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Research paper



Detection and feature extraction of CT lung tumor using cad system

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Abstract

A 64 slice computed tomography is used for treating pulmonary related embolism diseases.Pulmonary embolism is a condition which causes death for all age group people.In a decade analyzing, computed tomography technique is regarded as the minimally painful technique.In this condition basically there are five steps involved in it.The first step involved is segmenting the lung sec-tion.The second step briefly delivers about PE extraction using a mask of high intensity.The third step involves in extracting the features in the image.The fourth step is reducing the features using artificial neural networks.The fifth step involves a multi fea-ture system having k as its neighbor,which is helpful for classifying positive and negative differentiation.There are few other methods to improve the performance.:They use tobogganing algorithm and they use the method of grouping and it attained the sensitivity of 80%Other scoring methods are achieved and performance has been enhanced.It also improves CAD performance.

Keywords: *Lung; Feature Extraction; Detection; Pulmonary Embolism.*

1. Introduction

The aim of our present investigation is to find the number of affected pixels of the tumor. Compared to the previous algorithm which was region-growing our proposed algorithm i.e Back Propagation algorithm can detect more number of affected pixels[1].There are a number of features that are listed which are helpful for the surgeon in finding the intensity of the tumor. An image is selected from the database system. It undergoes preprocessing which includes noise filtering, contrast enhancement and global thresholding [2]. The image is segmented using Tobogganing algorithm.The region of interest (ROI) is selected and its features like entropy, correlation,dissimilarity energy etc are extracted of the selected area[3]. The number of affected pixels is calculated the features are enlisted using the GLCM algorithm.

2. Existing algorithm

Josefin Lennartsson , stated that "A drone associated with hospital which is fitted with a defibrillator is used to fly to emergency situations for helping victims suffering from myocardial infarction[6].It is used in a emergency disaster areas to deliver drugs,vaccines and medical supplies.A medical quadcopter which is equipped with oxygen cylinder to relieve from respiration diseases.It is basically used to supply oxygen.The existing methods are only used to measure one parameter.Due to ability of measuring one parameter,it is not able to measure many parameters.The measured health parameters will be intimated to the clinicians immediatel

3. Proposed method

The proposed method serves to compensate for the limitations in the existing method.The method uses back propagation algorithm which is much accurate than region-growing algorithm and the number of affected pixels found out by this algorithm is greater than the existing method.

4. Materials and methods

4.1. Tobogganing algorithm

In imaging method,segmentation is a very important tool for image extraction,measurement of image and it is used for diaplaying the image.Classifying the image pixels in to human anatomical regions such as cells,lesions,bones and muscles[4].To get better results in the lung segmentation process is done.Methods like lung segmentation are used to remove or take off the background and thoracic area.Lung segmentation undergoes basically two steps.First step is thresholding and the next one is 3 D based region growing step[5].Atfirst,each histogram value is computed.After that, reconstruction of lung segmentation is done using 3 D reconstruction algorithm[6].

5. Candidate extraction

It performs real and fake images,in a proper statistical framework[7].Rather than performing this the proposed method performs better than previous Case

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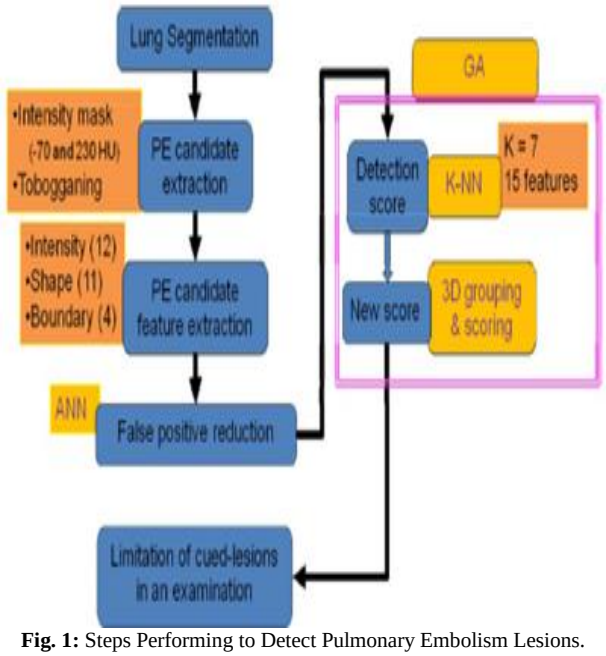


Fig. 1: Steps Performing to Detect Pulmonary Embolism Lesions.

