International Journal of Computational Intelligence Research
ISSN 0973-1873 Volume 13, Number 5 (2017), pp. 955-964

http://www.ripublication.com

Lung Tumour Detection by Applying Watershed Method

Rekha Rani[1] and Suneet Gupta[2]
[1]Research Scholar, CSE, Mody University,
Lakshmangarh, Rajasthan, India.
[2]Assistant Prof, CSE, Mody University,
Lakshmangarh, Rajasthan, India.

Abstract

The prime motto of this paper is to calculate the performance about the system for description of lung tumor in patients using morphological operators.

Lung tumor detection in input figure focuses on classifying the affected images into malignant on behalf of the presence of tumor in them.

Different processes were applied to distinguish the cancerous cell of a lung with image pre-processing such as Gabor filter, image segmentation and feature extraction by using MATLAB.

The input data is processed using cleaning and thresholding techniques followed by applications of morphological operations to clearly extract out the place of infected area in the input pictures. Discrete features for different approximation and details coefficient are extracted for the input data by applying watershed method. The system is qualified applying artificial neural network. We are aiming to get more sensitive and accurate results by applying neural networks.

Keywords: Lung Tumor Image, Morphological operator, Thresholding, Watershed Method, Neural Network

1. INTRODUCTION:

The lungs are a couple of wipe with cone structure. The left sided lung has two fold and right sided lung has two projections. The right sided lung is bigger than the left

lung. The oxygen is given to lung by breathing in process. The lungs tissue exchange oxygen to circulatory system. The lung growth is a disorder of irregular cells duplicating and developing into a tumor malignancy cells can be changed from the lungs in blood. The lung malignancy frequently spread toward the focal point of the chest on the grounds that the characteristic stream of lymph out of lungs is toward the focal point of the chest. There is minute distinctive kind of lung disease and are isolated into major two classifications

- Small-scale cell lung
- Large-scale cell lung,

Large-Scale Lung Tumor has three sub kinds;

- Carcinoma,
- Aden carcinoma
- Squalors cell Carcinomas.

It is surveyed that lung tumor positioned second among guys and tenth among females.

We are aiming at performing various nearby investigations of morphological operators, Gabor Filtering and watershed technique. We passed the possible lung tumor images in three stages: pre-processing, feature extraction using morphological operator and watershed technique and at last, identifying lung tumor cell applying neural network; to achieve higher quality and accuracy in the developmental results.

2. METHODOLOGY :

Lung tumor is the biggest universal and risky tumor on the earth as indicated by period of reports defining the growth cell in the lungs, so the early recognition of the tumor play an important character in maintaining a strategic distance from actual propelled stages, which lessens its level of dispersion.

In this research, to acquire more actual outcomes we partitioned our work into the three phases:

