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Detection of Diverse Tumefactions in Medial images by Various Cumulation Methods

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Abstract - *Nowadays, the abnormal growth of tissues may cause tumor. The tumor starts from very little and cultivate within the less time. The brain tumor is dangerous disease, which is very hard to identify the tumor in brain. Fast growth of tumor cause cancer like lung cancer etc. The lung carcinoma is major disease. The intensity of brain tissues, edema and are appears like normal tissues it's difficult to detect tumor in brain. The imaging technology is necessary to use for detection of accurate tumor in medical images. Generally the brain tumor and lung cancer is detected by radiologists through MRI/CT image but it takes long time with less accuracy. Recently the imaging technology is improved and developed with various image processing techniques to study the details in medical images. Image processing is a progressive diagnostic tool for medical images. Based on imaging technology the efficient optimization method is introduced for detection of brain tumor and lung cancer. In this work the various optimization techniques are proposed for detection of brain tumor and lung cancer in MRI and CT images and also the various parameters like MSE, PSNR, Specificity etc are compared with Particle Swarm optimization (PSO) and Search based optimization.*

***Key Words*: Sensitivity, Optimization, MRI,CT, Tumor, Search based, PSO, Accuracy**

1.INTRODUCTION

In medical practices the perfect detection and recognition of tumor is very important in medical images like CT and MRI. The more techniques are considered by researches for detection of tumor in brain, the tumor extraction from brain in Magnetic Resonance images by using matlab [1]. The lung cancer is major problem the CT can recognize the malignant in lung. Some discoveries such as x-ray, Ultrasound, MRI, CT, PET and SPECT can generate biomedical images. By using image processing the lung (CT) image was detect the tumor [2].The intention of biomedical images is to diagnose the images. In biomedical, image processing considers the analysis of enhancement and displaying the captured images. Image processing can determine the malignant in lung with Computer Tomography scan [3].In this paper the main target of the proposal method is to collect the tumor accurately in both MRI and CT by using PSO and search based optimization.

2.LITERATURE REVIEW

In 2014, Kun-Huang Chen et.al proposed a work for the discovers a neoplasm by using a PSO method with the classifier C4.5 for process of gene selection of an image [4].The PSO is the technique of an optimization and the classifier is well define the fitness activity by using PSO algorithm for to justify the efficiencies of fitness. In PSO the random function is initialized. In 2014, Joel George R et.al works upon the lung cancer using PSO [5].The image is act of dividing by using two methods k-means and PSO algorithm, actually PSO solve the thresholding problem in segmentation of an image, the fitness is calculated, the GLCM feature extraction is used to bring out the tumor in lung. In 2015, E. Ben George et.al proposed a works upon the brain tumor (MRI) images by using cuckoo search algorithm [6]. In this work the complete brain is described by gray matter, white matter and tissues. Inside the active tumor the Necrosis (dead cell) is placed. The normal brain image (MRI) intensity levels is different when compare with the abnormal brain image. The tumor is defined through segmentation using Cuckoo search. In 2017, Giovanni L.F.da Silva et.al works on the recognition of lung cancer, the complete diagnosis is done by using evolutionary convolution neural network [7].The pre-processing of CT image done by ostu algorithm using PSO.

3.METHEDOLOGY

We proposed a particular way of doing for Brain segmentation (MRI) and lung (CT) for to discover the tumor .Previously lung cancer is detected by using SVM and optimization techniques[8].In this paper, we are proposing a method to detect tumor by using PSO segmentation technique and search based segmentation technique These techniques are applying on both MRI brain and CT lung image, after the segmentation the tumor will be segmented, SVM classifier is used to identify the image is normal or not perfect as shown in this proposed block diagram Fig.1.

In proposed system the tumor can be detect and find the accurate shape through following few steps, at first give an image as input it may be unaffected or affected image of brain or lung (MRI/CT).

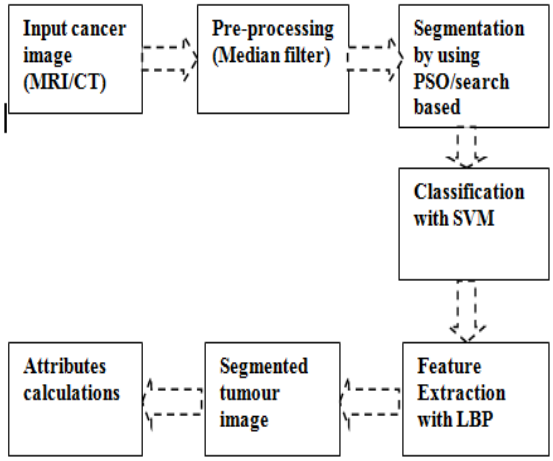

Fig-1: Block diagram of a proposed system

Normally image has its size and some blurriness even though it is looking clearly, so given input image is changed its size into 256*256. To remove the minimum blurriness in a image we have to use pre-processing, for to process an image, so many filters are there those are LPF, HPF, BPF, Mean filter and Median filter. In pre-processing the median filter, it removes the blurriness in image and finally getting the pre-processing output image or median filter output image.

