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Preprocessing of Lung Cancer Detection Using Image Segmentation by means of Evolutionary Algorithm

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Abstract: The aim of this paper is to explore an efficient image segmentation algorithm for medical images to reduce the physicians interpretation of Computer Tomography (CT) scan images. Medical imaging techniques which are modern generate large images that are extremely difficult to analyze manually. In this paper, image preprocessing is done using adaptive median filter and contrast limited adaptive histogram equalization .For Segmentation five important methods are used and they are k-means clustering, K-median clustering ,Particle swarm optimization(PSO), inertia-weighted particle swarm optimization(IWPSO), and guaranteed convergence particle swarm optimization(GCPSO).We will verify it using matlab and will get that GCPSO will give more accuracy of about 95.89%.

I. INTRODUCTION

Lung cancer which is also known as lung carcinoma is a dangerous tumor. It is characterized by its uncontrolled growth of the cell in the tissues of the lung.In order to avoid spreading ,it is required to treat at its early stage itself.Otherwise there is a chance of spreading it to other body parts also.The primary factor for the cause of lung cancer is the habit of smoking.Almost 85% of the lung cancer occur due to this smoking only.The most conventional methods to detect lung cancer is Computer tomography (CT) and radiographs. So it is necessary to find a new robust method to diagnose the lung cancer as soon as possible.In this paper, lung image sample and five algorithm have been taken for the analysis. It is proved that the contrast limited adaptive histogram equalization and and guaranteed convergence particle swarm optimization (GCPSO) algorithm gives accurate result comparing with others.

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II. METHODS

It is considered that in image segmentation, the accuracy is more important, as it deals with human lives. It is difficult to find out the noise content and to improve the image before an examination. This section of the work is known as preprocessing. In the stage of preprocessing, two primary steps are noise removal and contrast enhancement . In the present study, adaptive median filter is used. The visual appearance as well as the image quality are improved by contrast limited adaptive histogram equalization. The next stage is segmentation. This stage is done using five methods and they are, k-means, particle swarm optimization(PSO) , k-median, GCPSO and inertia-weighted particle swarm optimization(IWPSO) . The tumor portion is extracted from the results of these five methods and compared to the manual extraction. We get that the GCPSO-based segmentation has more accuracy than the others. Figure 1 shows the process of operation for the present study.

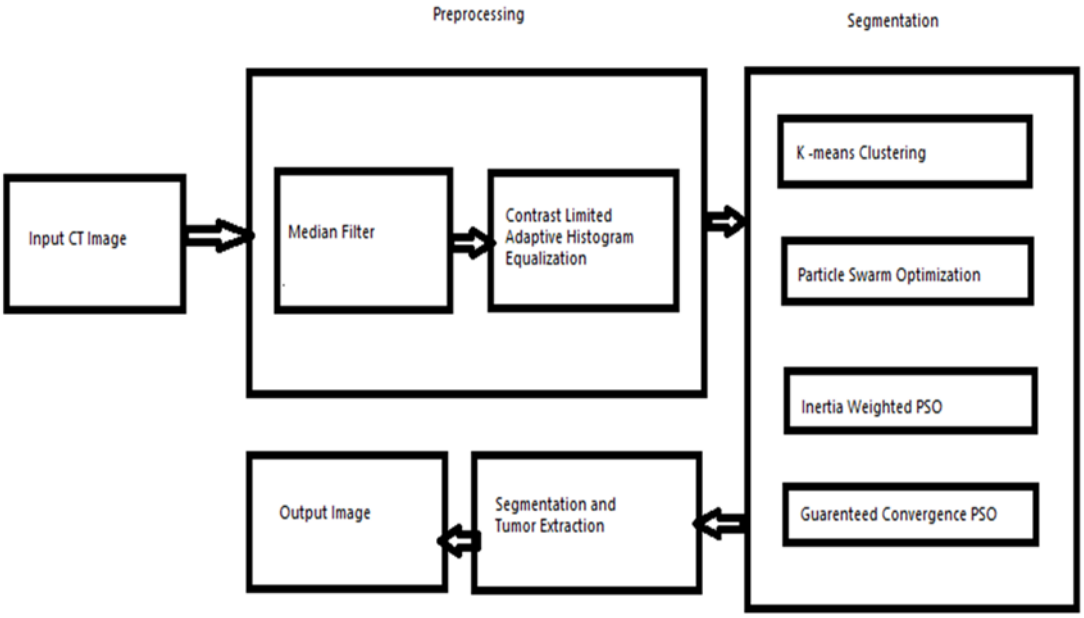


Figure-1

III. ADAPTIVE MEDIAN FILTER

Median filter helps to remove the noise and also helps to retain the sharpness of the images. The median value is used to replace each pixel. In this method a 3*3 window is used. It is one of the best filters which removes the noise among the conventional filters. Algorithm 1 given below is the steps involved in this filter.

