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ADAPTIVE FUZZY C-MEANS ALGORITHM FOR IMAGE SEGMENTATION AND CLASSIFICATION USING SVM

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Abstract – *The rising growth of internet function, the need for earlier detection of affected area helps in treatment of tuberculosis in efficient manner. There exist several methods for extracting the features by clustering the information. In older system, clustering were done in several other ways but they were not sensitive to the noises which usually lead to an un-ideal segmentation result. For overcoming these drawbacks, a noise detecting-based adaptive FCM algorithm for image segmentation is proposed in this study. The most attractive and latest way of clustering is Fuzzy C- Means (FCM). A cluster is therefore a collection of objects which are "similar" between them and are "dissimilar" to the objects belonging to other cluster. The main aim of this paper is to reduce noise effects in the process of image segmentation where FCM plays major role in de-noising and maintaining detail information. Also the image transforms are widely used in image filtering, data description, etc,. Nowadays the wavelet theorems make up very popular methods of image processing, de-noising and compression. As the Haar functions are the simplest wavelets, in this study Haar Wavelet Transform (HWT) are used in many methods of discrete image transforms and processing. In addition, at the output side Support Vector Machine (SVM) algorithm is used, this classifies the image by comparing the features of given image with that of the trained image.*

Key Words: ***Fuzzy C- Means (FCM), Support Vector Machine (SVM), Haar Wavelet Transform (HWT), Tuberculosis (TB)***

1. INTRODUCTION

Tuberculosis (TB) is a potentially serious infectious disease that mainly affects our lungs. The bacteria that cause tuberculosis are spread from one person to another through tiny droplets released into the air via coughs and sneezes. Early diagnosis helps in curing tuberculosis a little bit soon. So this is done by Image segmentation followed by applied transforms like Haar Wavelet Transform, clustering the segmentated image for feature extraction and finally classifying them by using Support Vector Machine.

Image segmentation is the process of partitioning a digital image into disjoined, meaningful regions. The meaningful regions may represent objects in an image of three-dimensional scene, regions corresponding to industrial, residential, agricultural, or natural terrain in an aerial recognizance application, and so on. Many clustering methods have been applied to image segmentation, including fuzzy clustering which has been developed owing to the theory of fuzzy sets. A cluster is therefore a collection of objects. Types: K-means, Fuzzy c- means, Hierarchy, Mixture of Gaussian.

In this study Fuzzy C- Means algorithm is been used. FCM is a data clustering technique in which a dataset is grouped into n-clusters with every data point in the dataset belonging to every cluster to a certain degree. For example, a certain data point that lies close to the center of a cluster will have a high degree of belonging or membership to that cluster and another data point that lies far away from the center of a cluster will have a low degree of belonging or membership to that cluster. This algorithm is meant for only two values, those are "0" and "1". It corresponds to true or false. Fuzzy control, which directly uses fuzzy rules, is the most important application in fuzzy theory. 1**.** Fuzzification **-** This involves a domain transformation where crisp inputs are transformed into fuzzy inputs. 2. Interference engine – It is used to apply rules, those rules are: Negative minimum, Negative maximum, Positive minimum, Positive maximum, Minimum, Maximum, zero. 3. Defuzzification - is the process of producing a quantifiable result in Crisp logic, given fuzzy sets and corresponding membership degrees.

The Haar functions are the simplest wavelets, these forms are used in many methods of discrete image transforms and processing. It is an algorithm used for extracting the features. A feature is defined as an "interesting" part of an image, and is used as a starting point in main primitives for subsequent algorithms. The most important types of features which can be considered when trying to identify the signs are spatial, temporal and textural**.**

Support vector machine" (SVM) is a supervised machine learning algorithm which can be used for both classification and regression challenges. However, it is mostly used in classification problems. In this algorithm, we plot each data item as a point in n-dimensional space (where n is number of features you have) with the value of each feature being the value of a particular coordinate. Then, we perform classification by finding the hyper-plane that differentiates the two classes very well. While SVM

helps in classifying and identifies whether the image is defected or not defected.