2.1. Image Pre-processing

2.2. Feature Extracted by Morphological and Watershed Technique

2.3. Neural Network for arrangement

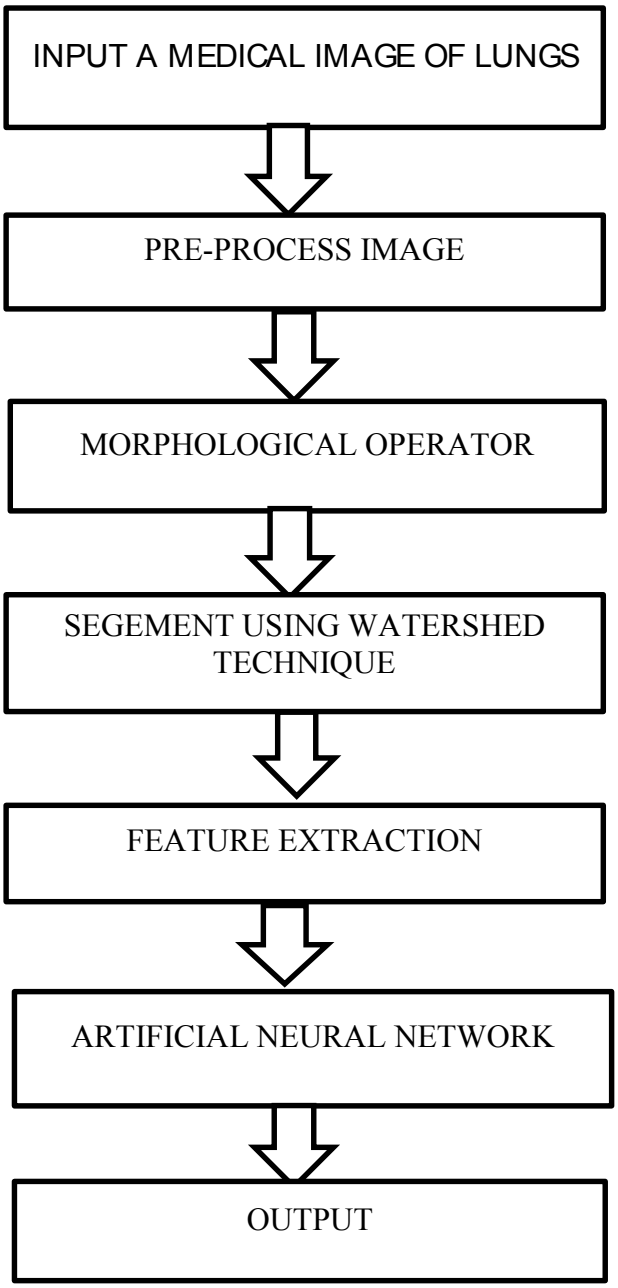

Fig.2.1. Block Diagram for Lung Detection Applying Watershed Method

2.1. Input Image :

In this methodology, we generate a database of 20 cancer infected images of lungs. Input picture with pixel size of 512 x 512 put away in a JPEG design will identifying lung tumor size and lymph node regions.

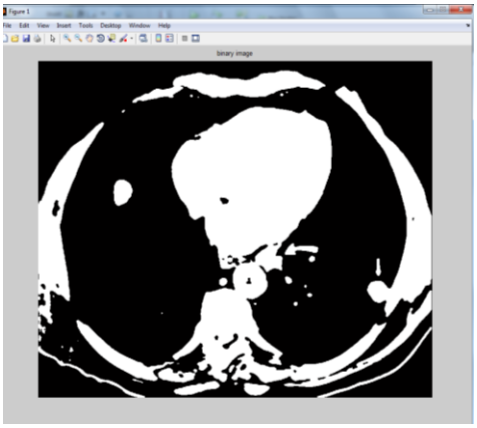

Fig 2.1 Binary Image

2.2. Pre-Process Image :

In further stage, we startup to modify image contrast level and grey values. Image distortion and image noise in the input images are detached in further preprocessing steps. The important point is to enhance interpretability or impression of data in pictures for human viewer, or to give better contribution to other computerized picture preparing procedures.

2.3. Morphological Operator :

The data need to be defined to a borderline or as a total area. It introduces to a defined operation where an object is hit with a structuring component and in this way decrease the additionally exposing shape. To design a structuring element specified by a shape structures, we apply Morphological operation. It includes erosion, dilation, filtering etc. In this proposed work morphological erosion and dilation have been applied to the enhance image to eliminate small unwanted pixel and image smoothing.

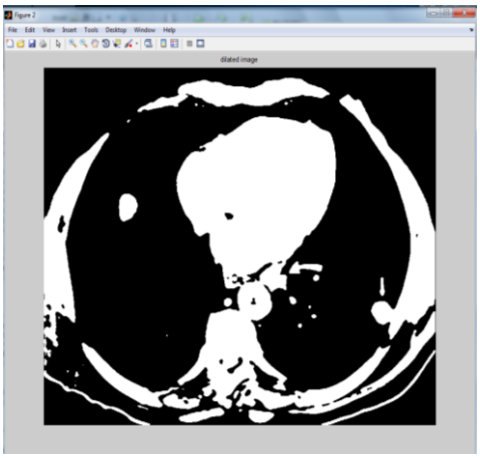

Fig 2.3.1 Dilated Image

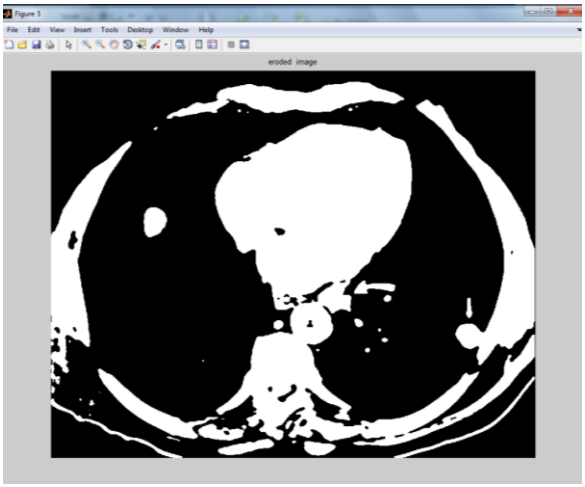

Fig 2.3.2 Eroded Image

2.4. Watershed Technique :

Segmentation using the watershed technique works well if the foreground objects and background regions are identified or marked. It is a simple, perceptive method and it is fast.

