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Analysis of CT Liver Images For Tumor Diagnosis Based On SVM Classifier and Clustering Model

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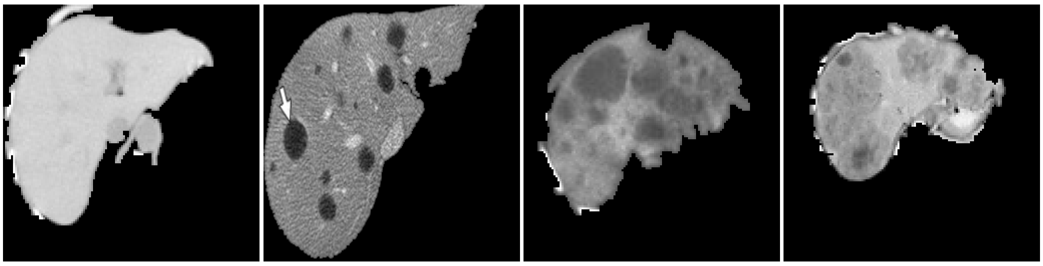
ABSTRACT: The project presents that classification of Liver images to detect the stages using supervised classifier and abnormal detection through spatial Fuzzy Clustering algorithm. The detection of the Liver Tumor is a challenging problem, due to the structure of the Tumor cells. The segmentation results will be used as a base for a Computer Aided Diagnosis (CAD) system for early detection of Liver Tumor which will improves the chances of survival for the patient. The stimulated result shows that the Fuzzy based segmentation results are more accurate and reliable than Thresholding and Clustering methods in all cases.

I. INTRODUCTION

Image segmentation is typically used to locate objects and boundaries (lines, curves, etc..) in images. Segmentation refers to the process of partitioning a digital image into multiple regions(sets of pixels).The goal of segmentation is to simplify and /or change the representation of an image into something that is more meaningful and easier to analyze.The result of image segmentation is a set of regions that collectively cover the entire image.



The effort is being made in early diagnosis and therapy. Liver segmentation medical images is very important to accurately evaluate patient-specific liver anatomy for hepatic disease diagnosis, function assessment and treatment decision-making. This project presents a segmentation method spatial fuzzy c mean clustering algorithm for segmenting computed tomography image to detect the liver tumor in its early stages. Semi-automatic or automatic liver segmentation are helpful and advisable in clinical applications. Recently, numerous methods have been proposed to segment livers effectively and efficiently. Many researchers have provided publicly available datasets and/or organized liver segmentation competitions to investigate thosecurrent segmentation algorithm.
Although CT images have been widely used in clinics, liver segmentation is still a challenging task in the medical image processing field. There are several special characteristics from the liver’s anatomical structure. First, there are several neighboring organs, e.g. muscles, heart and stomach, and they share similar intensities, which lead to low contrast and blurred boundaries in CT images between the liver and its neighboring organs. Therefore, liver segmentation using pixel based methods such as region growing may easily leak to neighboring organs. Second, image artifacts, noise and various pathologies, such as tumors often exist.The stimulated result shows that fuzzy based segmentation results are more accurate and reliable than thresholding and clustering methods in all cases.Probabilistics neural network with image and data processing technique was employed to implement an automatic liver tumor segmentation.

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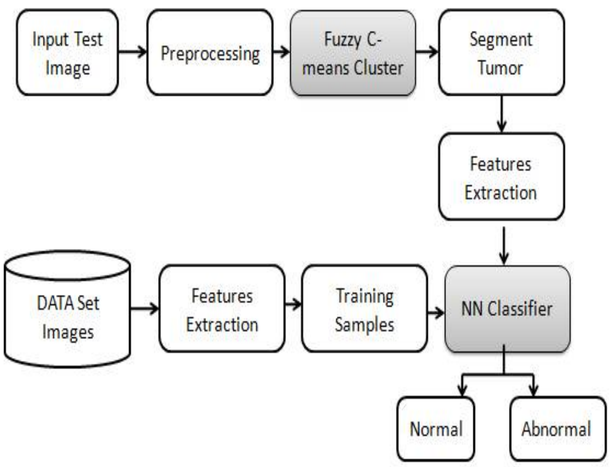
To tackle these problems, shape priors are desirable and advisable, since they can help to separate adjacent organs with similar intensities and preserve liver shape with non-homogeneous gray level. Anatomy of the liver varies largely from different health individuals both in shape and size. Besides, tumors and other pathologies may also change anatomical structure of a liver.
In this paper, we introduce a coarse-to-fine approach for the segmentation of the whole liver from CT images. To make the method automatic, the liver first needs to be localized in the image. This task is challenging due to inter-patient and inter-phase shape variability, liver pose and location variability in the abdomen, variation in reconstructed field-of-view (the reconstructed image may focus on the liver or may cover the whole chest and abdomen). After successful liver initialization using model adaptation method, liver shape can be adapted to the coarse boundary. Due to the complexity of liver anatomy, influenced by adjacent organs and insufficiency of shape prior, it makes accurate segmentation difficult. Decision making was performed in two stages: features extraction using the four level wavelet decomposition followed by Haralic features and the classification using support vector machine(SVM).The performance of the SVM classifier was evaluated in terms of training performance and classification accuracies .Probailistics neural network gives and accurate classification than other Nueral network and it is a promising tool for classification of the tumor.

