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Efficient Region and Edge Based Image Segmentation Technique

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Abstract:- In this paper we present a technique for image segmentation. The proposed method is a combination of region based segmentation and edge based segmentation. A spatial database is used in collaboration with the homogeneous function that predicts the next pixel to be included in the contour based on spatial database. Experimental results show that the technique has high true positive rate.

Keywords:- *Segmentationt; region based segmentation; edge based segmentation; homogeneous function; energy function.*

I. INTRODUCTION

Image processing is one area of research that invites the attention of wide variety of researchers. Image processing, mainly deals with processing of images, videos etc. Image processing is an expertise to increase the quality of an image in terms of visual insight of human beings. Image segmentation is the process of localizing areas of an image constructed on homogeneity of subjects. All similar and neighboring pixel join together to form a shape. There has been a lot of research into segmentation and its type and techniques available. The asserts a good segmentation algorithm must possess are speed, randomness and Spontaneous segmentation. Image segmentation is a vital process for image processing tasks. Many of the prevailing methods for image description and recognition, image visualization, and image compression vastly reliant on segmentation

In segmentation all the pixel that are similar in homogeneity are grouped together into one region. The pixel that belong to a region show similarity in terms of intensity, colour parameters and threshold. There are many methods available to segment an image. The segmentation can be performed based on Histogram, edge, region, Hybrid or Markov information extracted from the image. The idea is to find regions in the image that are similar and group them together

The simple form of segmentation is thresholding where an intensity level is set and all the pixels greater that the set threshold value are white and all the pixel less than the set value are zero

$g(x,y) = 0$ if $f(x,y) < T$ and $g(x,y) = 1$ if $f(x,y) \geq T$ (1)

Where T is the set threshold value. This method will turn the into grayscale and is known as binary threshold

The segmentation can be based on the colour component present in the image. The RGB colour spec is taken into consideration and the displacement of the colour from the RGB colour model is checked. All colour in a particular range are set. The dominant colour is found out and its Cartesian distance from the pure colour is used to perform segmentation.

$\mathbf{f}(x,y) = (R(x,y),G(x,y),B(x,y))$:

$$g(x,y) = \begin{cases} 1 \; if \; d(x,y) < T \\ 0 \; if \; d(x,y) > T \end{cases}$$

The segmentation is performed based on the region. The pixel is selected and all the neighboring pixel with the best homogeneity value is selected. The two pixel are now part of a set. The process continues and more pixel are added to the set. The elements of the set are the region and this process of checking homogeneity and adding to the set increases the region and is commonly mentioned as region based segmentation.

In this paper we have combined the methods of region based segmentation and edge segmentation. Criteria are specified for selecting the next pixel based on homogeneity function. The edge of the image is selected using the notion of subtracting out the foreground of the image fro he background. All the pixel that make up the edge are grouped into a single set S. The complete process is mentioned under the heading algorithm in section 3.

II. LITERATURE REVIEW

Mahipal and Rajeev[1] suggest a segmentation based on fuzzy c means clustering on medical images. The noise is removed using filters. The segmentation of the medical image even with noise element gives good contour. The method of FCM specified is complex with repeated use of convolutions. Yuri and marie [2] mention a method to interactive segment N-dimensional images. The user marks certain pixels as “object” or “background” to provide hard constraints for segmentation. Additional soft constraints incorporate both boundary and region information. The obtained solution gives the best balance of boundary and region properties among all segmentations satisfying the constraint. Senthilkumaran and rajesh [3] carried out a survey of edge based segmentation methods. They studied the different methods for edge detection used for image segmentation. Lekshmi and Atil[4] describe a segmentation algorithm based on colour specifications using canny and prewitt edge detection technique. Structuring element is used to detect the edge using sobel edge detection method. J.D.Tsai [5] specifies about Automatic property based approach on invariant colour models for detection of shadow regions with shape

information. The method fails when pixel intensity fluctuates in dark region. In this paper the image is converted to HSV to retain the colour information. In darker shadow regions pixels retain the colour intensity

III. METHODOLOGY

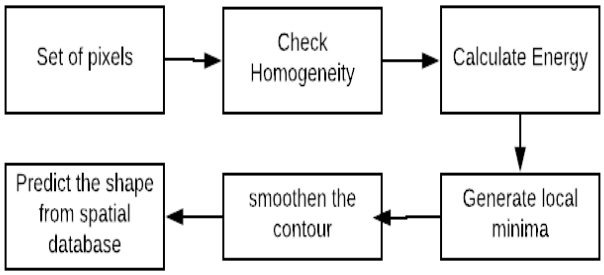

Fig 1:- Block Diagram

The image edge is found out by subtracting the foreground image from the background image. All the pixel of the edge are grouped together into a single set
S={ s1,s2,s3,….s_n }

