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Homogeneous Regions for Image Segmentation Based on Fuzzy Logic

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ABSTRACT:

This paper mainly replicates the idea of Fuzzy logic for homogeneous edge cutting algorithm for image segmentations. Soft Computing is an emerging field that consists of complementary elements of fuzzy logic, neural computing and evolutionary computation. Soft computing techniques have found wide applications. One of the most important applications is edge detection specifically at homogeneous regions for image segmentation based on Fuzzy logic. The process of partitioning a digital image into multiple regions or sets of pixels is called image segmentation [3]. Edge is a boundary between two homogeneous regions. Edge detection refers to the process of identifying and locating sharp discontinuities in an image.

Key words: ***homogeneous edges, soft computing, fuzzy logic, neural computing.***

I. INTRODUCTION:

Image Segmentation is the process of partitioning a digital image into multiple regions or sets of pixels [1][3][5]. Actually, partitions are different objects in image which have the same texture or color. The result of image segmentation is a set of regions that collectively cover the entire image, or a set of contours extracted from the image. All of the pixels in a region are similar with respect to some characteristic or computed property (called homogeneity), such as color, intensity, or texture. Adjacent regions are significantly different with respect to the same characteristics. Edge detection is one of the most frequently used techniques in digital image processing [12]. The boundaries of object surfaces in a scene often lead to oriented localized changes in intensity of an image, called edges. The implemented fuzzy inference systems (FIS) system presents greater robustness to contrast and lighting variations, besides avoiding obtaining double edges.It is gave a permanent effect in the lines smoothness and straightness for the straight lines and for the curved lines it gave good roundness. In the same time the corners get sharper and can be defined easily [4].An Edge in an image is a significant local change in the image intensity, usually associated with a discontinuity in either the image intensity or the first derivative of the image intensity. Discontinuities in the image intensity can be either Step edge, where the image intensity abruptly changes from one value on one side of the discontinuity to a different value on the opposite side, or Line Edges, where the image intensity abruptly changes value but then returns to the starting value within some short distance [5].Many points in an image have a nonzero value for the gradient, and not all of these points are edges for a particular application. Therefore, some method should be used to determine which points are edge points. Frequently, threshold provides the criterion used for detection [6].

II.FUZZY LOGIC APPROACH:

Since fuzzy logic foundation by Lotfi Zadeh in 1965, it has been the subject of important investigations [12]. It is a mathematical tool for dealing with uncertainty and also it provides a technique to deal with imprecision and information granularity for image segmentation [11]. The fuzzy logic model uses the fuzzy logic concepts introduced by Lotfi Zadeh [12]. Fuzzy

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reasoning consists of three main components [4, 7, 8, 11]: fuzzification process, inference from fuzzy rules and defuzzification process. Fuzzification process is where the objective term is transformed into a fuzzy concept. The membership functions are applied to the actual values of variable pixels to determine the confidence factor or membership function (MF) at edges. Fuzzification allows the input and output to be expressed in linguistic terms. Inferencing involves defuzzification of the conditions of the homogeneous pixels and propagation of the confidence factors of the conditions to the conclusion of homogeneous pixels. A number of homogeneous pixels will be fired and the inference engine assigned the particular outcome with the maximum membership value from all the fired homogeneous pixels. Defuzzification process refers to the translation of fuzzy output into objective homogeneous pixels to integrate the image segments.

III. Parameters' ANALYSIS

The main parameter for the evaluation of homogeneous pixels is the Magnitude of Relative Error (MRE) [13] which is defined as follows:

$$\mathbf{MRE_i=(/AEffort_i–PEffort_i/)*(1/AEffort_i)} \quad \mathbf{(1)}$$

The MRE value is calculated for each observation *i* whose effort is predicted. The aggregation of MRE over multiple observations (N), can be achieved through the Mean MRE (MMRE) as follows:

$$\mathbf{MMRE_i} = 1/N \sum_i^N \mathbf{MRE_i} \qquad \mathbf{(2)}$$

A complementary criterion is the prediction at level *l*, Pred(*l*) = k/N, where *k* is the number of homogeneous pixels where MRE is less than or equal to *l*, and *N* is the total number of homogeneous pixels. Thus, Pred(20) gives the percentage of homogeneous pixels which were predicted with a MRE less or equal than 0.20. In general, the accuracy of an estimation technique is proportional to the Pred(*l*) and inversely proportional to the MMRE [10, 13].

