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SEGMENTATION OF COLOR IMAGES

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Abstract: *Segmentation partitions animage intoitsessentialregionsorobjects.Thelevelto which the subdivision is lugged depends onthe obstacle being solved. Color images can increase the aspect of segmentation, but increase the multiplicityofproblem.Geneticalgorithmsare well suited to optimizing composite problems such as image segmentation. This paper gives modernization of Genetic Algorithm based segmentation methods. We discussthe usefulness ofusinggeneticalgorithmstosegmentgeneral color images and review the issues involved in designing suchalgorithms*.

Keywords–Colorimage,Geneticalgorithms, Segmentation

I. INTRODUCTION

Image segmentation is the bedrock of object recognition and computer vision. Segmentation is an salient process and its results are used in enormous image processing applications. However, there is no simple way to successfully segment all images. Differing from grey scale images, the color segmentation usually has more complicated and time consuming algorithms and is controlled by bulkier set of parameters. A way of handling the multiplicity in color image segmentation is to adopt a directed search method such as genetic algorithms. Genetic algorithm which mimic the process of evolution, have many aspects that make them well suited to the problem of image segmentation, such as the ability to design a local optimum to reach a global optimum and the potentiality to efficiently find an peerless solution from within a large searchspace.

The main uses of genetic algorithms in

image segmentation are as for the alteration of parameters in extant segmentation algorithms and pixel-level segmentation. Many algorithms that successfully apply genetic algorithms to image segmentation have been refined. Genetic algorithm (GA) is able to swamp many of the spurn in other optimization techniques such as exhaustive techniques, calculus-based techniques, partial knowledge (hill climbing, beam search).

Due to the observation of the genetic process, they are independent of the segmentation technique used containing only a measure of performance, which is referred to segmentation quality, for any given parameter fusion. We start noticing at the concept and image segmentation and mention the requirements for good image segmentation. The implication of using color in image segmentation is explored and techniques for image segmentation are briefly reviewed. Problems with existing image segmentation methods are quoted. Genetic algorithms are then introducedand their suitability for benefit in image segmentation is inspected. We explore various applicatons of genetic algorithms to the complication of image segmentation. Finally, the feasibility of the use of genetic algorithms for general color image segmentation is considered and design spurt for such an

algorithm arediscussed.

II. REQUIREMENTS FOR IMAGE SEGMENTATION

Good image segmentation meets a couple of requirements

1. Everypixelintheimageowestoaregion
2. Aregionisconnected:anytwopixelsina particular region can be banded by a line that doesn't leave theregion,
3. Eachregionassociatedwithsegmentation is homogeneous with respect to a chosen characteristic.Thecharacteristiccouldbe syntactic(forexample,colour,intensityor texture) or depended on semantic interpretation
4. Adjacent regions can't be fused into a single homogeneousregion
5. No overlapping ofregions.

III. METHODSOFIMAGESEGMENTATION

Image segmentation is an exhausted and important problem, and there are many image segmentation techniques. Most of these methods were developed to be passed on a fewclass of images and therefore aren't general image segmentation methods

The image segmentation algorithms are classiified into three major categories

1. EdgeBased
2. RegionBased
3. ClusteringBased

3.1. Edge-BasedSegmentation

Understandably, an edge is scheduled of linked pixels lying on the march between different regions, where there are intense discontinuities such as gray change, color distinctness, texture variety and so on [6]. An image can be segmented by checking those discontinuities. Based on this theory, there are two major edge-based segmentations methods: Gray-histogram method and Gradient--basedmethod.

The key to a fortable segmentation result lies in maintaining a balance between detecting accuracy and noise immunity [7]. If the level of detecting accuracy is very high, noise may bring in fake edges producing the outline of images unreasonable; otherwise,few parts of image outline may get undetected.