II. EXISTING METHOD

Thresholding method:-
This method is based on a clip-level (or a threshold value) to turn a gray-scale image into a binary image. The key of this method is to select the threshold value (or values when multiple-levels are selected).
DRAW BACKS:-
Difficult to get accurate results. Not applicable for multiple images for Tumor detection in a short time. Poor discriminatory power .less classification accuracy
PROPOSED METHOD:-
CT liver image classification and segmentation for diseases diagnosis system based on:
Fuzzy clustering:
It is an unsupervised clustering algorithm that classifies the input data points into multiple classes.
NN stage classifier:
The neural network model is used to act as a classifier with radial basis function for a network activation function.

III. BLOCK DIAGRAM



Preprocessing is the process of removing dots or dirt in an image. Fuzzy C means clustering is to simplify and the representation of an image into easier to analyze .The segmentation refers to the process of partitioning digital image into multiple segments. Feature extraction measures both energy and entropy .NN classifier learning with non

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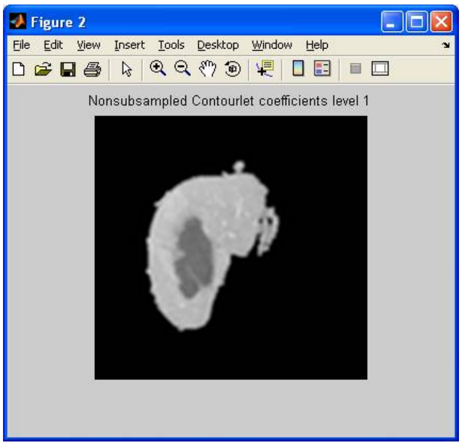
knowledge based classifier will be used for image classification. Dilation and erosion process will be used to enhance the tumor region by removing the unwanted pixels from outside region of tumor part.

IV. CT LIVER IMAGES

Liver tumor is the leading cause of cancer death among men and women in the United States and is responsible for more deaths than is the combined mortality from breast, prostate, and colon-cancers. The overall 5-year survival rate with **liver tumor** is roughly 14%; however, patients with early-stage disease who undergo curative rese**ct**ion have 5-year survival rates of40%–70%. Improved survival with early dete**ct**ion of non–small cell **liver tumor** is the rationale for revisiting **lung** cancer screening with computed tomography (**CT**).



PREPROCESSING:-

Noise Removal (Image Smoothing)

An image may be “dirty” (with dots, speckles, stains) Noise removal: – To remove speckles/dots on an image – Dots can be modeled as impulses (salt-and-pepper or speckle) or continuously varying (Gaussian noise) – Can be removed by taking mean or median values of neighboring pixels (e.g. 3x3 window) – Equivalent to low-pass filtering Problem with low-pass filtering – May blur edges – More advanced techniques: adaptive, edge preserving

FUZZY C-MEANS CLUSTERING:-

The segmentation refers to the process of partitioning a digital image into multiple segments. The goal is to simplify and change the representation of an image into something that is more meaningful and easier to analyze. The segmentation is performed by using kernel weighted fuzzy C means clustering algorithm. It is an unsupervised clustering algorithm that classifies the input data points into multiple classes based on their inherent distance from each other. It includes the spatial function to modify membership function to get the accurate result by analyzing local neighbour hood information

MORPHOLOGICAL PROCESS:-

Morphological operations are applied on segmented image for smoothening the Liver tumor part. Dilation and erosion process will be used to enhance (smoothening) the tumor region by removing the unwanted pixels from outside region of tumor part. These morphological operations are performed on images based on shapes. It is formed by structuring element. It is a matrix containing 1’s and 0’s where 1’s are called neighbourhood pixels .The output pixel is determined by using these processing pixel neighbours. Here, the ‘line’ structuring element is used to dilate and erode the image for smoothing.