Watershed Division Method extracts seeds, which indicate the nearness of items or foundation at particular areas. There Marker areas are then set to be the local minima inside the topological surface and the watershed calculation is connected. The advantage of watershed division is that it creates an extraordinary answer for a specific picture input.

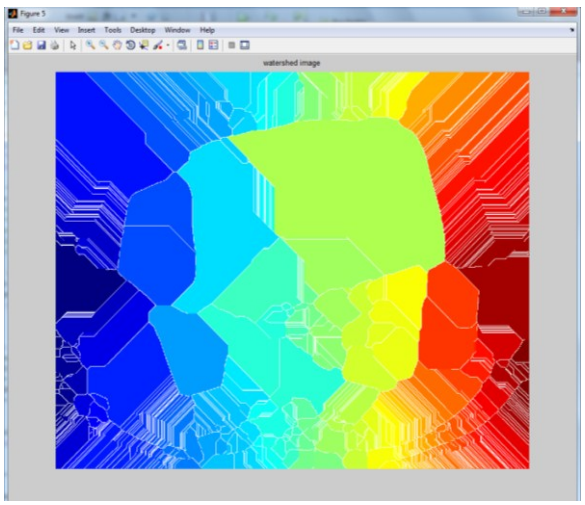

Fig 2.4.1 Watershed Image

After getting watershed image, the cancers are spotted out in input image.

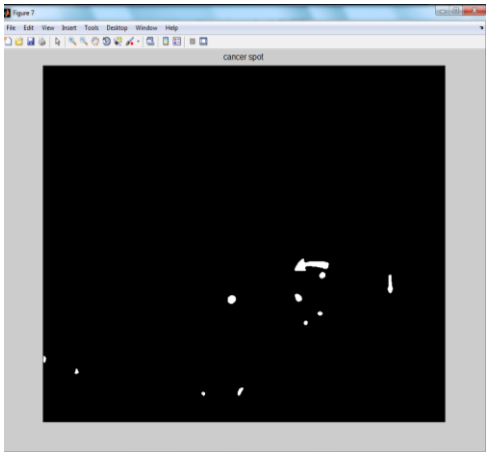

Fig 2.4.2 Cancer Spotted Image

For definitely visible cancer spot, Red mark color is used, so as to highlight the total no. of cancer present in given binary or input picture.

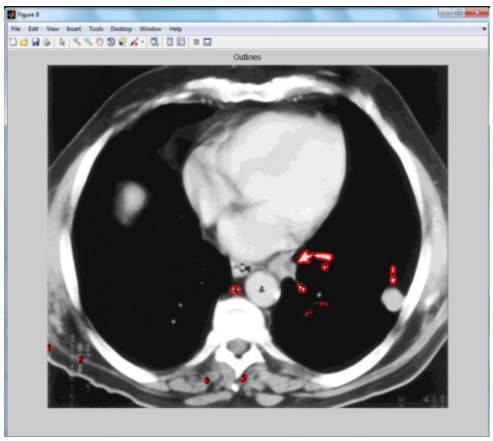

Fig 2.4.3 Cancer Outlined By Red Color In Input Image

2.5. Feature Extraction :

The next step in this method is to confine various preferred shapes or portions of the image. In picture handling, distinctive calculations are utilized to determine normality and abnormality of an image. The area, perimeter, centroid and diameter are important features helping to form the classification of tumor region. The features are:

2.5.1.Area:

It gives unmistakable pixel estimation of lung picture. The regions are marked with numeric number and area of that marked region is calculated in the input image.

2.5.2.Perimeter:

It gives the unmistakable number of pixel value at boundary of image. Values are obtained by summing interconnected lesion pixel and normal pixel at boundary of lung figure.

2.5.3.Diameter:

It defined the global length of the poisoned region in image.

2.6. Artificial Neural Network :

Artificial Neural Networks are exceptionally valuable in arrangement acknowledgement. Encourage forward manufactured neural systems with one invisible layer can estimated any capacities in any certainty.

A Neural Network is an extremely parallel and circulated method made up of sample handling units, which have natural interest for keeping test learning and building it accessible for future use.

It resembles into 2 aspects:

- Knowledge is procured by the system through the learning procedure.
- Interneuron association quality known as manufactured weight is utilized to store this obtained learning.

The Neural Network can be trained to perform pattern classification. The least complex neural system utilized for patter arrangement comprises of a layer input unit and a output unit.

