Application of Image Segmentation Techniques on Medical Reports

Chandni Panchasara
MSc Computer Science Student
Mumbai Maharashtra India,

Amol Joglekar
Professor
Computer Science, Mithibai College
Mumbai Maharashtra India

Abstract:Medical image segmentation is an essential and challenging aspect in computer aided diagnosis and also in pattern recognition research. For medical images, the image segmentation is the most useful thing. This paper identifies the correct, on defective images features are already available, by comparing with segmented images, and the defect can be easily shown.
Currently there are many different algorithms available for image segmentation. Each have their own advantages and purpose.
This paper presents algorithms like Otsu's Method, Anny edge detection algorithm, Region growing algorithm to obtain the resulting segmented image.

I. INTRODUCTION

Image Segmentation
Image segmentation is the process of partitioning a digital image into multiple segments. The goal of segmentation is to simplify and change the representation of an image into something that is more meaningful and easier to analyze. [1]
Each of the pixels in a region is similar with respect to some characteristic or computed property, such as colour, intensity or texture.
Adjacent regions are significantly different with respect to the same characteristic.
The main goal of segmentation is to divide an image into parts having strong correlation with areas of interest in the image.
In recent years, a lot of research is done in the field of image segmentation process. There are currently thousands of algorithms, each doing the segmentation process slightly different from another, but still there is no particular algorithm that is applicable for all types of digital image, fulfilling every objective. Thus, algorithm developed for a group of images may not always apply to images of another class. [2] [3]
Currently image segmentation approach, based on two properties of an image, is divided into two categories:
A] Discontinuities based
It means to partition an image based on abrupt changes in intensity [4], this includes image segmentation algorithm like edge detection.
B] Similarities based
It means to partition an image into regions that are similar to a set of predefined criterion [4], this includes image segmentation algorithms like thresholding, region growing.

Medical Image Segmentation
Medical image segmentation is used in various applications. For example, in imaging field is used to locate tumours, study of anatomical structure etc. It provides comparable resolution and better contrast resolution.
One of the most important problems in image processing and analysis is segmentation. This paper presents a new segmentation method called the Medical Image Segmentation Technique (MIST), used to extract an anatomical object of interest from a stack of sequential full colour, two-dimensional medical images from the Visible Human dataset. [5]
An important area of current research is obtaining more information about Human body structure and function.
Human body is particularly complex structure and its segmentation is an important step for studies in temporal changes, detection of morphology as well as visualization in surgical planning, volume estimation of object of interest and more could benefit enormously from image segmentation.

II.LITERATURE REVIEW

Rohan Kandwal,Ashok kumar and Sanjay Bhargava "Existing Image Segmentation Technique" Volume 4,Issue 4,April 2014,ISSN: 277 128X International journal of Advanced research in computer science and software engineering have discussed major image segmentation algorithm and concluded that it as promisisnig future ahead but there is no universally accepted image segmentation algorithm.
Sujata Saini and Komal Arora, "A study Analysis on he different image segmentation techniques",
international journal of information and computation Technology ISSN 0974-2239 volume 4, number 14 (2014),Concluded facts that segmentation techniques are broadly categorized on the basis of detection of discontinuity and similarity of images thus Opting a single technique or method would not provide better optimized results.
Nivedita M Mahore,Ravi V Mante and Dr P.N.Chatur "A review on current method in MR image segmentation" ISSN/;2321-7782 volume 1.Issue 7,December 2013 examines the different methods considering three categories i.e. traditional image processing method, statistical based segmentation method and partition technique with basis field estimation.

Mrs.Princy Mishra,Mrs.Shikha Agarwal and Ms.Usha Kiran "Survey paper based on medical image segmentation" ISSN: 2278 1323 International journal of advanced research in computer engineering and technology (IJARCET) volume 2,Issue 12,December 2013 represented various methods of segmentation and clustering which can be helpful for medical image segmentation.

Paresh Chandra Barman, Md.Sipon Miah,Bikash Chandra singh and Mst, Titasa Khatun "MRI image segmentation using level ste method and implement an medical diagnosis system" An International journal(CSEIJ),Vol 1, No 5 , December 2011, In this paper they proposed a new medical diagnosis system for image segmentation with new variation level set algorithm without re-initialization.

Ping-sung Liao, Tse-sheng Chen and Pau-choo Chung "A Fast Algorithm for Multilevel Thresholding" concluded that a fast and efficient recursive algorithm along with a look-up table has been developed for one-dimensional multilevel Otsu's thresholding.