The pre-processing image is segmented through optimization based segmentation process. The Particle swarm optimization (PSO) and search based optimization, Both algorithms are made use to partition the image separately into the few segments. The segmentation based identification of tumor in brain MRI image [9]. This process is followed in this paper for both MRI and CT, the segmentation based PSO and Search based optimization methods are applied on MRI (brain) and CT (lung) image. After getting the few segments of given image, the partitioned image will be undergo into the classification.

The classification is classifies the given image is affected with tumour or not. The Support vector machine (SVM) is a classifier, after completion of SVM training it can classify the image is tumour affected or not. For lung cancer detection the SVM based CAD systems are used to detect malignant perfectly [10].After the classification the image can be extracted by using feature extraction process. Local binary pattern (LBP) feature extraction is depends upon the texture. In brain the tumour detection part is classified by using wavelet and texture based NN [11].The texture and shift based LBP is used to define the tumour in MRI brain and CT lung. At first it obtains the lung part and next tumour image. Finally the tumour is found and obtain the parameters like MSE,PSNR, sensitivity ,specificity ,accuracy and processing Time. Finally compare parameter values of both PSO and Search based optimization, the search based optimization is obtained accurate shape of a tumour when compare with PSO.

3.1.Input image

The input image is in the form of DICOM format, this image can be converting into the JPEG format and resize the image, because the image is having more size, it requires more computing time for segmentation process and less picture quality. So the size should be resized into 256*256. The input images for this work using Brain (MRI) and Lung (CT) images received from diagnosis hospitals.

3.2.Preprocessing

Pre-processing, it's truly improves the clear appearance of an image. Every image has contained some noise and having some blurriness. To remove the noise and blurriness of input image through Median filters. The image is converted by using enhancement in both MRI and CT.

3.3.Median Filter

This is a sliding window spatial filter, it changes the middle value of a window with the median value of all the pixels. Due to changing the median of all the values through the middle value it avoids the noise and preserves the edges of an image, its one type of smoothening technique. It improves the quality of an image. There is no reduction in contrast, it doesn't shift boundaries and unrealistic values are not created near edges.

$$\text{Median}[C(x) + D(x)] \neq \text{median}\,[C(x)] + \text{median}\,[D(x)]$$

3.4.Segmentation Process

In segmentation the search based optimization and particle swarm optimization algorithm is need to detect the neoplasm in brain (MRI) and lung (CT) images. The both algorithms can archive the tumor from brain and lung images. The image can be segmented thoroughly and finally obtained the image in segments. The segmentation process is partitioning an image into the multiple segments, it is simply to convert the representation of an image and easy to analyze.

3.5.Classification

Normally the classification is classified that the input image is normal or abnormal. The Support vector Machine is a classifier, the features and values of tumor affected image and non tumor image is already placed in database, the intensity is also having in tumor affected image, the classifier examine the similarities between the given input image within the database if the tumor is identified while comparing the each pixels, it display the information in

dialog box the tumor is affected, after completing the SVM training. The process of classification is done by training and testing. Linear function is given by

$f(x) = w^T X + b$

3.6.Feature Extraction

The feature extraction is a major process in recognition applications and classifications, it is based upon the texture and shift in this work, normally several texture based feature extraction classifications are there, those are GLCM, LBP, SLBP..Etc. The Local binary pattern (LBP) is shift based feature extraction. The gray scale never change texture is measured and derived from explanation of texture in local region. It's an efficient texture operator, it labels image pixels by the threshold process from neighborhood of a pixel and represents in binary number. In this the tumor part is bring out from the lung and brain images.

4. OPTIMIZATION TECHNIQUES

The optimization is something doing better as fully perfect. The feasible region of an area is derived by set of coordinates and it satisfies the inequalities system, thus the region is satisfied by all the restrictions by a single series process scenario. This is the main concept of optimization technique. The optimization techniques are GA, PSO, EMO, ACO, ABC and search based optimization .In proposed work, search based optimization technique is introduced for segmentation based optimization, the PSO is existing system. The search based optimization is accurately works on both (MRI) brain and Lung (CT) images.