3.2 Region-Based Segmentation

Edge-based segmentation splits an image based on blunt changes in intensity near the edges whereas region-based segmentation partitionsanimageintoregionsthataresimilar according to a group of predefined criteria.The main examples of techniques in this category Thresholding, region raising, region splitting and merging[10]. Region growing pairs neighboring pixels with similar characteristics to form larger regions. This continues until the terminationconditionsarereached.Mostofthe region growing algorithms focus on general information,

making it difficult to reach good global results. This method owes to excessively mergeregions,resultinginundersegmentation. Regionsplittingandmergingworkstoovercome the weaknesses of region budding and region partitioning by combining the two techniques. Initially the image is splitted into arbitrary regions. Region splitting and region joining occuruntiltheterminationconditionsaremet.

1.3 ClusteringBasedTechniques

Clustering partitions the image into variousclasseswithoutanyanteriorknowledge. This method is based on the assumption that article within each class should have a high degree of similarity, while those indifferent classes should be dissimilar. It is examined an unsupervised image segmentationtechnique.

1.4 GeneticAlgorithms

Genetic algorithms are anoptimization technique which is practiced in image segmentation. It mimics natural selection, accords an algorithm to adapt. The given solutions are represented by a population of individual chromosomes, usually expressed as binary strings. A chromosome is made up of genes, each of which can possess a particular characteristic.Eachindividualinthepopulation isdeterminedandgivenafitnessscorebasedon solving the problems. The higher the individual's fitness score, the greater their probability of breeding which creates the next generation through crossover and mutation. Crossover joins the chromosome of two individuals, set up a new individual which is unlike either of the parents. Mutation, which occursonlyasmallrangeofthetime,randomly changes a new individual's chromosome. Since the more optimal individuals have a leading chanceofbreeding,thepopulationaccomplishes toevolveandreachanoptimalsolution.

Farmer and Shugars[15] divide the genetic algorithms used for image segmentation into two major categories:

1. Parameter selection, where genetic algorithms are used to modify the parameters ofanexisting image segmentation method to enhance its output.
2. In Pixel-level segmentation, the genetic algorithms are used to do regionlabeling.

Mostimagesegmentationmethodshave many parameters that need to be scrutinised, a ndtherefore the first method is used more often[8]. Many such methods are reviewed, as well as a few methods use pixel-level segmentation. Modified genetic algorithmsand hybrid genetic algorithms have also been suggestedandusedforsegmentation.

IV. OVERVIEWOFGABASEDCLUSTERING ALGORITHMS

Cluster analysis is a technique, which is used to develop patterns and associations within data. More specifically, it is a multivariatestatisticalcustomthatstartswitha dataset having information on some variables and tries to reorganize these data cases into relatively homogeneous groups. One of the major problems examined by researcher, in associate with cluster analysis that different clustering methods can and develop different

solutions for the same data set. The needed techniquethathasdiscoveredthemost`natural' groups in a data set. The research effort was to investigate the potential usefulness of using genetic algorithms for the determination of clustering.

4.1. ParameterModification

Many of the image segmentation methods have various parameters, constants and thresholds that need to be adjusted to produce optimal segmentation results. This creates a very large search space. Since the parameters interact in complex and non-linear scopes,ananalytickeyisnotgenerallypossible.

With a reasonable length of computation, genetic algorithms are able to detect good approximations of a global optimum within a expandedsearchspace,thussuitedtoproblems involving parameter optimization. Most of the applications of genetic algorithms to image segmentation binds the optimization ofvarious parameters.
The pose image segmentation as an optimizationproblem. They define a general segmentation method, whereby genetic algorithms are applied to the parameters of somewellknownimagesegmentationmethods.
They advocate the use of genetic algorithms to exploringthe parameters of segmentation methods in order to be applicable to few images. They are done with outdoor color imageryandadapted 4parameters of the Phoenix segmentationalgorithmwith genetic algorithms. They methods promotes this method very promising. Zingaretti [9] propose using geneticalgorithms inunsupervised. An important merit of this method over the previous one is that segmentation is made totally unsupervised. It also doesn't rely on any prior data regarding the nature of image that is being processed or the task for which the segmentation output will be used.color image segmentation. This is other case of parameters of an extant image segmentation method being increased by genetic algorithms. Amaindifferenceisthatitperformsmulti–pass thresholding. Different thresholds areprovided during each pass of genetic algorithms. An important merit of this method over the previous one is that segmentation is made totally unsupervised. It also doesn't rely on any prior data regarding the nature of image that is being processed or the task for which the segmentation output will be used. This approach y segmented a wide range of images, with the exception of highly textured images Pignalberietal[8]accountedgeneticalgorithms for the optimization of parameters in an image segmentation.
In this case, they looked in to ranges of images, where a pixel is colored depending on the distance between the object and a sensor. This method partitions the surfaces of 3D objects, but could be applied to segmentation of 2D images. Thus it had successful results, producing high quality image segmentation with a reasonable amount of computation. Even though they developed and performed well on outdoor scenes, these algorithms havenot been proved to be able to cope with general images. The fact that these algorithms can be changed to adapt the parameters of othersegmentation.