6. Feature space reduction

Better classification of images is done using feature space reduction.Kernels are used to represent the data to perform classification.This algorithm is used to find the data values and kernel values,it is used to find the selection of the type,de-noising to get better classification.Mammogram images improves the overall performance when CAD techniques are used[8].In the final study,it is helpful to find the performance of pulmonary embolism lesion detection using CAD technology[9].

7. GLCM features

This statistical method defines accurately about the image pixels relationship [10].Many features like image clustering,correlation of data,dissimilarities between the images,sum average values,autocorrelation [11].

8. Results and discussion

We select the input image from the database which has a collection of images.

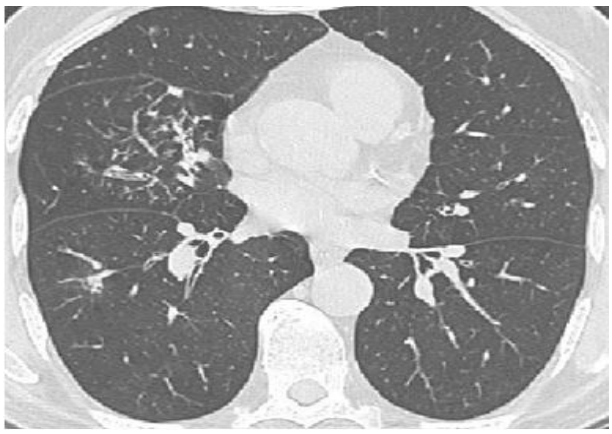


Fig. 2: Input Images.

In the next step we go for noise filtering.We remove the guassian noise by using guassian filter.The resultant image is guassian smoothened image.



Fig. 3: Smoothed Image.

Generally after filtering noise, the image gets degraded. Hence, in order to develop the quality of degraded image, we go for contrast enhancement. The resultant image converts into a high quality digital image from a low quality digital image [12].

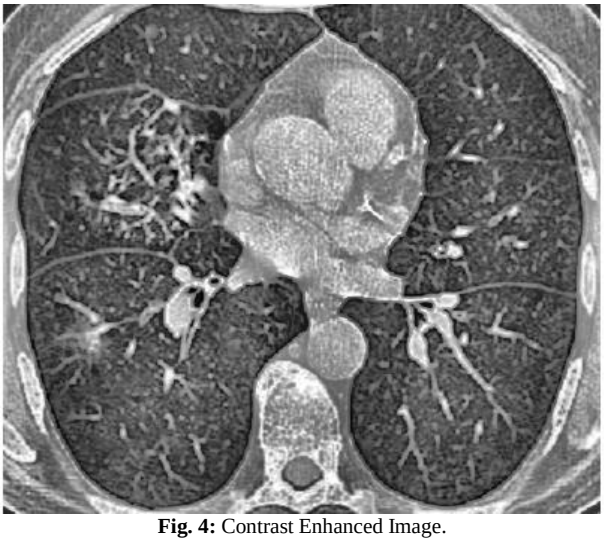


Fig. 4: Contrast Enhanced Image.

The resultant image undergoes thresholding by CLAHE (Contrast Limited Adaptive Histogram Equilisation).A Threshold of 0.5 is selected. The values which are greater than this are converted to white and the values which are less than 0.5 are converted to black.Thus the image converts into a 'black and white' form [13].



Fig .5: Global Thresholder Image.

After the global thresholding, the image goes for segmentation. In this process the unwanted areas are removed. Only the selected region of interest (ROI) is left which further reduces the chances of error.

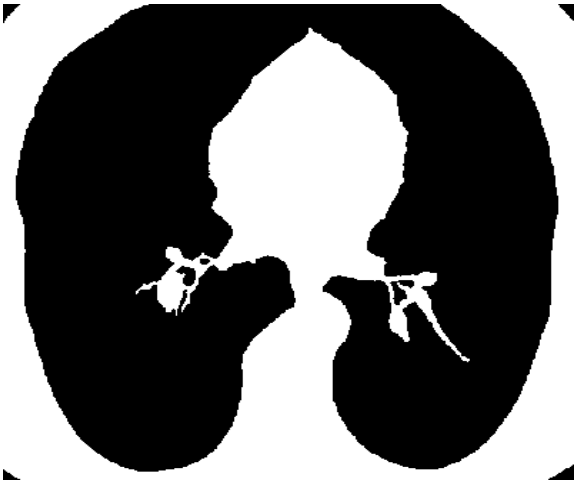


Fig .6: Segmented Output.