4.1.Particle Swarm Optimization

The Particle swarm optimization technique is used in multilevel thresholding method for segmenting images. The PSO can solve the threshold problem, it is used to discover the appropriate values of threshold and obtain a fitness function for target image. The analysis of techniques the CT lung cancer was detected in previous paper [8], it is following here using PSO technique. The PSO is population based optimization which is modeled from the community lifestyle of birds in flock. It consists of a swarm of particle where the particle is presenting a developing solution. Particle is swarm fly through the hyperspace and it is having two extremely important reasoning capabilities, each and every particle position on its distance from its own best position and amount of space from the best particle of swarm through search space. The main drawbacks of PSO, it causes less exact in regulation of its speed and direction. It requires more time to process. The particle position is change by adding the velocity:

$$x_i(t+1) = x_i(t)+v_i(t+1)$$

4.2.Search Based Optimization

The search based optimization is proposed to approach the near optimal solutions for the problem. The search based optimizations has contained more optimization techniques, in those the search based algorithm is proposed in this work. The Search based optimization, it is an algorithm and it has an ability to enhance its search for an optimal solution within time. The optimization technique follows a lifestyle of a bird family. It's a Meta heuristic, the does not make nests for laying eggs and it lays eggs in other birds nest. This technique is inspired by the bird. The bird lays the eggs within the specific region, this behavior is called as egg laying radius [6]. The behavior of bird is used to find difficult solution for different optimization problems. Every egg in nest shows a solution and bird egg shows a new solution. Each egg lies from 5 to 20 eggs. Thus values can be named as higher and lower limit of dedication of egg at each bird at different iterations. The habit of bird is maintaining a maximum amount of area is empty from their habitat, it's nothing but an egg laying radius (ELR).

$$ELR=\alpha*\frac{Number\ of\ current\ cuckoo\ eggs}{total\ number\ of\ eggs}*(var_h-var_l)$$

Generate initial solutions in nest
While
Generate cuckoo with levy flights
Evaluate fitness of input image
Select a nest randomly
If Pj<Pi then
Replace the host with best solution
End if
Keep the best solutions as nests
Rank the solutions and find the best
Pass the best solution to the next generation
End while
The Gbest has the optimum label.

The search based optimization upon the three perfect rules:

i) Each and every bird lays only one egg at a time and dumps the egg randomly in chosen nest.
ii) The best nest having high quality eggs, those are solutions it will carry to the coming generations.
iii) Fix the available number of host nests and host can discover a strange and frightening egg with the probability. The important advantage of search based optimization is that it is robust and generic.

5.EXPERIMENTAL RESULTS

Some of the tumor contained MRI brain tumor and Lung cancer CT images are tested through proposed optimization algorithm using MATLAB simulation.

The fig.2 describes the input images as MRI brain tumor image and (CT) Lung cancer image. The images have contained some noise , to remove the noise the median filter is required in preprocessing.

