International Journal of Electrical and Electronics Engineers
Volume 14, Issue No. 01, Jan-June 2022
ISSN (O) 2321-2055
ISSN (P) 2321 -2045

HOMOGENEOUS AREA SEGMENTATION AUTOMATICALLY BY DYNAMIC REGION MERGING

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ABSTRACT:

In this project, we are doing experiments on natural images to prove the performance of the dynamic region merging algorithm. The image segmentation is done automatically by using a new style that is called dynamic merging. Image segmentation plays an important role in computer graphics on image processing due to the modern popularity the image modifications are also changed rapidly, it is essential to process for many applications such as object recognition, and target tracking. In this project were are taking an initially over-segmented image, which contains many regions with the same or homogeneous color detected, in this image segmentation is performed by iteratively merging the homogeneous regions based on a statistical test. It is mainly done by two algorithms: there are the order of merging and the stopped criterion. In the proposed algorithm, these two issues are solved by a novel predicate, which is defined by the sequential probability ratio test (SPRT) and the minimal cost criterion. Starting from an over-segmented image neighboring regions are progressively merged if there is evidence for merging according to this predicate. Here we are proving that the produced image satisfies the global statistics and properties. Moreover, a faster algorithm was developed to accelerate the region merging process, which maintains a nearest neighbor graph (NNG) in each iteration. We are doing experiments on natural images to demonstrate the performance of the dynamic region merging algorithm.

Key Words: Image segmentation, Region merging, Wald's SPRT, Dynamic programming.

INTRODUCTION:

In computer vision and image processing, picture segmentation is a fundamental yet difficult problem. It's crucial for a variety of applications, including object detection, target tracking, content-based image retrieval, and medical image processing. In general, the purpose of image segmentation is the process of dividing an image into a set of fragments with similar characteristics for example (color, texture, etc.) and, in the meanwhile, putting the important elements together for ease of use observing. Humans

are required to manage a high quantity of photographs in many practical situations. There should be as few interactions as feasible during the segmentation process. This results in automatic image generation. Moreover, appealing segmentation approaches. Furthermore, numerous high-level segmentation strategies have proven to be successful. There is a significant body of literature on automatic picture segmentation that dates back decades. Edge detection methods, for example, are based on sudden changes in image intensity or hue.

As a result, distinguishable edges can be identified. However, the resulting margins are frequently discontinuous or jagged. They can only supply candidates for the object borders if they are over-detected. Another well-known type of region-based segmentation algorithm is based on the similarities between pixels within a region. algorithms. In order to organize an image's pixels into meaningful groups of regions or regions. The homogeneity of a region is an important segmentation requirement for items. Graph with many cut criteria, normalized cut, Minimum cut, etc. These algorithms are designed to achieve a desirable segmentation. Obtaining global cost function optimization, However, these cost functions only offer a rough estimate. rather than the entire region, each cut is characterized. Another issue is optimization. For many practical applications, processes are frequently computationally inefficient. The recent success of combinatorial graph-cut approaches has gotten a lot of interest from researchers. These procedures use user input data and cut criteria in optimization, and almost global optima can be achieved in linear computational time. In fact, for the vast majority of cut-based energy functionals, a single it is difficult to choose the best image. For this reason, the hypothesis has been investigated. Many studies have looked into the usage of primitive regions as a pre-processing step for picture segmentation in region-based algorithms There are two benefits. To begin with, areas are more active. expressing the nature of items with information Second, there are many fewer primitive regions than there are primitive regions. The region merging procedure is greatly accelerated by the number of pixels in an image. Starting with a set of primitive regions, segmentation is carried out by gradually merging similar surrounding parts based on a predicate, until a homogeneity requirement is met. Region merging techniques based on statistical features, graph properties, and Spatio-temporal similarity have been proposed in earlier research. Despite the fact that segmentation is achieved by making local decisions, several strategies have yielded satisfactory results when implemented efficiently. Even while some recent region merging work addresses the optimization of various global energy factors, such as the number of labels and the area of regions, most region merging algorithms lack some desirable global features. Watershed transform [45] can also be categorized as a region-based segmentation approach because it represents morphological segmentation well. Watersheds are the dividing lines between distinct catchment basins in geography, therefore the concept is intuitive. The image is over-segmented, which is a key downside of the watershed transformation. To solve this problem, one method is to use "flooding" from the selected markers [46-48], which saves just the most essential regional minima for segmentation. The other [49] is based on a hierarchical process in which thewatershed image's catchment

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basins are combined until they form almost homogeneous regions. In this research, we use a region merging approach to implement the segmentation algorithm, where similar neighboring regions are iteratively merged according to a unique merging predicate. As previously indicated, the region merging process requires homogeneity criteria (cues). Our work does not focus on finding a more complicated area model, despite the fact that a good adequate cue is required to produce a useful segmentation. Instead, a function of random variables is used to model the cues. The reliability of the cues, rather than their qualities, is the primary concern in this case. Because of the reliability of many standard segmentation methods presents, researchers frequently attempt to develop them using more reliable cues. Some statistical segmentation methods, for example, employing parametric probability models, can calculate the dependability of cues. They cannot, however, be applied in a broad sense. Another statistical approach identifies the region boundaries by directly using a statistical attribute of image data (for example, colors). A homogeneity criterion based on the four expected pixel colors inside a region is proposed in particular, which naturally leads to a merger predicate. A likelihood ratio test is used as the measure of region similarity in current region merging research. Both the chance of neighboring regions merging and the probability of adjacent regions overlapping are calculated. The optimal merger will occur together with the highest decrease in the likelihood ratio in order to reduce both probabilities of error.