2. RELATED WORK

In 2016, Avinash. S and Dr .K .Manjunath **"An Improved Image Processing Analysis for the Detection of Lung Cancer using Gabor Filters and Watershed Segmentation Technique"** An image improvement technique is developed for earlier detection or identification of lung cancer disease for diagnosis and also for treatment. The image presentation based on Gabor function constitutes an excellent local and multi-scale decomposition in terms of logons that are simultaneously localization in space and frequency domains. Marker driven watershed segmentation technique extracts seeds that indicate the presence of objects or background at specific image locations. The results of healthy person and diseased persons are compared, and results are found to fruitful. Hence, this proposed method of Improved Image Processing Analysis for the Detection of Lung Cancer using Gabor Filters and Watershed Segmentation Technique helps in earlier detection of lung cancer disease.

In 2015, Farli Rossi and Ashrani A. Abd. Rahni **"Combination of Low Level Processing and Active Contour Techniques for Semi-Automated Volumetric Lung Lesion Segmentation from Thoracic CT Images"** In this paper, we propose a semi-automated segmentation method for extracting lung lesions from thoracic Computed Tomography (CT) images by combining low level processing and active contour techniques. To evaluate its accuracy, the Jaccard Index (JI) was used as a measure of the image of the segmented lesion compared to alternative segmentations from the QIN lung CT segmentation challenge. The results show that our proposed technique has acceptable accuracy in lung lesion segmentation with JI values between 0.837 to 0.956, especially when considering the variability of the alternative segmentation

In 2015, Shraddha Gangwar and Dr.R.P.Chauhan "**Survey of Clustering Techniques Enhancing Image Segmentation Process**" Image segmentation is considered to be a wider term as a necessary requirement for the evolution of the necessary data out of the given image. Till today, there have been a lot of methods incorporated to enhance the process. One basic step arises called the clustering technique which enhances the process of image segmentation. Since Clustering method gives the way to select the groups or zones efficiently so they are much in demand. Here, we classify and describe the various available clustering methods available till date which can be examined and manipulated according to the use and demand of the required image processing model. Here, we supply the evolution of the clustering techniques from simplicity to complexity describing their pros and cons. This paper will be helpful to all the researchers who want to apply one of the clustering methods to their research model.

In 2015, R. GeethaRamani and C. Dhanapackiam "**Automatic Localization and Segmentation of Optic Disc in Retinal Fundus Images through Image Processing Techniques**" The Optic Disc location detection and extraction are main role of automatically analyzing of retinal image. Ophthalmologists analyze the Optic Disc for finding the presence or absence of retinal diseases viz. Glaucoma, Diabetic Retinopathy, Occlusion, Orbital lymphangioma, Papilloedema, Pituitary Cancer, Open-angle glaucoma etc. In this paper, we attempted to localize and segment the Optic Disc region of retinal fundus images by template matching method and morphological procedure. The optic nerve is originate in the brightest region of retinal image and it act as a main region to detect the retinal diseases using the ratio of cup and disc(CDR) and the ratio between Optic rim & center of the Optic Disc. The proposed work localizes and segments the Optic Disc then the corresponding center points & diameter of retinal fundus images are determined. We have considered the Gold Standard Database (available at public repository) that comprises of 30 retinal fundus images to our experiments. The location of Optic Disc is detected, segmented for all images and the center & diameter of segmented Optic Disc are evaluated against the Optic Disc center points & diameter (ground truth specified by ophthalmologist experts). The Optic Disc centers & diameter identified through our method are near close to ground truth provided by the ophthalmologist experts. The proposed system achieves 98.7% accuracy in locating the Optic Disc while compare with other Optic Disc detection methodologies such as Active Contour Model, Fuzzy C-Means, Artificial Neural Network.

3. PROPOSED WORK

Considering the above approaches of the related work, in this current paper we get the segmentated output and therefore by applying FCM the de-noised image, the detailed information is obtained. Whereas in older algorithms they were not sensitive to the noise, which lead to an un-segmentated images. To overcome this drawbacks FCM algorithm is been used in this study.

The advantages are:

- Gives best result for overlapped data set and comparatively better than k-means algorithm.
- Unlike k-means where data point must exclusively belong to one cluster centre here data point is assigned membership to each cluster centre as a result of which data point may belong to more than one cluster centre.

This new approach improves the SA by considering noise intensity in every local window rather than the whole image because it may be dramatically different in different regions.Two different smoothers are used here to deal with high-intensity noises and maintain local image information. For segmentation the most basic morphological operations are dilation and erosion. Dilation adds pixels to the boundaries of objects in an image, while erosion removes pixels on object boundaries. The number of pixels added or removed from the objects in an image depends on the size and shape of the *structuring element* used to process the image. In the morphological dilation and erosion operations, the state of any given pixel in the output image is determined by applying a rule to the corresponding pixel and its neighbors in the input image. The rule used to process the pixels defines the operation as dilation or erosion.

```
se=strel('disk',7);
idilate = imdilate(I,se);
```

According to the above condition it clusters the pixels in disk shape.