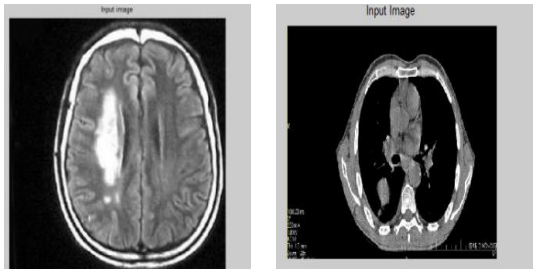

Fig-2: Input images of (MRI) Brain tumor and CT lung cancer

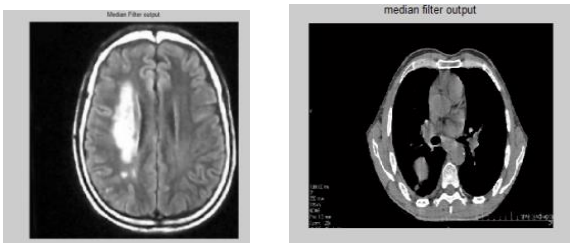

Fig-3: Median filter output for (MRI) brain tumor and (CT) lung cancer images

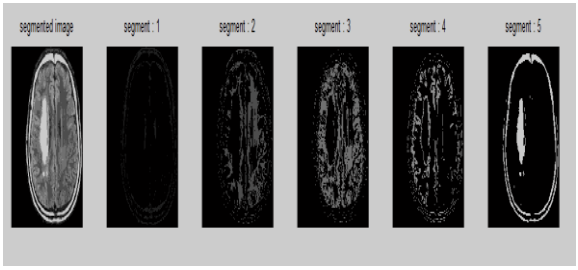

Fig-4: Segmentation of MRI brain tumor image with PSO

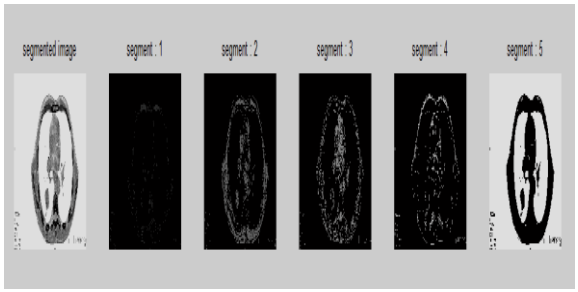

Fig-5: Segmentation of CT Lung cancer image with PSO

The median filter output is taken as input to the segmentation process with particle swarm optimization technique and segments the image into the 5 segments as shown in fig.4 segmentation of brain tumor (MRI) image and fig.5 segmentation of lung cancer (CT) image.

Fig-6: segmented the tumor part from MRI brain tumor image and CT lung cancer image

The tumor part is segmented through Particle swarm optimization technique.

5.1.Statistical values for PSO

Table -1 : Attributes for PSO

Parameters	MRI Brain tumor image	CT Lung cancer image
Specificity	70	71
Sensitivity	86	89
Accuracy	90	91

Consider the above MRI brain and Lung CT original images in fig.2.And the original images are pre-processed by using median filter to get good quality appearance in images as shown in fig.3 as median filter images.

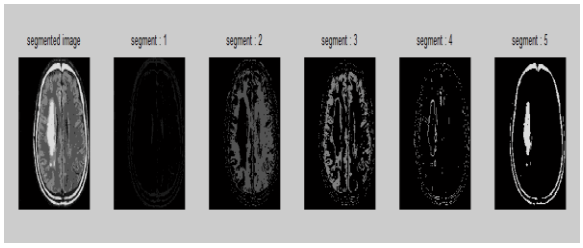

Fig-7: Segmentation of MRI brain tumor image with Search based optimization

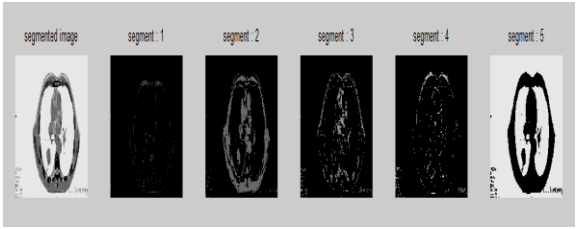

Fig-8: Segmentation of CT lung cancer image with Search based optimization

The search based segmented technique is used to segment the brain (MRI) and lung (CT) into few segments shown in fig.7 and fig.9.

Fig-9: Segmented tumor part from MRI brain image

5.2.Statistial values for Search Based Optimization

Table-2: Attributes for Search based optimization

Parameters	Proposed method (search based optimization for MRI brain image
Specificity	69
Sensitivity	90
Accuracy	92

The attributes calculations for search based optimization in MRI brain, The sensitivity is high than the specificity so we can identify that the person is in sick and accuracy is 92% is obtained.

The PSNR values are obtained those are better than the PSO PSNR values and the MSE values are very less, due to this we can define the given image is in good quality. The processing time is mentioned to distinguish the time which method is using more time for process.

5.3.Comparision of Statistical Values

Table -1: Attributes comparison of PSO and Search based Optimization

Parameters	MRI brain image with PSO	CT Lung cancer with PSO	MRI Brain image with Search based optimization
Specificity	70	71	69
Sensitivity	86	89	90
Accuracy	90	91	92

The statistical values are obtained through optimization algorithms of Search based optimization and PSO. By comparing the Search based optimization parameters with PSO, the search based accuracy is 92 for brain and PSO is having less accuracy, the processing time is less than the PSO.

6.CONCLUSION

In this paper, the search based optimization technique and particle swarm optimization technique is used for segmentation. These techniques are applied on both brain (MRI) and Lung (CT) images for identification of lung cancer and brain tumor. Initially the images are smoothened and enhanced by using median filter. The search based optimization method for segmentation results is compared with the Particle swarm optimization method (PSO), the search based segmentation performs accurate segmentation of tumor in both Brain (MRI) and Lung (CT) images. The processing time requires for Search based is less than the PSO, comparing the statistical values for accuracy, specificity and sensitivity.

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