The selected region of interest is extracted and separated where the tumor is active. This will help in reducing the computation error.



Fig .7: 2-D Candidate Extraction.

The area which is left out is known as circulatory which is the black portion inside the figure. The white portion is the unwanted area. By double-clicking on the black portion the circulatory is selected and its features are enlisted.



Fig .8: (Disease Area Left of Left Lung).



Fig .9: Disease Area Left.

The circulatory left is undergone second order segmentation so that the unwanted white portion is removed and only the ciculatory artea is left.It is shown in White colour.

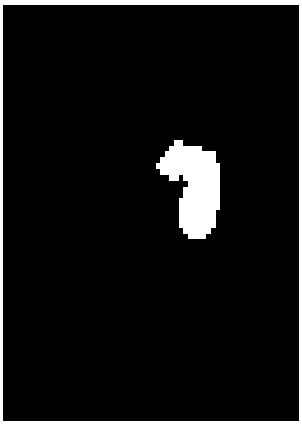


Fig. 10: (Feature Extraction of Left Lung).

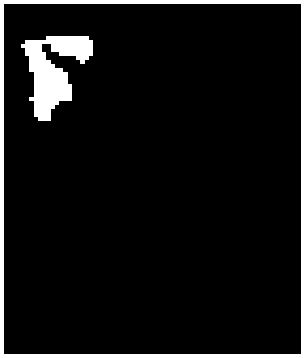


Fig. 11: Feature Extraction.

The Back Propagation curve gives the efficiency of the BPN algorithm.The graph is drawn between amplitude as y-axis and epochs as x –axis.

Table 1: Performance Curve

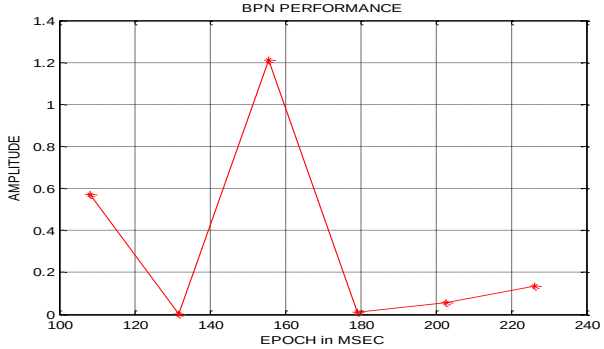


Table 2: Table Showing Enlisted Features of Right Lung

S.No	Features	Values
1	Autoc	[1.151105263157895e+0011.098364735158194e+001]
2	Contr	[3.404210526315789e+0004.511553501599716e+000]
3	Corm	[7.777241640776174e-001 7.059750444491357e-001]
4	Corrp	[7.777241640776174e-001 7.059750444491357e001]
5	Cprom	[2.646887377607911e+0032.472536386811299e+003]
6	Cshad	[2.496346537749115e+0022.352739309463498e+002]
7	Dissi	[4.863157894736842e-001 6.445076430856738e001]
8	Energy	[4.863157894736842e-001 6.445076430856738e001]
9	Entro	[6.227967374576793e-001 6.033475551338569e001]
10	Homom	[7.261216121564147e-001 7.751082709339201e-001]
11	Homop	[9.392105263157896e-001 9.194365446142908e-001]
12	Maxpr	[7.714035087719299e-001 7.596871667259154e001]
13	Sosvh	[1.313974523711623e+0011.329982976984647e+001]
14	Savgh	[4.714035087719299e+0004.719872022751511e+000]
15	Senth	[6.779661238227768e-001 7.113873225007701e-001]
16	Dvarh	[3.404210526315789e+0004.511553501599716e+000]
17	Dvarh2	[0 0]
18	Denth	[2.522753989678272e-001 3.073068349962957e-001]
19	Inf1h	[5.234568483551746e-001 4.230907072277163e-001]
20	Inf2h	[6.343540704618709e-001 5.851645695949519e-001]
21	Mxcch	[0 0]
22	Invdc	[0 0]
23	Indnc	[9.675789473684212e-001 9.570328237942885e-001]
24	Idmnc	9.698742431299489e-001 9.600747477734538e-001]
25	Idmnc	[9.698742431299489e-001 9.600747477734538e-001]
26	Circulatory Left	1.111111111111111e-001
27	Area Left	1.226375000000000e+003
28	Thickness Left	77