EXISTING ALGORITHM:

Edge Detection Algorithm:

Edge detection is an image processing technique for the boundaries of objects within images. It works by detecting discontinuities in brightness.

- Apply a Gaussian Filter
- Compute the image gradient
- Apply non-maximum suppression
- Apply double thresholding
- Apply hysteresis

Cut Criteria In Graph Theory:

Graph theory supports the following pointsin image segmentation:

1. Normalized cut
2. Ratio cut
3. Minimum cut

By the reference of J. Shi and J. Mallik cut Criteria are done by grouping the partitions into Graph.

Class-Based Object Segmentation:

Object segmentation is a process instead of a per-pixel basis, segmentation automatically digitizes the image for you. Object-based image analysis (OBIA) segmentation is a process that groups similar pixels into objects.

PROPOSED ALGORITHMS:

1. REGION MERGING PREDICATE

To get image segmentation a more reliable and easy way of the process we are introducing the new concept REGION MERGING PREDICATE. The proposed predicate is based on measuring the dissimilarity between pixels along the boundary of two regions. For the convenience of expression, we use the definition of region adjacency graph(RAG) to represent an image.

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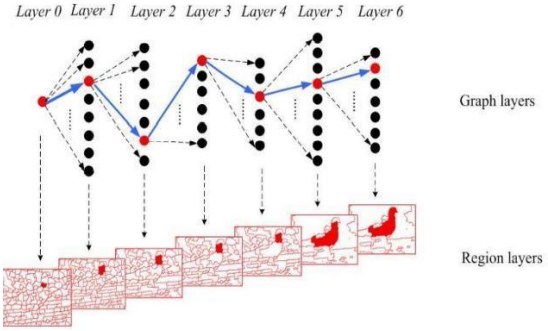
2. DYNAMIC REGION MERGING

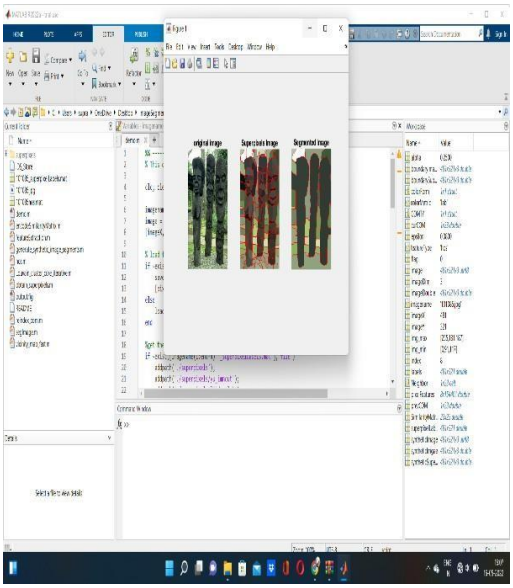
The proposed DRM algorithm is started from a set of over-segmented regions. This is because a small region can provide more stable statistical information than a single

ixel, and using regions for merging can improve a lot computational efficiency. The proposed DRM algorithm is summarized in below table.



RESULT:

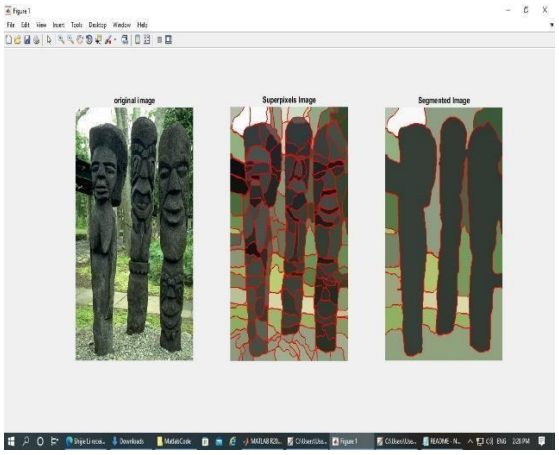
Final output



Description: Execution of the code using matlabR2022a Version.

FIGURE:

The below figure shows the **final output image**



Final output image

FUTURE SCOPE:

There are several potential extensions to this work, such as the introduction of global refinement and user interaction, etc. Those will be further investigated in our future work.

CONCLUSION:

The proposed algorithms are implemented in a region merging style. We defined a merging predicate P for the evidence of a merging between two neighboring regions. This predicate was defined by the sequential probability ratio test (SPRT) and the maximum likelihood criterion. A dynamic region merging (DRM) was then presented to automatically group the initially over-segmented many small regions. Although the merged regions are chosen locally in each merge stage, some global properties are kept in the final segmentation. For the computational efficiency, we introduced an accelerated algorithm by using the data structure ofthe

region adjacency graph (RAG) and nearest neighbor graph (NNG). Experiments on natural images showed the efficiency of the proposed algorithm. There are several potential extensions to this work, such as the introduction of global refinement and user interaction, etc. Those will be further investigated in our future work.

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