A.M Khan,Ravi S, "Image Segmentation method:A Comparative Study", International journal of soft computing and Engineering(IJSCE) ISSN:2231-2307,Volume 3,Issue 4,September 2013 concluded that segmentation process can be divided into various category and each approach has its own advantages and disadvantages.
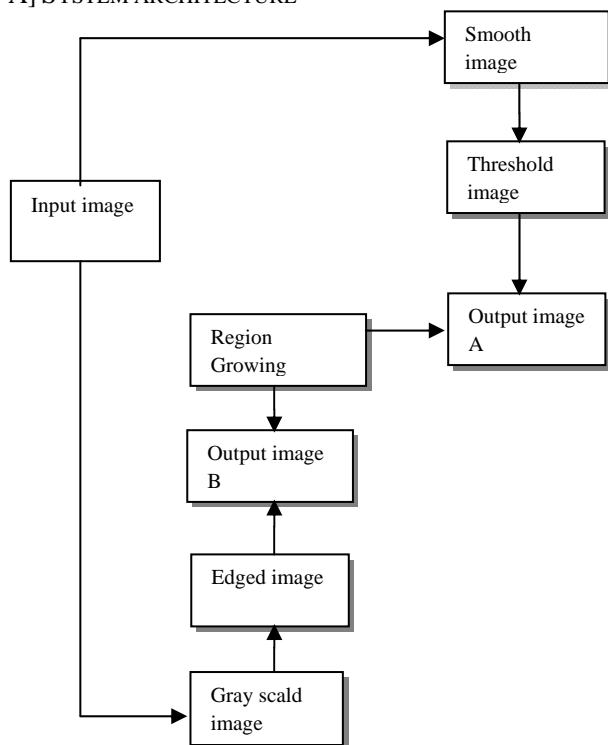
III. RESEARCH METHODOLOGY

A] SYSTEM ARCHITECTURE

Figure 1: System Architecture

B] Proposed Algorithm

1] Authentication: The user enters the system through user name and password which provides security.

2] Loading the Image: Load the image to be segmented.

3] Smoothing: In this paper, first we filter MRI image for removing noise using the Gaussian (filtering).

4] Gray Scaling: It require gray scaled image as input for Otsu's algorithm.

5] Thresholding: This gray scaled input image is applied to **Otsu's algorithm** for separating the pixel values of tumour/abnormal region from the Original image using Binary threshold values.

6] Edge detection: After separating tumour/abnormal part from the original image **Canny's Edge detection algorithm** is used to detect outer edge of tumour/abnormal part.

7] Region Growing: After that we place a seed point on desired (abnormal) part of image.

8] Final Output: These two output images are combined with original image together to display the final output.

Algorithm Used:
Otsu's algorithm
Step for algorithm:

1] Select an initial estimate for global threshold, T.

2] Segment the image using above equation which will produce two groups of pixels: G consisting of pixels with intensity values > T and G consisting of pixels with values <=T.

3] Computing average (mean) intensity values m1 and m2 for the pixels in G1 and G2, respectively.

4] Compute a new threshold value, T=(m1+m2)/2.

5] Repeat step 2 through 4 until the difference between values of T in successive iteration is smaller than predefined T.

Various Otsu's Algorithm

A. Image Segmentation Based on Improved Otsu Algorithms
Segmentation Result: Good
Limitation: This algorithm gives better result in salt and paper noise but does not give on Gaussian noise. [6]

B. Comparative Research on Image Segmentation Algorithm
Segmentation Result: Good/ stable
Limitation: High complexity/ low processing rate. [7]

C. Otsu Thresholding Based on Improved Histogram
Segmentation Result: Stable
Limitation: When the global distribution of target image and background vary widely, the performance degrades. [8]

Canny's Edge detection algorithm

1] Smoothing: Blurring of the image to remove noise.

2] Finding Gradient: The edges should be marked where the gradients of the image has large magnitudes.

3] Non Maximum suppression: Only local maxima should be marked as edges.

4] Double thresholding: Potential edges are determined by thresholding.

5] Edge tracking by hysteresis: Final edges are determined by suppressing all edges that are not connected to a very certain (strong) edge.

The Canny edge detector is an edge detection operator that uses a multi-stage algorithm to detect a wide range of edge

in images. It was developed by John F.Canny in 1986 also produced a computational theory of edge detection explaining why the technique works. [9]

Even though it is quite old, it has become one of the standard edge detection methods and it is still used in research. [10] [11]

Region Growing Algorithm

Region growing is a procedure that group's pixels in whole image into sub regions or

Larger regions based on predefined criterion [12]. Region growing can be processed in

Four steps:-

1] Select a group of seed pixels in original image [13].

2] Select a set of similarity criterion such as grey level intensity or colour and set up a stopping rule.

3] Grow regions by appending to each seed those neighbouring pixels that have Predefined properties similar to seed pixels.