FEATURE EXTRACTION:

Energy: It is a measure the homogeneousness of the image and can be calculated from the normalized COM. It is a suitable measure for detection of disorder in texture image.

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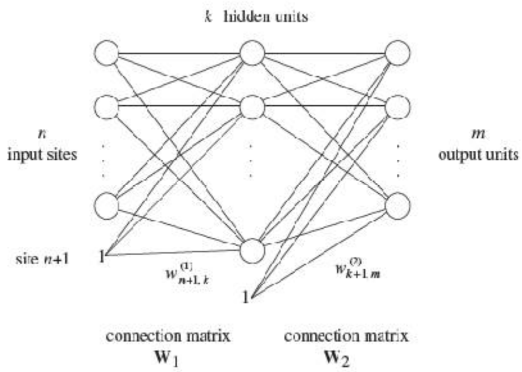
Entropy: Entropy gives a measure of complexity of the image. Complex textures tend to have higher entropy
Where, p (i , j) is the co occurrence matrix.
Contrast: Measures the local variations and texture of shadow depth in the gray level co-occurrence matrix.
Correlation Coefficient: Measures the joint probability occurrence of the specified pixel pairs.
$sum(sum((x- \mu x)(y-\mu y)p(x , y)/\sigma_x\sigma_y))$
Homogeneity: Measures the closeness of the distribution of elements in the GLCM to the GLCM diagonal.
$sum(sum(p(x , y)/(1 + [x-y])))$

NEURAL NETWORK CLASSIFIER:-

Here,Supervised learning with non knowledge based classifier will be used for image classification. The neural network model PNN is used here to act as a classifier with radial basis function for network activation function. The training samples features with assigned target vectors are fed into created PNN model for supervised training to get network parameters such as node biases and weighting factors. Finally, test image features are simulating with trained network to make decision of brain stages like normal or abnormality(benign and malignant)

NEURAL NETWORK STRUCTURE:-



The network classifies input vector into a specific class because that class has the maximum probability to be correct. The PNN has three layers: the Input Layer, Radial Basis Layer and the Competitive layer. Basis Layer evaluates vector distances between input vector and row weight vectors in weight matrix. These distances are scaled by Radial Basis Function nonlinearly. Competitive Layer finds the shortest distance among them, and thus finds the training pattern closest to the input pattern based on their distance.

PERFORMANCE MATRICES:-

The performance of classifier can be evaluated through following parameters,
Sensitivity: It measures the proportion of actual positives which are correctly identified
Sensitivity = Tp.(Tp + Fn)
Where,
Tp = True Positive: Abnormality correctly classified as Abnormal
Fn = False negative: Abnormality incorrectly classified as normal
Specificity: It measures the proportion of negatives which are correctly identified.
Specificity = Tn./(Fp + Tn)
Where,
Fp = False Positive: Normal incorrectly classified as Abnormal
Tn = True negative: Normal correctly classified as normal
Total accuracy: (Tp+Tn) . (Tp+Tn+Fp+Fn)
The network generates the performance metrics, **Sensitivity: 85.7143%, Specificity: 100%, Acuracy: 90.9091%**

ADVANTAGES:-

Better texture and edge representation It is useful to classify the liver tumor images with better accuracy Segmentation provides better clustering efficiency.