4.2. Pixel-LevelSegmentation

In pixel-level segmentation, genetic algorithmsaremadeforregionlabeling.Apixel is catogerised in a particular region depending on its characteristics [15]. Peng el al[11] take thisapproach.Eachpixelintheimageisdenoted by a chromosome, which is a region label. The maindemeritofthismethodisthatthenumber of clusters must be given as an input, and so can't be an unsupervised, general approach. Chun and Yang[11] carried out a similar approach,butusedafuzzyfitnessfunction.

Gong and Yang[9] denotes the image and the segmentation results by quad trees. In the same way to Zingaretti el al they define a two pass sys- tem, genetic algorithms being used for optimization in both passes. In the first pass, genetic algorithms are used to reduce an energy function.

In the optional second pass, a parameter defining how coarse or fine the segmentation is developed by genetic algorithms to clustering methods into Genetic Algorithms, for guiding this last Evolutionary Algorithm in search for findingthe optimal or sub-optimal data partition, that requires a non-trivial search because of its intrinsic NP-complete nature. To solve this task, the appropriate genetic coding was also examined. The coding should be in appropriate form, that may develop a great segmentation process of its own way.

4.4 Hybrid Genetic Algorithms

Grenfenstette[18] mentions that geneticalgorithms can be joined with local search methods, creating a high performance search algorithm. The following are the examples of apt implementation of hybrid genetic algorithms for image segmentation. Genetic algorithms have been combined with someother hierarchical method to owe the image segmentation problem. Zhang[6] combine genetic algorithms with simulated annealing based techniques problem of grey-scale image Segmentation for -which mimic the physical process of cooling to approach**.** Hence an attempt to get rid of the weaknesses of each class. This resulted in finer performance than traditional genetic algorithms.

V. ApplicationsOfGaBasedClustering

In above section various GA based clustering algorithms are studied. This portion providesdiscussiononfewofapplicationsofGA based clustering algorithms. Article [14] shows application of Genetic Algorithm to production simulation . The simulation is treated as a detailed, stochastic, multi-modal function that potrits a performance statistic. Authors triedto maintain (or at least improve) the performance of the system. A model of a real-world production line for printed circuit boards that hasmanyproductsretooledwasused.Sincethe product line is always differing, with half of the productsturningoverwithinayear,theworkof configuring and fine-tuning the development line is neverending.

VI. CONCLUSION

The capability of GAs was applied to evolving the proper number of clusters and giving appropriate clustering. Many GA based clustering algorithms are discussed. Some are appliedonsmalldatasetandsomeareinvolved on large data set. GA based clustering techniques used in areas like production simulation image segmentation, document clustering,imagecompression,geneexpression analysis, text clustering etc. GA was applied on distance based clustering algorithms like K- meansandfuzzyc-meansclusteringalgorithms. GA is yet to be applied to other clustering algorithm.

The use of genetic algorithms in image segmentation opens up promising results. Geneticalgorithmsareacommonly used approach to the parameters of existing image segmentation algorithms. The major decision takenonchoosingamethodofsegmentationto which genetic algorithms will be applied, findingafitnessfunctionthatisagoodfactorof thequalityofimagesegmentationandfindingameaningful way to denote the chromosomes.

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