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Segmentation of Ultrasound Images Using Closest Neighbour Approach

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Abstract: ***As we know image segmentation is field which is uses in automated recognition of objects in medical fields, traffic analysis, face recognition and many more. In past few year as image processing goes on hike researches continuously exploring the field of image segmentation with various algorithm. Main problem of this field is overcome from over segmentation and the merging criteria for various clusters to segment an object. Medical images are difficult to segment due to low contrast and speckle noise. We are going to overcome over segmentation and will use closest element approach to merge various objects for segmentation. Also compare it with other technique of segmentation.***

Keywords: closest neighbour approach, segmentation, US images.

I. INTRODUCTION

Segmentation is the process of separating a digital image into different regions which have similar properties such as gray level, colour, texture, brightness etc [1]. So that the image can be more simplify, understandable and helpful to analyzing. On the basis of pixel intensity we can differentiate the boundaries of different objects. Segmentation identifies separate object within an image and also find boundary between different regions.

Segmentation can be classified into two types: local segmentation and global segmentation. Local segmentation is small windows on a whole image and deal with segmenting sub image. Global segmentation deals with segmenting whole image. Global segmentation mostly deals with relatively large no of pixel. But local Segmentation deal with lower no of pixel as compare to global segmentation.

Image segmentation is one of the classical problems in image processing and computer vision. Using of Image segmentation we can able to understand the fundamental of digital image processing. Image segmentation is used to enhancement of image and also useful different medical application. Image segmentation can also use for analysis of the image and further pre-processing of the image. After a segmentation process each phase of image treated differently. Now we are going through about medical images like Ultrasound Images (US) which is widely used today.

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Ultrasound is a powerful technique for imaging the internal anatomy (e.g., abdomen, breast, liver, kidney, and musculoskeletal) [2].US images are mostly used today. Ultrasound imaging is fast, portable, inexpensive but it contains speckle noise due to low contrast [10].Different approaches have been used for US image segmentation. Khaled Hammouda, Prof,Ed Jernigan[3] using unsupervised approach for segmentation.

They used Gabor Filter and K-means algorithm. Gabor filter is linear filter used for edge detection defined by harmonic function multiplied by a Gaussion function. In term of functionality it describe as:

$$g(x, y; \lambda, \theta, \psi, \sigma, \gamma) = \exp\left(\frac{x'^2+\gamma^2 y'^2}{2\sigma^2}\right)\cos\left(2\pi\frac{x'}{\lambda}+\psi\right) \quad (1)$$

Where $x' = x\cos\theta + y\sin\theta$ (2)

And $y' = -x\sin\theta + y\cos\theta$ (3)

λ – Wavelength of the sinusoidal factor

θ – Orientation of the normal to parallel stripes of Gabor function.

Ψ – Phase offset

σ – Sigma of Gaussion envelope

γ – Aspect ratio

K-mean clustering is a simple unsupervised learning algorithm which is mostly used in image segmentation. In this we define k centroid. Aim of this algorithm is minimizing an objection function. Objection function can be defined as:

$$J = \sum_{j=1}^{k}\sum_{i=1}^{n}\left\|x_i^{(j)} - c_j\right\|^2 \quad (4)$$

Where $x_i^{(j)}$ is data point and c_j is the cluster center. Using these techniques we does not solve the problem of US image segmentation completely.

Anita Khanna and Dr. Manish Shrivastva[1] proposed three method for segmentation on Gabor filtered US images : Thresholding, k-means clustering and Expectation Maximization. They compared these three unsupervised techniques and conclude that Expectation Maximization technique of segmentation is best of all. Thresholding is most important approach of mage segmentation. It is operation against a function T.

$$T = T[x, y, (p(x, y), f(x, y)] \quad (5)$$

Threshold image may be defined as:

$$g(x,y) = \begin{cases} 1 \; if \; f(x,y) > T \\ 0 \; if \; f(x,y) \geq T \end{cases} \quad (6)$$

It does not work properly in large number of classes. EM is iterative method for searching maximum likelihood estimate. It divides into two steps:

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E step- X given under current estimate of Q^t than E can be calculate expected value of the log likelihood function with respect to conditional distribution of Z that is:

$$Q\left(\theta/_{Q\theta^t}\right) = E_{Z/X,}\,\theta^t\,[\![logL(\theta;x,z)]\!] \quad (7)$$

Where X is observed data and Z is missing value

M step- find the parameter that maximize the quantity

$$\theta^{(t+1)} = \arg\max \quad Q\left(\theta/\theta^{(t)}\right) \quad (8)$$

An advantage of EM over K-mean clustering technique is that it provide statistical model of data. But it gives good result only limited noise level. So we propose the nearest neighbour approach to merge the various objects for segmentation. Using this approach and method we conclude the accurate result. The paper organized in VI section. We review various techniques used and related work describe in section II.Problem formulation describe in section III. Proposed work is described in IV section. Conclusion and Future work describe in V section. Finally conclude section VI.

II.RELATED WORK

Many researchers have been done in this area and many algorithms have proposed for US image segmentation. we review all techniques and proposed method. Anita Khanna, Dr. Manish Shrivastva[1] proposed unsupervised technique of segmentation which is simple and give satisfactory result. There is a problem to segment Ultrasound image because of low contrast and high speckle noise. In this paper we use different unsupervised technique like thresholding; K-means cluster technique and expectation maximization and compare all the result. Ultrasound images are texture feature image and expectation maximization (EM) technique gives best result of segmentation.Thresholding is suitable only for small number of gray levels and classes. By using K-mean cluster they experiment to Ultrasound images and find that K-mean is able to detect liver and GB but they find that background of image is not clear. Using the technique Expectation Maximization (EM) they find that the boundary of the image is well defined and this technique is able to detect the liver and cyst quite well.