4] Stop region growing when no more pixels met the criterion for inclusion in that region (i. e. Size, likeness between a candidate pixel & pixel grown so far, shapeof the region being grown

Region growing can also be sensitive to noise, causing extracted regions to have holes or even become disconnected. These problems can be removed using a hemitropic region-growing algorithm. [14]
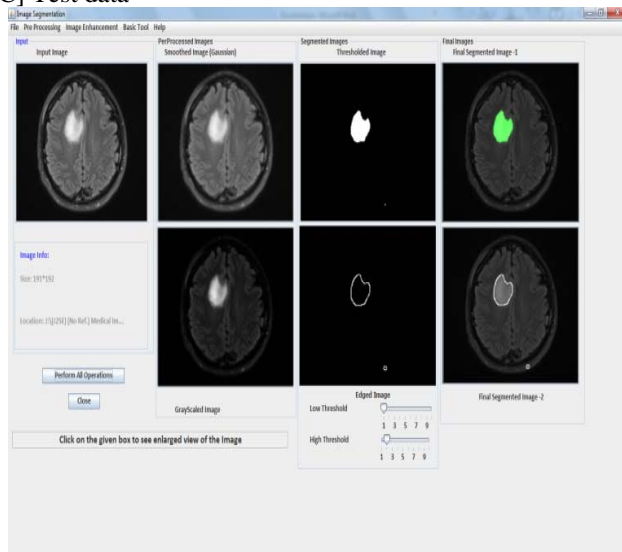
C] Test data

Figure 2: GUI Model

IV.   FUTURE SCOPE

2D approach of segmentation can be extended to next level of 3D.So it will give the Better view of Anatomicla structure of body part.

The new technique like novel esack model, watershed etc can be used in integration along with existing system. It can also be developed for other types like PNG etc. The versioning of this software will be possible as day by day new technology is introduced and hence adding further coding this software will be used for other application also

V.   CONCLUSION

Finally the cost effective segmentation tool for medical images is obtained by integrating different technologies.Otsu method is applied for thresholding which gives good result than normal thresholding method. Hence desired result is obtained with consideration of speed and cost.It can also be developed for other types like PNG.The versioning of this software will be possible as day by day new technology is introduced and hence adding further coding this software will be used for other application also.
 It is able to provide manual selection of object in the image and using algorithms it highlights the desired selected part. The final output image comes with the highlighted segmented part.Other basic facilities such as magnification scaling, shrinking gives the better view of image. Cany Edge Detection algorithm gives result but to apply Canny algorithm to whole original image becomes fast as compared to applying canny algorithm directly to original images.It is able to provide manual selection of object in the image and using algorithms it highlights the desired selected part. The final output image comes with the highlighted segmented part.Other basic facilities such as magnification scaling, shrinking gives the better view of imageThis system can help the doctor/medical practitioners for faster detection and study of brain Tumour, fracture etc.

VI.   REFERENCES

[1] Sujata saini and Komal Arora "Study Analysis on the different Image segmentation Techniques" international journal of information and computation ISSN 09742239 volume 4, Number 14(2014), pp 1445-1452.

[2] Image segmentation technique Rajeshwar Dass, Priyanka, Swapna Devi IJECT vol 3,Issue 1,Jan-March 2012.

[3] Edge Detection techniques evaluation and comparisions Ehsan applied mathematical sciences vol 2, 2008 no 31, 1507 -1520.

[4] Rafael C Ganzalez,Richard E Woods, "Digital Image processing",2nd ed ,Beijing Publishing Housing of Electronics Industry,2007.

[5] Felica s jones "Medical Image Segmentation" (Under the Direction of Hamid Arabnia).

[6] Zhong QuandLi Hang "Research on Image Segmentation based on the improved Otsu Algorithm", 2010.

[7] W X Kang Q Q Yang, R R Liang "The comparative research on image segmentation.

[8] Z Ningbo,W Gang,Y Gaobo and D Weiming, "A fast 2d Otsu threshholding algorithm based on improved histogram" in pattern Recognition,2009 CCPR 2009 Chinese Conference on,2009.

[9] Er Pratibha Thaku,Er Nishi Madaan, " A survey of image segmentation techniques" International journal of research in computer application and robotics ISSN 2320-7345.

[10] F Mai,Y Hung,H Zhong and W Sze A hierarchical approach for fast and robust ellipse extraction pattern Recognition,41(80)2512-2524,August 2008.

[11] Sergei Azrnikov sweeping solids on manifolds in symposium on solid and Physical Modelling pages 249-255, 2008.

[12] K K Singh, "A study of Image Segmentation Algorithms for Different Types of images" international journal of Computer Science Vol 7, Issues 5, 2010.

[13] H G Kaganami,Z Beij, "Region based detection versus Edge Detection", IEEE Transactions on Intelligent information hiding and multimedia signal processing, pp 1217-1221,2009.

[14] Li N,Liu M,Li Y (2007) Image Segmentation using watershed transform and level set method In IEE international conference on acoustics, speech and signal processing, pp 613-616.