Evaluation of Various Segmentation Techniques in Digital Image Processing

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ABSTRACT: : *Image Segmentation is an importantphase in image processing, object illustration and lots of different other image processing fields.This paper deals with some segmentation strategies used in image processing. Initial segmentation was not up to the satisfactory. But time to time, new techniques had been observed which lead to the efficient segmentation of images. Here we analyse diverse image segmentation techniques. The output of some basic segmentation strategies in the form of images are also blanketed in this paper. Each of these results shows the performance and distinctiveness of corresponding method in comparison with other segmentation algorithm.*

Key Words: *Watershed, Edge Based Detection, Thresholding, fuzzy mathematical morphology, Ostu's thresholding.*

1. Introduction

Segmentation is a vital task in which it outlines and separates the regions exactly. This makes the identification and progression of the information without difficulty. The process of assigning labels to pixels is called Image segmentation.In this sort of way, the images with identical labels share homogeneous characteristics. Discontinuity and Similarity are the 2 main properties of intensity values. Algorithms used for segmentation is based on these properties. Extremely good collection of segmentation techniques has been proposed during the past many years. Few categorizations are vital for presenting the methods here, like threshold based segmentation, edge based segmentation, region based segmentation clustering techniques etc. In clinical image segmentation, the information is partitioned into contiguous areas representing individual anatomical stuffs. Strategies analysed in this paper is primarily based on medical image segmentation, segmentation applied in mathematical morphology and so on. A set of segments that covers the whole image is the result produced as the part of segmentation process.

2. ASSOCIATED WORKS

[1]advocated a fuzzy mathematical morphology based on fusion image segmentation algorithm. To smoothen the image, set of rules has used such as morphological opening and closing functions. Then execute a gradient operation on the resultant image. After this, with Prewitt methods and watershed algorithms, estimate the proposed fusion algorithm. It concluded that fusion approach is a remedy for the troubles over segmentation of watershed algorithms. Advantages of fusion approach are; it improves speed and saves the statistics, details the image nicely.

The work [2] delivered an approach using a new fussy rule to segment the rock thin sections image, based on image segmentation. In this technique, red, green and blue components of an image are used as features and then the rock thin section images are segmented into minerals. They input RGB components of image of rock thin segment and provide images of segmental mineral as output. A comparison is performed to show the advantages proposed system over segmentation using fussy C-means approach. The end result indicates that proposed system is the better Fussy C-means approach.

[3] This paper recommended a non-linear discontinuous Partial Differential Equation (PDE) that structures the set approach of gray snapshot. To get a numerical end result and to put in force the more fit, a separate technique is likewise proposed. Using MATLAB, a non-linear discontinue PDE method is registered. Outputs have revealedthat imageedges and margins can be blurred and via near operator, it can be shifted. Extra data can be stored through the usage of the recommended scheme.

[4] In this work, an MRI image is used to do the segmentation technique. For the segmentation of hippocampus part of the brain, technique based on watershed algorithm is used. It is incredibly sophisticated to find the vicinity that is affected by the ailment in the brain image. It uses two procedures to transform the brain image into binary form. In the first technique, it uses the standards of block menu, mask

and labelling. And within the second approach, it follows the top hat, masks and labelling standards. However it was found that holes in the image can preclude the segmentation system. Thus for avoiding such problems, holes inside the images are stuffed using right filling strategies and to form connected components the related components are grouped. Any image is transformed into binary form to make the processor less difficult. Then by performing the morphological bottom-hat operation, a filtered image is returned. The image is split into 3*3 block. After segmentation, the features of each segment are extracted and they are subsequently classified. An effective morphological based segmentation device is Lucy Watershed algorithm. An efficient watershed algorithm calculates the segmentation of marker image accurately. Final results of the algorithm is analysed and the use of shape analysis approach, the diseased region is analysed.

[5] One of the most essential components in the ventriculography image is the left ventricle. For figuring out this component, it use two segmentation tactics such as; region based and edge based. In region based segmentation, the pixels that havesimilar properties are acquired collectively. The active contour version calculated by chan-vese is a procedure which allows segmenting many kinds of images. This version makes use of the function Mumford-Shah and makes use of the Heaviside function to model the region information. The simplicity and the computational approach are the two benefits that are acquired by gradient-level thresholding. The classification of the picture elements into different classes is the real purpose of thresholding techniques. Two scenarios for thresholding are Bi-degree thresholding and multithresholding. In edge based segmentation, numerous techniques are used. Edge detection is mainly used for detecting edges. Robert-cross gradient operators were the former method which uses 2D masks, computes the gradient and the diagonal edges were given more priority. Perwitt's operator is an extension from 2D to 3D mask which is a new operator that is now in use. Modified form of Perwitt's operator known as Sobel operator, in which a factor of 2 is multiplied to the central column. A 3*3 masks are used and is implemented on part of the image.