The local energy at each pixel is calculated using the equation Take the first pixel from the set S and check its homogeneity function with the 8 neighboring pixels (X+i).Jump to X+i pixel that is most homogeneous with the intensity level of pixel. The probability function can be used to detect the next pixel to compare based on the spatial information available in the database. The selection of the probability function is based on the shapes of object oriented information inbuilt with the database. Based on the pattern of selection the next pixel can be predicted based on the training given to the machine learning algorithm.[6][9] Mark this pixel as local minima and continue the step to cover a set of identical homogeneous pixel to complete the contour .This will maximize the energy function. The contour completes the segmentation process

The image is converted to HSV. The conversion to HSV from RGB will preserve the colour chromaticity of the image. Consider the image

$$I: \omega \rightarrow R \quad (1)$$

Is an HSV Image converted from RGB, ω is the image domain segmentation of image is obtained by dividing ω into different regions { ω_1, ω_2, ω_3 …. ω_n} that are separated by contour C and represented as

$$\omega = \cup\, i\omega i \cup C \quad (2)$$

To get smooth prediction of Image I, the energy function is to be minimized. According to Mumford shah model and equation 1 and 2

$$Fms = \int (1-u)^2 dx + \mu \int \Delta^2 dx + v|c|$$

u and μ are fixed parameters, u is slightly soft approximation of Image I and the value of u smoothly varies in region omega and rapidly changes across boundaries. The first term gives close to image. The second term smoothens u and the third term |C| is the length of curve to regularize contour.[1]

$(\omega_1, \omega_2, . \omega_n) = \sum$ $Fms = \int (1-u)^2 dx + \mu \int \Delta^2 dx + v|c|$
region ω_1 and ω_2 are seperated by contour C . ω_1 and ω_2 are inside and outside regions with reference to contour C. It is assumed intensities inside the regions are constant.

E(C)=E1(C) +E2 (C)

E(C0) = 0 if C is exactly at Boundary
E(C)= E1(C)>0, E2(C)<0 if C is inside boundary
E1(C)<0, E2(C)>0, if C is outside boundary

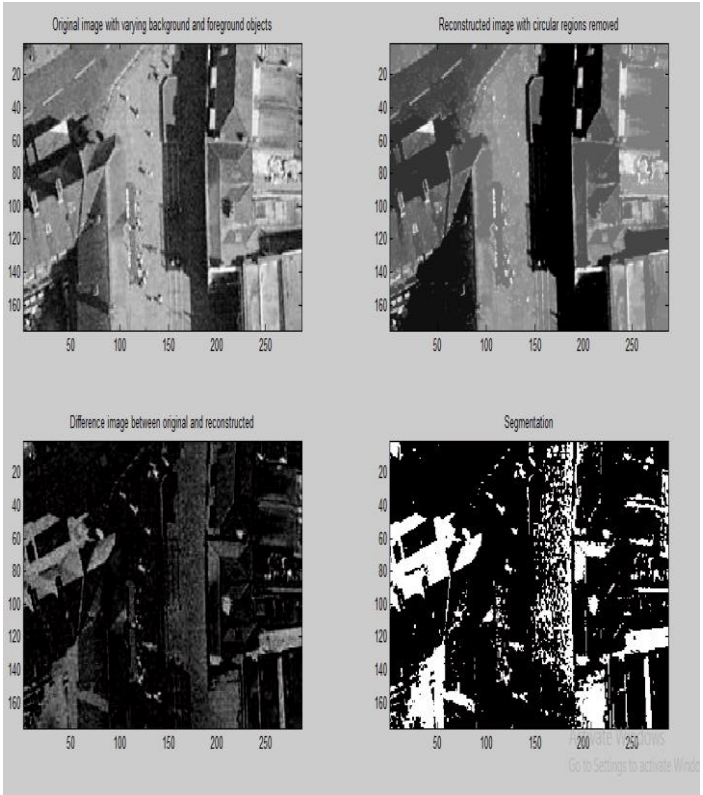

Fig 2:- Stages of image segmentation

The division is completed in light of the limit and force of the pixel. The nearby pixel is a piece of the portion just if the edge and chromaticity are in as far as possible. The dim scale estimation of the pixel is taken. The pixel with same force are assembled together into an area and relegated an incentive against the foundation. The image is remade. The coordinating procedure of looking at the similitude between the first image and recreated image is performed. The contrast between the image is plotted as in Figure 2. The shadow area are distinguished. The division is performed in light of the neighboring pixel chromaticity data and edge.