IV. METHODOLOGY

The empirical study carried out here is based on the empirical study done by Lopez-Martin *et al* [2]. They used the sets of system development projects. Here we are emphasizing that the homogenous edges are to be detected at complex segments to notify the discontinuous masking of an images (edge cuttings).The development of images were evaluated nearby neighborhood of a pixels in an image for their homogeneity as coupling (Dhama), complexity (McCabe) plot for calculating the edge integration to the edge cutting (simply called to be segment Vs de-segment of an image), and lines of code metrics were registered to evaluate the validation of boundaries(edges).

Implementing a fuzzy system requires that the different categories of the different inputs be presented by fuzzy sets, which in turn is presented by membership functions. A natural membership function type that readily comes to mind is the Two-sided Gaussian membership function. A Two-sided Gaussian membership function, defined by minimum (a), maximum (c) and modal (b) values, that is MF(a, b, c) where
$a \le b \le c$. Their scalar parameters (a, b, c) are defined as follows [16, 18]:

$$MF(x) = 0 \text{ if } x < a$$

$$MF(x) = 1 \text{ if } x = b$$

$$MF(x) = 0 \text{ if } x > c$$

Six rules are suggested [6]:

1. If *Complexity* is low and *Size(LOC)* is small then *DT* is low
2. If *Complexity* is average and *Size(LOC)* is medium then *DT* is average
3. If *Complexity* is high and *Size(LOC)* is big then *DT* is high
4. If *Coupling* is low then *DT* is low
5. If *Coupling* is average then *DT* is average
6. If *Coupling* is high then *DT* is high

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The *LOC* stands for localization of a pixel, *DT* represents Development Time function for Edge Cutting. Here complexity measures the functional validation of segment Vs de-segment of an image and coupling is for nearby neighborhood of a pixels for their homogeneity.

The membership function plots replicates the corresponding input image homogeneous pixel values for edge segmentation and de-segmentation values are shown in Figures 1, 2, 3 and 4.