Table 3: Table Showing Enlisted Features of Right Lung

S.NO	Features	Values
1	Autoc	[1.151105263157895e+0011.098364735158194e+001]
2	Contr	[3.404210526315789e+0004.511553501599716e+000]
3	Corm	[7.777241640776174e-001 7.059750444491357e-001]
4	Corrp	[7.777241640776174e-001 7.059750444491357e001]
5	Cprom	[2.646887377607911e+0032.472536386811299e+003]
6	Cshad	[2.496346537749115e+0022.352739309463498e+002]
7	Dissi	[4.863157894736842e-001 6.445076430856738e001]
8	Energy	[4.863157894736842e-001 6.445076430856738e001]
9	Entro	[6.227967374576793e-001 6.033475551338569e001]
10	Homom	[7.261216121564147e-001 7.751082709339201e-001]
11	Homop	[9.392105263157896e-001 9.194365446142908e-001]
12	Maxpr	[7.714035087719299e-001 7.596871667259154e001]
13	Sosvh	[1.313974523711623e+0011.329982976984647e+001]
14	Savgh	[4.714035087719299e+0004.719872022751511e+000]
15	Senth	[6.779661238227768e-001 7.113873225007701e-001]
16	Dvarh	[3.404210526315789e+0004.511553501599716e+000]
17	dvarh2	[0 0]
18	Denth	[2.522753989678272e-001 3.073068349962957e-001]
19	inf1h	[5.234568483551746e-001 4.230907072277163e-001]
20	inf2h	[6.343540704618709e-001 5.851645695949519e-001]
21	Mxcch	[0 0]
22	Invdc	[0 0]
23	Indnc	[9.675789473684212e-001
24	Idmnc	[9.698742431299489e-001 9.600747477734538e-001]
25	Svarh	[4.351614692571162e+0014.223690058891931e+001]
26	Circulatory left	1.739130434782609e-001
27	Area left	1.121250000000000e+003
28	Thickness left	97

Comparing to the existing algorithm which was region growing,the affected number of pixels were 104650 whereas our proposed BPN algorithm gives more number of affected pixels which are calculated as 111344.This shows that the bpn algorithm is superior to the existing method used.The algorithm named tobogganing is used to detect accurately the regions of pulmonary embolism.A good sensitivity of 82% have been achieved by using a technique named 3D grouping method.While implementing artificial neural network with proper training procedures a ratio of about 96% have been achieved. After applying grouping method,sensitivity of the image drops from 80% to 78%.To achieve higher performance Region of convergence program has been applied to enhance higher performance.However,the performance is not satisfactory.After threshold has been detected sensitivity reaches to 80%.Finally the sensitivity reaches to 74%..Here,two experiments have been conducted.A complete dataset of nine CT examinations have been submitted.CAD techniques are used to detect lesions in a individual slicing of CT image.Three parameters have been measured.They are the maximum,minimum and average value of the images.We take the input as CT images of the infected lungs.We remove the different types of noises using filters specific to the noises present.We further use tobogganing algorithm in order to obtain the segmented output.The active region is segregated as the region of interest(ROI).Using back propagation algorithm we reduce redundant features by false-positive reduction.The GLCM gives a list of the features of the circulatory area of separate left and right lung.

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9. Conclusion

When a blood clot break from veins and travel through the walls of the heart,pulmonary embolism occurs.The proposed algorithm serves to find out more number of affected pixels and has a better detection sensitivity. Based on the scoring method, it can detect 21 features of the required region of interest (ROI) which are helpful for the surgeon in knowing the characteristics of the tumor.
The proposed study showed that

1) application of maximum scoring; grouping method
2) GA selecting the optimal features
3) This study implements to limit the number of PE lesions.This is helpful to improve the CAD performance in pulmonary embolism detection.

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