IV. CONCLUSION

This paper presents the outline of image segmentation using the combination of region based approach and edge technique by maintaining chromaticity. The spatial database is used to train the image shapes and predict the outcome based on the sample set of pixel that are selected based on the homogeneous function. The experiment results show the

methods can effectively segment the image. Compared with other techniques, this method can segment complex structures like building and the shadow of the building. Experimental results show higher average accuracy and lower false detection rate, and it has great adaptability.

REFERENCES

[1]. Singh Choudhry, Mahipal and Kapoor, Rajiv. (2018). A novel fuzzy energy based level set method for medical image segmentation.Cogent Engineering. 10.1080/23311916.2018.1475032.

[2]. Yuri Y. Boykov Marie-Pierre Jolly (2001) Interactive Graph Cuts for Optimal Boundary & Region Segmentation of Objects in N-D Images,Proceedings of "Internation Conference on Computer Vision", Vancouver, Canada, vol.I, p.105-112.

[3]. N. Senthilkumaran and R. Rajesh (2009),Edge Detection Techniques for Image Segmentation – A Survey of Soft Computing Approaches, International Journal of Recent Trends in Engineering, Vol. 1, No. 2, pp. 250-254.

[4]. H C Vijay Lakshmi and S. atilKulakarni (2010) Segmentation Algorithm for Multiple Face Detection in Color Images with Skin Tone Regions using Color Spaces and Edge Detection Techniques, International Journal of Computer Theory and Engineering, Vol. 2, No. 4, pp. 1793-8201.

[5]. V.J.D Tsai," A comparative study on shadow compensation of color aerial images in invariant color models ",IEEE trans. Geo, Sci. Remote Sens., vol. 44, no. 6, pp. 1661-1671, 2006.

[6]. Victor . J. D. Tsai, "A comparative study on shadow compensation of color aerial images in invariant color models," in *IEEE Transactions on Geoscience and Remote Sensing*, vol. 44, no. 6, pp. 1661-1671, June 2006. (doi: 10.1109/TGRS.2006.869980).

[7]. Kuo-Liang Chung,Yi-Ru Lin,Yong-Huai Huang," efficient shadow detection of color aerial images based on successive thresholding scheme", IEEE transactions on . Geo. Science and remote Sensing.,vol. 47, no 2,pp. 671-682,2009 .

[8]. Xin Huang and Liangpei Zhang," morphological building/shadow index for building extraction from high resolution imagery over urban areas", IEEE Journal of selected topics in applied earth observations and Remote Sensing., vol 5, no 1, 2012.

[9]. Zhe Zhu and Curtis E.Woodcock,"object based cloud and cloud shadow detection in landsat imagery", remote Sensing of Environment. , ISSN: 0034-4257, Vol: 118, Page: 83-94, 2012.

[10]. Mauro Dalla Mura,Jón Atli Benediktsson,Björn Waske, and Lorenzo Bruzzone," morphological attribute profiles for the analysis of very high resolution images", IEEE transactions on geoscience and remote Sensing., vol 48,no 10,2010.

[11]. Huihui Song, Bo Huang and Kaihua Zhang," shadow detection and reconstruction in high resolution satellite images via morphological filtering and example based learning" , IEEE transactions on geoscience and remote Sensing, vol. 52, pp. 2545-2554,2014.

[12]. Mauro Dalla Mura, Jon Atli Benediktsson, Francesca Bovolo, and Lorenzo Bruzzone , "An Unsupervised Technique Based on Morphological Filters for Change Detection in Very High Resolution Images," in *IEEE Geoscience and Remote Sensing Letters*, vol. 5, no. 3, pp. 433-437, July 2008. (doi: 10.1109/LGRS.2008.917726).

[13]. Jameela Ali Alkrimi, Hamid A. Jalab, Loay E. George, Abdul Rahim Ahmad, Azizah Suliman, and Karim Al-Jashamy,"comparative study using Weka for red blood cells classification",International Journal of comuter and information technology. Med. Health Bio. Med. Eng., vol. 9, no.1,pp 19-22, 2015.

[14]. Elena Salvador, Andrea Cavallaro, Touradj Ebrahim, "Shadow identification and classification using invariant color models," 2001 IEEE International Conference on Acoustics, Speech, and Signal Processing. Proceedings (Cat. No.01CH37221), Salt Lake City, UT, 2001, pp. 1545-1548 vol.3. (doi: 10.1109/ICASSP.2001.941227).