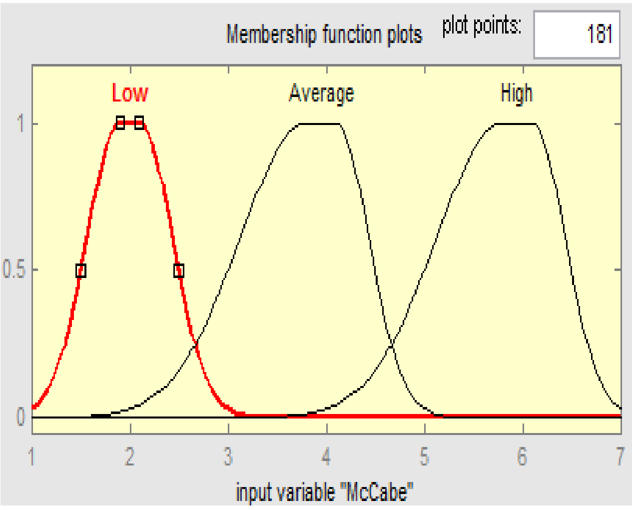

Fig. 1) McCabe Complexity Plot

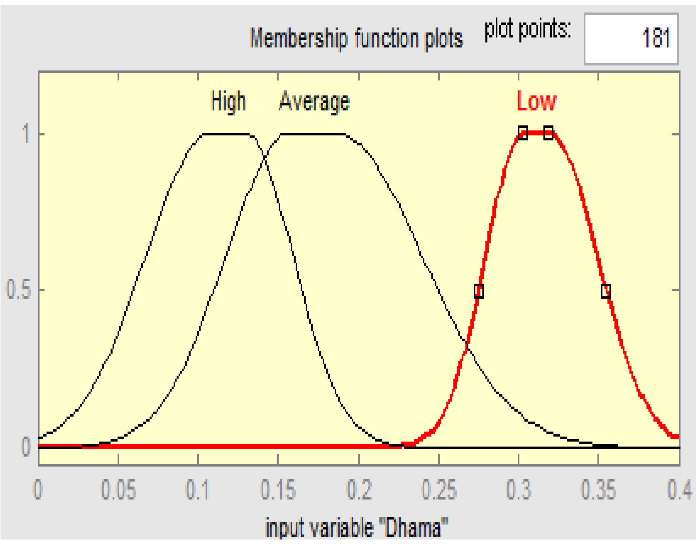

Fig. 2) Dhama Coupling Plot

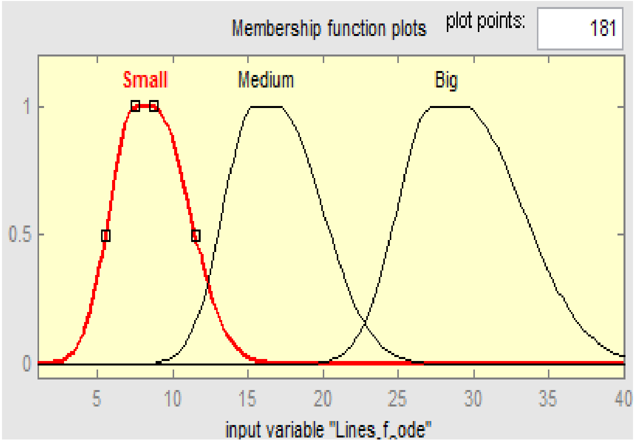

Fig. 3) Physical Line of Code Plot

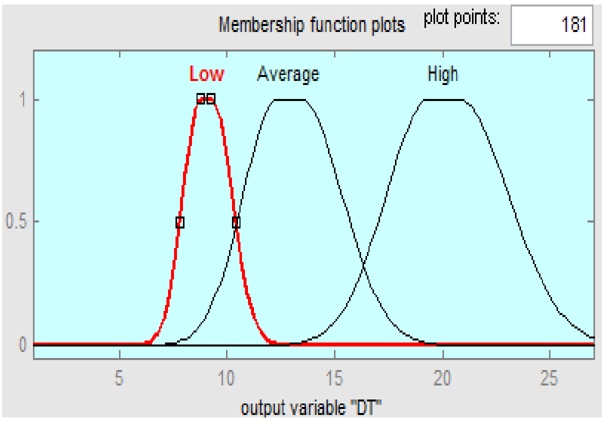

Fig. 4) Development Time function for Edge Cutting

V.CONCLUSION AND RESULTS:

The paper suggests a new approach for homogeneous edge cutting algorithm for image segmentations. The major works is that Two-sided Gaussian membership function in fuzzy technique is used for homogeneous edge cutting for image segmentations. Here, the advantages of fuzzy logic and good generalization are obtained. The main benefit of this model is its good interpretability by using the fuzzy rules and another great advantage of this research is that it can put together expert knowledge (fuzzy rules) project data into one general framework that may have a wide range of applicability for homogeneous edge cutting for image segmentations. The results showed that Two-sided Gaussian membership function may be much better than other mentioned models.

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VI.REFERENCES:

[1] A. Witkin, “Scale-space filtering,” in Int. Joint Conf. Artificial Intelligence, Karlsruhe, Germany, 1983, pp. 1019–1022.

[2] S. C. Zhu and D. Mumford, “Prior learning and Gibbs reaction-diffusion,” IEEE Trans. Pattern Anal. Machine Intell., vol. 19, no. 11, 1997.Ilya

[4] Mausumi Acharyya and Malay K. Kundu, “ Image Segmentation Using Wavelet Packet Frames and Neurofuzzy Tools”, International Journal of Computational Cognition, Vol.5, No.4, December 2007, pp.27-43.

[5] Ibrahiem M. M. El Emary, “On the Application of Artificial Neural Networks in Analyzing and Classifying the Human Chromosomes”, Journal of Computer Science, vol.2(1), 2006, pp.72-75.

[7] Bouchet A, Pastore J and Ballarin V, “Segmentation of Medical Images using Fuzzy Mathematical Morphology”,
JCS and T, Vol.7, No.3, October 2007, pp.256-262.

[8] Mantas Paulinas and Andrius Usinskas, “A Survey of Genetic Algorithms Applications for Image Enhancement
and Segmentation”, Information Technology and Control,Vol.36, No.3, 2007, pp.278-284.

[9] European Journal of Scientific Research ISSN 1450-216X Vol.63 No.1 (2011), pp. 56-62 C. Sriramakrishnan Assoc. Professor, Dept.of ECE, Adhiyamaan College of Engg., Hosur A. Shanmugam Principal, Bannari Amman Institute of Technology, Sathy, Tamil Nadu, India.

[11] M.Abdulghafour,”Image segmentation using Fuzzy logic and genetic algorithms”, Journal of WSCG, vol. 11, no.1, 2003.

[12] M.Paulinas, A.Usinskas, “A Survey of Genetic Algorithms Applications for Image Enhancement and Segmentation”, Information Technology and Control, Vol.36,No.3,pp.278-284,2007.

[13]Advanced Edge Detection Techniques in Computational Vision: http://www.cpsc.ucalgary.ca/Research/vision/501/edgdetect.pdf.