[6] In this work, the idea of accumulating evidence is explored in which the result of multiple clustering is combined. As far as other segmentation techniques are considered, the histogram based approach is more efficient for the reason that they usually need only a single pass along the pixels. Clusters within an image are located using the peaks and valleys of the histogram which was figuredout from all the pixels in the image. The algorithm used to perform the decomposition of the image into k number of clusters is commonly called as k-mean i.e., k-means clustering is an algorithm used for segmentation. Border detection and object detection are performed using the result of this segmentation algorithm. A weighted distance measure is used instead of using the Euclidean distance measure. In this paper, to produce the clusters, they use k-means algorithm. It is mainly focussed on the value which was generated by multiple execution of k-means algorithm. For thearea that constitutes the primary group centroids, K-point remains constant. Item having nearest centroids are assigned to this group. The locations of the k-centroids are recalculated after assigning all the objects until no new centroids are introduced. The proposed approach uses a split-and-merge methodology. Multidimensional information maybe decomposed into huge number of clusters by this approach. This decomposition is performed by the k-mean technique which gives diverse clustering results. The result is acquired by means of random initialization of the algorithm by using split. In merge operation, a mean mechanism is proposed to integrate the clustering due to the randomicity of the k-mean. Various initializations may lead to exceptional clustering, to aim at locating the most optimal configuration. The proposed algorithm have two essential parameters; k, which is the number of clusters and t, the instances i for generation.

Using the methodologies such as thresholding and edge detection, all images can be segmented which is described as a new method in [7]. In this method, an optimum threshold for binary processing of images is determined with the aid of a minimal threshold with a Laplace transform. This procedure improves the computational time and segmentation quality. Laplace histogram is used for thresholding that transform image into histogram with peaks first, and then finished the minimum thresholding processing.

FISTA (Fast Iterative Shrinkage Thresholding Algorithm) is the base method used in work [8]. For CS-MR image reconstruction, FISTA is an effective method. Compressed scanning is a thriving area in signal processing and acquisition. The key principle behind CS-MRI reconstruction is the fixing of the optimization problem having constrains. Because of the simplicity, Iterative Shrinkage Thresholding algorithm is a right way for signal processing. Consequently based on the idea of FISTA, this work optimized it by including the Haar wavelet transform and implemented it for reconstructing the sub-sampled MR image. Also it reconciles the quality of the recreated image and escape time. Thus FISTA is stable for compressed sensing.

Based on pigeon-inspires optimization, an Ostu multi-threshold segmentation is proposed in the work [9].

One can design an objective and an interclass variance function which can be considered as the fitness function. Here in this technique, this fitness feature is thebenchmark for getting the resultant and coordinate the pigeon in the pigeon-inspired optimization. When the pigeon finds the finest position, the finest segmentation threshold is acquired. Finding an effective solution is transformed into solving the trouble of multi-dimensional variables and efficiently optimizes the solution. The multiple segmentation parameters of this method are related with parameters of different classical algorithm. It confirmed that the Ostu's segmentation method based on pigeon-stimulated technique advanced the rate of threshold solution and accuracy of segmentation.

Infrared image segmentation is one of the primary and key technologies in image processing. Simple genetic set of rules can greatly improve the segmentation efficiency of traditional threshold methods. In work [10], segmentation approach based on advanced OSTU and adaptive genetic algorithm puts forward fast sorting method, which increases the computation speed. Morphological noise reduction is accomplished firstly using morphological weighting adaptive algorithm. Then global optimization of OSTU image segmentation function is carried out using the enhanced genetic algorithm. Finally the optimum threshold for image segmentation is obtained. This overcomes the poor convergence, premature and other issues in genetic algorithm. Hence the work showed that the threshold acquired through this approach is greater strong.

3. RESULT OF SOME BASIC SEGMENTATION TECHNIQUES

The figure shown below is the result of Kmeans algorithm, one of the most common segmentation techniques.

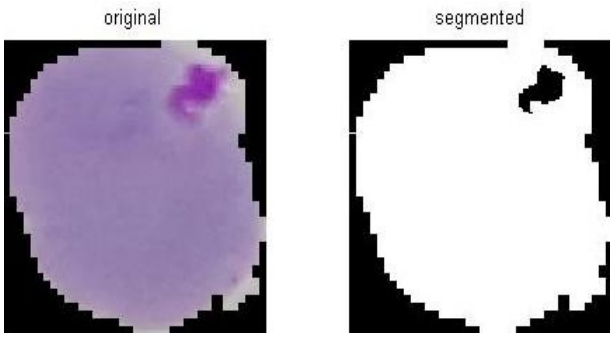

Fig1

The input is a malaria parasite image. Kmeansalgorithm is applied on the input image and performs the segmentation process to get the output image.This is shown in the above figure (Fig1). This output image is a sample reference image. The Kmeans algorithm is referredfrom [12].

4. CONCLUSION

In this paper various segmentation techniques have been analysed. Each approach has its own pros and cons. Images are different in terms of color, intensity, and sample. So, each technique on similar image generates one of a kind stage of output. The papers depicted here deals with different methods used in image segmentation process. Watershed algorithm, thresholding, edge based segmentation etc. are described in this work. Each of these techniques has its own characteristics. Also each of them has merits as well as demerits in comparison with others.

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