The wavelet theorems make up very popular methods of image processing, de-noising and compression. These Haar functions are the simplest wavelets; these forms are used in many methods of discrete image transforms and processing. It is an algorithm used for extracting the features like Mean, Variance, Standard Deviation, Kurtosis, Skewness, Entropy, Correlation factor. The advantage of using Haar Wavelet Transform in this study is to identify the sudden transitions such as monitoring of tool failure in the machine.

```
[feature Vector, hog Visualization] = extract HOG
Features(I,[16 16]);
```

The above syntax is used for extracting the features.

Support Vector Machine is one of the most efficient machine learning algorithms, which is mostly used for pattern recognition since its introduction in 1990s. SVMs vast variety of usage, such as face and speech recognition, face detection and image recognition has turned it into a very useful algorithm. The core idea behind the SVMs is building an optimal hyper plane in order to use in classification of linearly separable patterns. That is it helps in determining the difference in two classes by making a Hyper-plane and thus segregate the classes. The classification through SVM is easier when it is a linear plane, it adds feature to solve the problem. Thus the additional feature is z=x^2+y^2. SVMs can efficiently perform a non-linear classification using what is called the kernel trick, implicitly mapping their inputs into high-dimensional feature spaces. But they do not need to add this feature to have hyper-planes. The role of SVM is to notify whether the considered image is defected or not defected. The main benefit of accuracy rate is more, also Authentication, Identification, Recognition are possible in this algorithm. Experimentally in this paper the results show that SVMs achieve significantly higher search accuracy than traditional query refinement schemes.

```
svmStruct1 = svmtrain(xdata,group,'kernel_function',
'linear');
```

The above SVM syntax is used for classification of images.

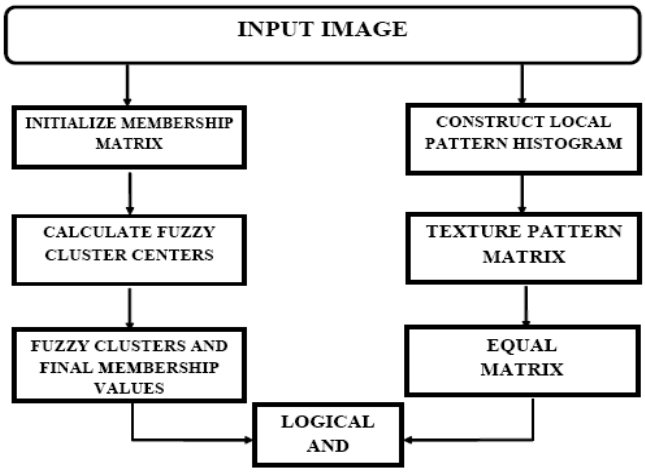


Figure 1: Block diagram of segmented output

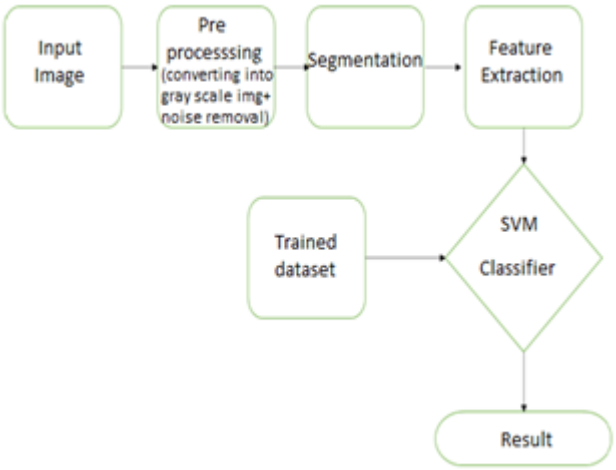
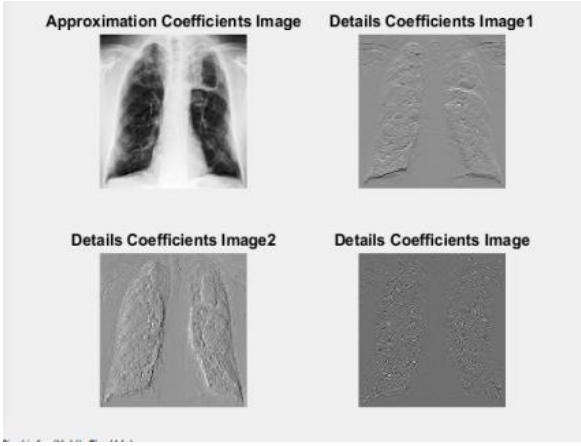
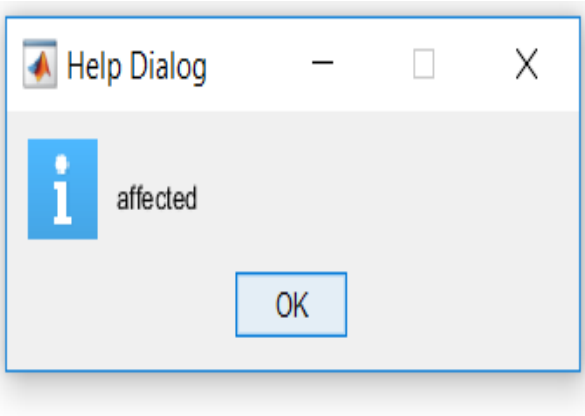