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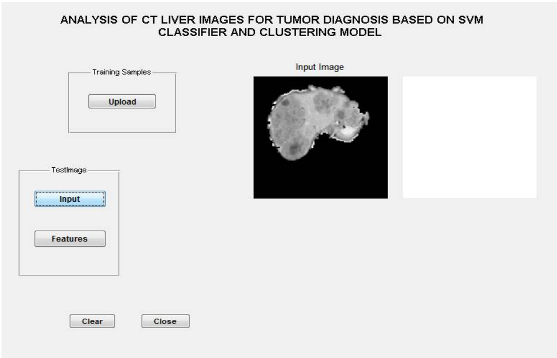
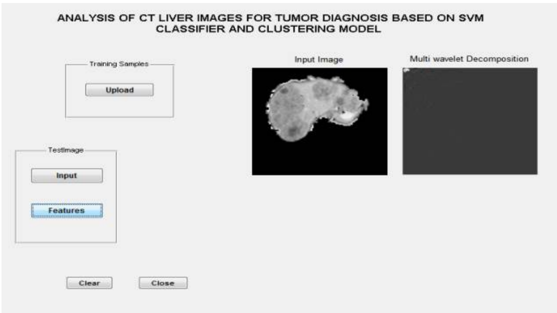
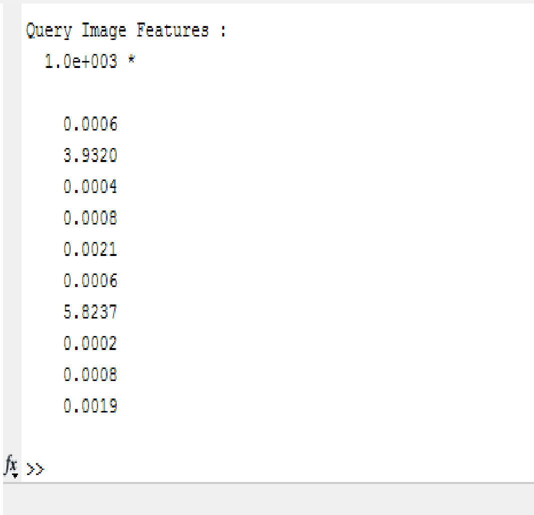
INPUT IMAGES:-



FEATURE EXTRACTION:-





V. CONCLUSION

Thus we get the output based on SVM classifier and clustering model. Then detect the tumor on liver accurately.

REFERENCES

[1]Yu-Len Huang, Jeon-Hor Chen, Wu-Chen, Wu-Chung Shen., "Diagnosis of hepatic tumors with texture analysis in non enhanced computed tomography Radiology, This work was supported by the National science council,Taiwan,Republic of china,under grants NSC-89-2314-B-039-020-M08 and NSC-92-2213-E-029-022.Published by Elsevier inc.Vol. 13,pp 713-720, 2006.

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[2]Luyao Wang, Zhi Zhang, Jingjing Liu, Bo Jiang, Xiyao Duan, Qingguo Xie, Daoyu Hu,, Zhen Li., “Classification of Hepatic Tissues from CT images based on texture features and multiclass support vector machines”, Proceeding of the 6th international symposium on Neural Networks: Advances in Neural Networks, pp 374-381, 2009.

[3]V.Subbiah Bharathi, L.Ganesan., “Orthogonal moments based texture analysis of CT Liver images”, Pattern Recognition Letters Elsevier science inc. Newyork , NY Vol. 29, pp, I 868-1872, 2008.

[4] Balaji Ganesan, Kenneth A. Miles, Chris R. Chatwin., “Texture analysis in non contrast enhanced CT: impact of malignancy on texture in apparently disease free area of the liver”. European Journal of Radiology. Vol. 70, pp 101-110, 2009.

[5] Dirk Smeets, Dirk loeckx, Paul Suetens., “Semi automatic level set segmentation of liver tumor combining a spiral scanning technique with supervised fuzzy pixel classification”. Medical image analysis paper. Vol. 14, pp 13-20, 2010 .

[6] Ludvak tesar, Akinobu Shimizu, Shigeru Nawano., “Medical image analysis of 3D CT images based on extension of Haralick texture features”. Vol. 32, pp 513-520, 2008.

[7] Stavroula G.Mougiakakou, Loannis K. Valavanis, Konstantina S. Nikita., “Differential diagnosis of CT focal liver lesion using texture features, feature selection and ensemble driven classifier”. Artificial intelligence in medicine. Vol. 41, pp 25-37, 2007.

[8] K. Mala, V. Sadhasivam., “Wavelet based texture analysis of liver tumor from computed tomography images for neural network”. Vol 42, pp 132-137 , 2013.

[9] Stephen Aylwar, Lubomir M. Hadjiiski San Diego., “Texture feature based liver lesion classification”. Vol. 57, pp 97-100, 2011.

[10] Altenbernt J, Heusner TA, Ringelstein A, et al., “Dual-energy-CT of hypervascular liver lesions in pantients with HCC”. Investigation of image quality and sensitivity. Eur J radiol. Vol.21, pp 738-743, 2011.