IV. CONTRAST LIMITED ADAPTIVE HISTOGRAM EQUALIZATION

We use a technique called Image enhancement inorder to improve the quality of the image. In order to understand it easily, it is necessary to enhance the contrast of the medical images. Therefore, we use a conventional method for this called Contrast limited adaptive histogram equalization. The important steps used in this method are given in Algorithm 2.

(1) Let the input matrix "A" which has M rows and N columns.
(2) Construct a matrix with M+2 rows and N+2 columns by appending zeros to sides of the input matrix.
(3) Take a mask of size 3 by 3.
(4) Take place the mask on the first element.
(5) All the elements listed by the mask is to be selected and arrange them in ascending order.
(6) Get the median value (center element) from the sorted array and replace the element A (1,1) by the median value.
(7) The mask is slide to the next element.
(8) We have to repeat the steps from 4 to 7 till all the elements of matrix "A" are replaced by their corresponding median value.

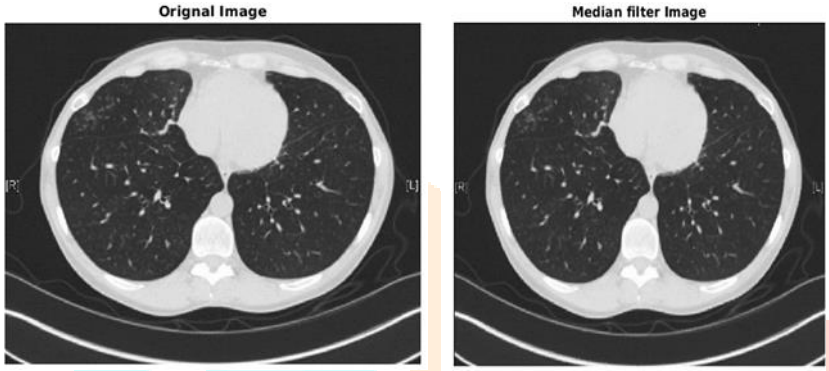
Algorithm-1

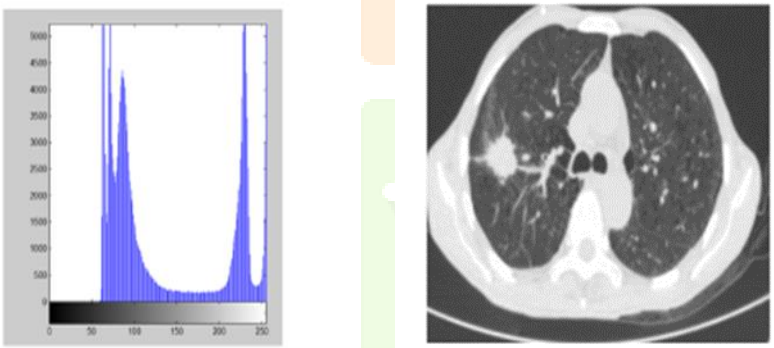
(1) Get the histogram for the input image and find the probability mass function.
(2) Find cumulative distribution function and from that , find the CDF according to gray levels.
(3) Find new gray levels by using equation;
CDF(new)=CMDF * (number of gray levels – 1).
(4) The new gray levels is to be mapped into a total number of pixels and the modified histogram is plotted.

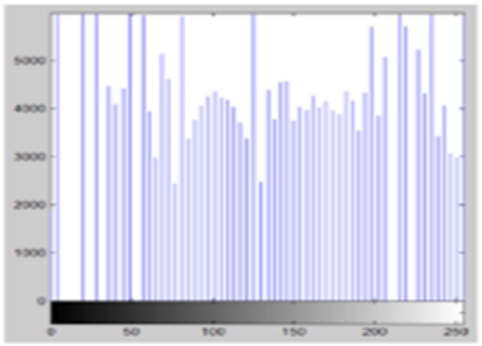
Algorithm-2

V. RESULTS AND DISCUSSION

The methods used in the preprocessing stages of this paper are practically implemented using MATLAB coding, and the results are verified.







VI. CONCLUTION

After preprocessing we are able to continue with the Segmentation and Extraction using the Evolutionary algorithms which are k-means clustering, k-median clustering, PSO, IWPSO and GCPSO.

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