Figure 2: Block diagram of SVM classifier

4. OUTPUT



The above illustration shows the output obtained after segmentating and applying FCM algorithm.



The above illustration shows the output obtained after classifying the features by SVM algorithm.

5. CONCLUSION

The proposed system uses a parameter which tradeoffs the noise sensitivity and preserving the information of the image in an effective manner. This is widely used in medical applications .The use of fuzzy color creditability approach to color image filtering. However, in this paper, to obtain an exact limit of the regions, every empirical dispersion of the image is computed by Fuzzy C-Means Clustering (FCM) segmentation. A classification process based on the Support Vector Machine (SVM) classifier is accomplished to distinguish the normal tissue and the abnormal tissue. The experimental evaluation is done using the Lung Disease.

6. REFERENCE

[1] E. Schrock, S. Du Manoir, T. Veldman, B. Schoell et al., "Multicolor spectral karotyping of human chromosomes," Science, vol. 273, no. 5274, p. 494, 1996.

[2] M. R. Speicher, S. G. Ballard, D. C. Ward et al., "Karyotyping human chromosomes by combinatorial multi-fluor fish," Nature genetics, vol. 12, no. 4, pp. 368–375, 1996.

[3] M. P. Sampat, A. C. Bovik, J. K. Aggarwal, and K. R. Castleman, "Supervised parametric and non-parametric classification of chromosome images," Pattern Recognition, vol. 38, no. 8, p. 1209, 2005.

[4] M. Wang, T. Z. Huang, J. Li, and Y. P. Wang, "A patchbased tensor decomposition algorithm for MFISH image classification," Cytometry Part A, 2016.

[5] H. Choi, A. C. Bovik, and K. R. Castleman, "Feature Normalization via Expectation Maximization and Unsupervised Nonparametric Classification For M-FISH Chromosome Images," IEEE Transactions on Medical Imaging, vol. 27, no. 8, p. 1107, 2008.

[6] S. Derivaux, G. Forestier, C. Wemmert, and S. Lef`evre, "Supervised image segmentation using watershed transform, fuzzy classification and evolutionary computation," Pattern Recognition Letters, vol. 31, no. 15, pp. 2364–2374, 2010.

[7] J. Li, D. Lin, and Y. P. Wang, "Segmentation of multicolor fluorescence in-situ hybridization (m-fish) image using an improved fuzzy c-means clustering algorithm while incorporating both spatial and spectral information," in Bioinformatics and Biomedicine (BIBM), 2015 IEEE International Conference on. Institute of ElectricalandElectronicsEngineers(IEEE),Nov2015, pp. 413–416.

[8] P. S. Karvelis, D. I. Fotiadis, A. Tzallas, and I. Georgiou, "Region based segmentation and classification of multispectral chromosome images," in Twentieth IEEE International Symposium on Computer-Based Medical Systems (CBMS'07), June 2007, pp. 251–256.

[9] W. C. Schwartzkopf, A. C. Bovik, and B. L. Evans, "Maximum-likelihood techniques for joint segmentation-classification of multispectral chromosome images," IEEE Transactions on Medical Imaging, vol. 24, no. 12, p. 1593, 2005.

[10] J. C. Bezdek, Pattern recognition with fuzzy objective function algorithms. Plenum Press, NY, 1981.