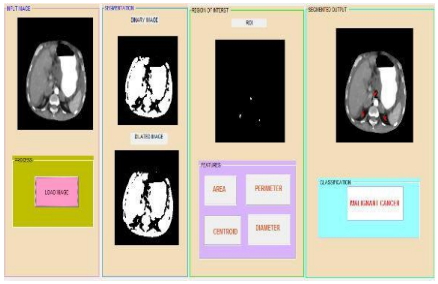

Figure 3: Malign cancer

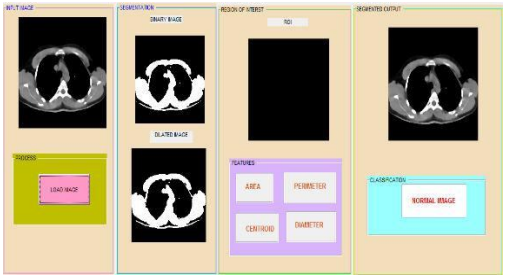

Figure 4: Without cancer (normal image)

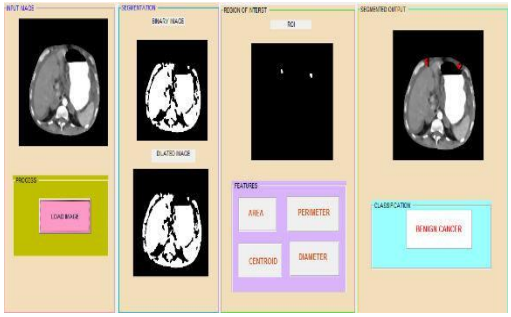

Figure 5: Benign cancer

5. CONCLUSION

Prediction of lung cancer is most challenging problem due to structure of cancer cell, where most of the cells are overlapped each other. The image processing techniques are mostly used for prediction of lung cancer and also for early detection and treatment to prevent the lung cancer. To predict the lung cancer various features are extracted from the images therefore, it achieved the high accuracy as compared to existing method. And the complexity of the system also reduced by using combination of thresholding segmentation with morphological segmentation.

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REFERENCES

1. National Cancer Institute, "The cancer imaging archive,"https:llwiki.cancerimagingarchive.net/display/Public/LlDC-lDRI, September 2011.

2. Sharma, D., & Jindal, G. (2011). Identifying lung cancer using image processing techniques. In InternationalConferenceonComputational Techniques and Artificial Intelligence (ICCTAI'2011) (Vol. 17, pp. 872-880).

3. Tariq, A., Akram, M. U., & Javed, M. Y. (2013, April). Lung nodule detection in CT Computational Intelligence in Medical Imaging (CIMI), 2013 IEEE Fourth International Workshop on (pp. 49-53). IEEE.

4. Chaudhary, A., & Singh, S. S. (2012, September). Lung cancer detection on CT images by using image processing. In Computing Sciences (ICCS), 2012 International Conference on (pp. 142- 146). IEEE. https://doi.org/10.1109/ICCS.2012.43

5. Hashemi, A., Pilevar, A. H., & Rafeh, R. (2013). Mass Detection in Lung CT Images Using Region Growing Segmentation and Decision Making Based on Fuzzy Inference System and Artificial Neural Network. International Journal of Image, Graphics and Signal Processing (IJIGSP), 5(6), 16. https://doi.org/10.5815/ijigsp.2013.06.03

6. S.Shakit Praveen, Dr.C.Kavitha, Detection of lung Cancer nodule using automatic region growing method", IEEE, International Conference on Computing, Communication and Networking,(2013)

7. Clark K, Vendt B, Smith K, Freymann J, Kirby J, Koppel P, Moore S, Phillips S, Maffitt D, Pringle M, Tarbox L, Prior F. The Cancer Imaging Archive (TCIA): Maintaining and Operating a 6, December, 2013, pp 1045-1057.

8. Anitha Chaudary, Sonit.S.Singh, Lung cancer Detection on CT images by using image processing",IEEE, International Conference on Computer Sciences, (2014).

9. www.wcrf.org: Ferlay J, Soerjomataram I, Ervik M, Dikshit R, Eser S, Mathers C, Rebelo M, Parkin DM, Forman D, Forman D, http://globocan.iarc.fr accessed on 30-03-2017.