Haryali dhillon, Gagandeep jindal and akshay girdhar[2] demonstrate the new threshold function is better than other threshold function. They proposed Bayes shrink method. They used different types of US images for Experimental result. Using images US images of baby, kidney, liver of size(256×256) and speckle noise is variance with 0.09,0.1,……. 0.3. After applying different method for denoising like Median filter, Wiener filter, Bayes shrink and Proposed Bayes Shrink method and compare the result. They conclude that their proposed method gives best result of all. Jappreet kaur, Jaspreet kaur and manpreet kaur[5] using US images they proposed the idea of despeckling of Ultrasound images. They study various speckle reducing filter and conclude that wavelet filter give better result to all. They find that other techniques have some kind of problem like resolution degradation, over smoothing etc. Having properties like sparsity, multiresolution and multiscale nature the wavelet transform give the best result and simple to implement. Jaun shah[6] used the breast US images for segmentation. In his work he applied neutrosophy method to breast Ultrasound image segmentation and proposed l-means neutrosophic. He compared his method with other segmentation method and analyzed the accuracy and time complexity of all. He then fined that his method gives best result of all. He compared Histogram thresholding, Region growing, Model based, Machine learning and Watershed method. Histogram threshold works only bimodal histogram and does not produce good result. For applying Region growing seed point is required and this method is sensitive to noise. Model based method is time consuming. Machine learning required long learning time and produce over training problem. Watershed method does not solved over segmentation problem completely. All these problems are resolved by his novel lesion segmentation method.

Mei wang, Xiao-Wei Wu, Hsiung-Cheng Lin, Jian-ping wang[7] discussed the new image segmentation method Proportion of Foreground to Background(PFB). Using this method on human brain image we experiment the result that the number of iteration steps for the threshold T is reduced. Using this method over segmentation and discontinuities also can be avoided. Today medical image like CT, MRI and PET is increased day by day. To apply single segmentation technique is difficult to processing of medical images. So integrating segmentation method is applied.

Ali Kermani, Ahmad Ayatollahi, Ahmad Mirzaes, Mohammad Barekatain[8] proposed the Local Histogram range image method modified by means of Discrete Wavelate Transform(DWT). Using this method their is possible for tissues to be segment correctly. This method was applied on carotid image and breast lesion image. Without changing in segmentation DWT decrease the execution time. By using modified Wavelet computation load can be reduce and produce more accurate result.

Ashish Thakur, Radhey Shyam Anand[9] demonstrate the Local statistics based region growing segmentation method. To detect interest object with the correct position and shape US images are difficult to properly segment. Used b-mode US images of breast mass and liver cyst image for experimental result. The method used for fully developed speckle US image with efficient segmentation.

III. PROBLEM FORMULATION

In past few years image processing goes on hike researches continuously exploring the field of image segmentation with various algorithm. We find that the medical images like ultrasound images are difficult to segment due to low contrast and noise. Over segmentation is also occurred there is difficult to merge various object for segmentation. By using best segmentation technique we merge the closest neighbour element approach. Main problem is that there is difficult to overcome the over segmentation and merging various closest element.

IV. PROPOSED WORK

Problem related segmentation can be overcome using the appropriate segmentation technique. We find that some medical images are difficult to segment. We cannot merge the nearest neighbour of that objects. Due to this reason there is problem of segmentation is occurred. We will use closest neighbour approach to hide this problem and then we can easily avoid over segmentation. Medical images like ultrasound images can be segment and give accurate result.

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V. CONCLUSION AND FUTURE WORK

In this paper we go through the brief overview of US image segmentation techniques, their drawback and their experimental result. We find that the problem of US image segmentation is not solving by different techniques. A different technique has different drawbacks and does not give the satisfactory result. Using closest neighbour approach we will overcomes the problem of over segmentation. In future work we will design, implement and test this approach using algorithms.

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REFERENCES

1. Anita Khanna, Dr. Manish Shrivastva (2012), "Unsupervised Techniques of Segmentation on Texture Images: A comparison"IEEE.
2. Haryalli Dhillon, Gagandeep jindal, Akshay Girdhar(2011), " A Novel Threshold Technique for Eliminating Speckle Noise In US images"IPCSIT Vol. 10.
3. Khaled Hammouda, Prof. Ed Jernigan, "Texture Segmentation Using Gabor Filters", University of Waterloo, Ontario, Canada, 2001.
4. A. K. Jain, F. Farrokhnia, "Unsupervised texture segmentation using Gabor filters", Pattern Recognition, Vol. 24, No. 12,pp.1167-1186, 1991.
5. Jappreet kaur, Jaspreet kaur, Manpreet Kaur, "Survey of Despeckling Techniques for Medical US Images"IJCTA 2011.
6. Juan Shan, "A Fully Automatic Segmentation Method For Breast Ultrasound Images", Ph.D. Thesis(Utah State University)2011.
7. Mei wang, Hsiung-Cheng Lin, Xiao-Wei Wu, Jian-ping Wang (2012) "Image segmentation Using Proportion of Foreground to Background Algorithm"IEEE.
8. Ali Kermani, Ahmad Ayatollhi, Ahmad Mirzaes, Mohammad Barekatain, " Medical US image Segmentation by modified Local Histogram range image method", JBSE 2010.
9. Ashish Thakur, Radhey Shyam Anand, "Local statistics based Region Growing segmentation method for US medical images", world academy of Science,Engineering and Technology 10 , 2007.
10. P.R Tamilselvi, P.Thangaraj, "Improved Gabor filter for extracting texture edge features in US kidney images" Modern applied science vol. 4, 2010.

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