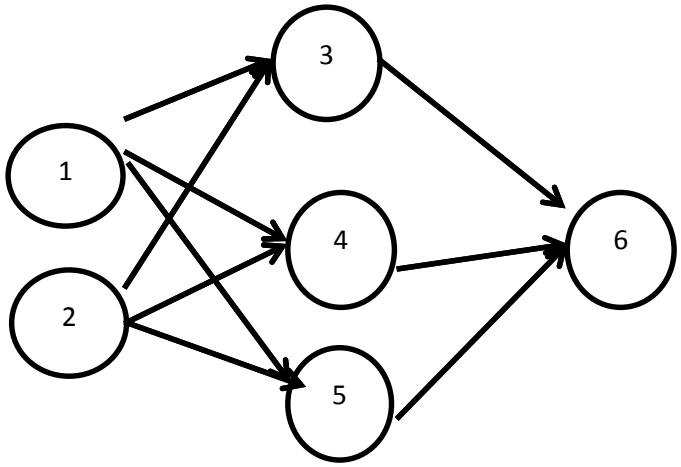

Fig 2.6.1 Neural Network

3. EXPERIMENTAL RESULTS :

The observation are tested on the lung tumor detection system (LCDS) with the input are pictures of malignancy lungs. Images are effectively prepared by each step in lung tumor detection and the outputs were obtained.

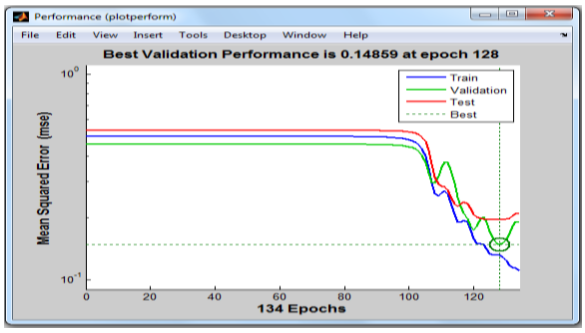

Fig 3.1 Performance Graph

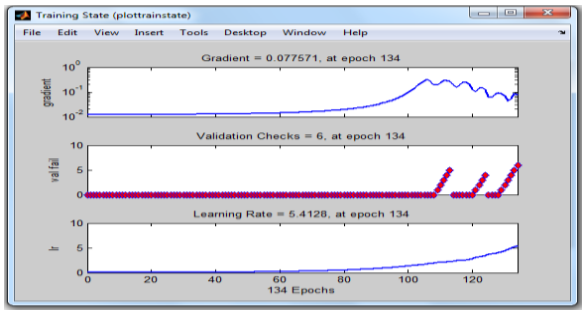

Fig 3.2 Training Graph

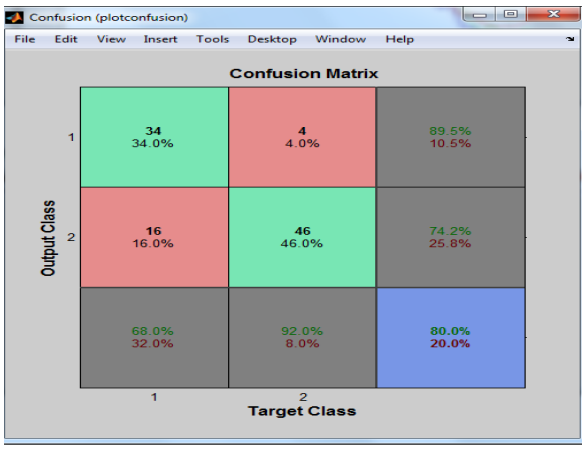

Fig 3.3 Confuse Matrix

4. CONCLUSION:

Watershed Division strategy can be utilized on a vast collection of pictures and in a expanded region of utilizations. The CT captured pictures are handled. The tumor is identified accurately from the initial input image. Gabor filter, morphological operator and watershed division gives best results for pre-processing stage.

From the extracted area of interest, four features are extracted i.e., area, perimeter, centroid and diameter. The outputs indicate that the tumors are of distinct dimensions. By measuring the dimensions of the tumor the lung tumor stage can be identified accurately applying the proposed neural network method. In view of this review it is clearer that watershed division method is useful for assessment of lung disease cell area.

5. FUTURE SCOPE :

The work can be extended by testing with various other neural network and comparisons can be made so as to relate the improvements in the observations, if any.

One can execute this method on some more pictures also. Expanding the quantity of pictures utilized for the procedure, can enhance the exactness. Additionally X-ray, X-beam, PET pictures can also be considered as input for this method.

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