Efficient Image Segmentation Technique

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Abstract —**Instead of the large number of techniques developed in the recent year, accurate segmentation of digital images remains a challenging task. This paper presents five efficient image segmentation techniques with their performances, working and parameters used. The five image segmentation techniques used are Bottom-up aggregation, Unified Multiscale Low Rank image segmentation, Weakly-Supervised image segmentation, Evolving Fuzzy image segmentation and Scale Synthesis image segmentation. In this paper a comparative analysis between different image segmentation techniques is shown based on their performance to find out efficient image segmentation techniques**

***Keywords* — Cue Integration , Density, Superpixel.**

I. INTRODUCTION

Image segmentation is being used in many multimedia applications, e.g., image cropping, scene parsing and photo aesthetics ranking. These applications require the image to be ideally segmented. Image segmentation is to partition an input image into several semantically consistent regions. 0bjects of the image may be separable by any variety of cues, be it intensity, texture, color, boundary continuity. Image segmentation is the most challenging task and the difficulties occur due to the larger intra-category variation. The quality of the image segmentation depends upon how well the extra images match with the given image. In this work, there is given different simple image segmentation techniques. First is the Probabilistic Bottom-Up aggregation image segmentation, this approach depends primarily on local information available within the image to be segmented. Starting with an image, pixels are merged to produce larger regions [1]. Second is the Unified Multiscale Low Rank Image Segmentation, in which each scale of input image is partitioned into set of non overlapping superpixels [2], and construct an affinity graph.

Third is the Weakly-Supervised image segmentation algorithm that is developed to avoid the redundancy of the graphlets and its goal is to predict semantics labels to every pixels. The fourth Evolving Fuzzy image Segmentation technique is developed to adjust the parameter of existing segmentation method and switch between their results. Last is the Scale-Synthesis image segmentation, in this for getting the appropriate segmentation result for target application, choosing the correct scale for distinct object and combine them together is needed. To achieve this aim Scale Synthesis method is developed. Comparing this different segmentation technique we can find out which is best efficient image segmentation.

II. BACKGROUND

Different image segmentation techniques used in this paper. Out of which first is bottom up aggregation. For this an evaluation scheme is proposed that is based on an image data set which was specifically chosen such that the human annotations would avoid semantic consideration. For the MsLRR, solved low ranked refined Superpixels affinities are taken, so one can call Normalized Cut method [2] to address supervised or unsupervised segmentation problem. The need to develop weakly supervised segmentation occurs, due to unsupervised method segmentation whose performance is unsatisfactory due to lack of high level cues. The fuzzy platforms offers a unique and flexible platform for knowledge representation. There exists number of fuzzy threshold techniques. For the last, Scale synthesis method, object based Quickbird-image, Land-use-classification has been developed.

III. PREVIOUS WORK DONE

Author Sharon Alpert, et al. [1] has worked on bottom up aggregation image segmentation method which provides patches that can be distinguished by intensity. Author Xiaobai Liu, et al. [2] proposes MsLRR, i.e. unified Multiscale low rank representation image segmentation which can be used for both supervised and unsupervised image Segmentation and is propose to infer low rank affinity matrix. Author Luming Zhang, et al. [3] shows representative discovery of Structure cues for Weakly-Supervised Image which provides distribution of spatially structural superpixel set. Author Ahmed A. Othman, et al. [4] has developed Evolving Fuzzy image segmentation which consists of fuzzy rules for user oriented environments, for capturing the feedback by the design. Author Lina Yi, et al. [5] has developed A Scale Synthesis method for image segmentation which is highly flexible to be adjusted, so that the segmentation requirement of varying image analysis task can be meet.

IV. EXISTING METHODOLOGY

Many segmentation algorithms were developed and verities of techniques were utilized including: clustering [1], Markov random field, and level set method. Form the bottom up aggregation segmentation, vast number of methods, approaches segmentation using bottom up merge strategies, starting with the classic agglomerative clustering algorithm to watershed [1], to more recent algebraic inspired aggregation [1]. MsLRR is related to the efforts in image segmentation for which a broad family of unsupervised method have been proposed. The typical ones include Tu and Zhu's data driven MCMC (Markov Chain Monte Carlo) algorithm

[2], Comaniciu and Meer's Mean-shift, and Shi and Malik's Normalized Cuts method (NCut) and its extension multi-scale NCut [2]. Verbeek et al.[3] proposed an model to estimate pixel-level labels for each image, which is modeled as a mixture of latent topics. For fuzzy segmentation Kasabov [4] has proposed evolving fuzzy rules and genetic algorithm. Dragut et al. [5] has proposed a robust tool to estimate scale parameter based on the idea of local variance of information.

V. Analysis And Discussion

A. Analysis of Existing method:

1. In the bottom up aggregation approach to image segmentation, a sequence of steps is executed in which pixels are mixed to produce larger and larger regions. First step is the division of the image into a set of regions R = {R1, R2, …., Rn} is given, along with a set of observations, for each region Ri (i =1, . . . ,n). Next step is to produce larger regions of coherent properties. Following is given how to elaborate the likelihood densities, the cue arbitration, and prior probabilities.

1. **Likelihood Densities**

Likelihoods are determined from the image by local properties of surrounding regions. Also, likelihoods is the principle, that a region would merge with its most similar neighbor. Different points considered in likelihood are-

1.1 Intensity Likelihood Density

1.2 Texture Likelihood Densities

2. **Prior**

We determine the prior P(sij) according to the geometry of the regions.

3. **Cue Integration**

In this bottom up aggregation approach "mixture of experts" model is used. This model allows us to control the influence of each cue and adapt it to the information contained in each region.

2. In MsLRR after resizing the input, oversegment each scaled image into a set of non-overlapping super-pixels is done. Let m denote the number of scales, I s be the scaled image indexed by $s = 1, . . . , m$. Affinity graph is constructed by taking the superpixels in I s as graph vertices. Two different vertices are connected by a graph edge, weighted by the likelihood of the two associated superpixels belonging to the same semantic region. Quality of segmentation depends on the pairwise superpixel affinity matrix.

3. In weakly supervised image segmentation following steps occur:

A] Graphlet Extraction and Representation.

B] Manifold Graphlet Embedding.

C] Representative Graphlet Selection.

D] Representative Graphlet Cut.

4. Segmentation using fuzzy rules has the benefit of transparency and interpretability when compared with other methods. Fuzzy inference systems generally consist of a set of IF–THEN rules of the following form:

If x1 is A1 and x2 is a2 AND….AND xn is AN, THEN y is B, where xi, y belongs to X are variables defined in corresponding universes of discourse Xi and Y, respectively, and Ai and B are fuzzy (sub)sets.

5. In scale synthesis method there are two types: multiscale and single scale synthesis. In multiscale segmentation an edge-embedded marker-based watershed (EEMW) segmentation algorithm is used to derive the initial oversegmentation result of HSRI

B. Attributes and parameter considered:

1. Texture
2. Intensity
3. Color
4. Boundary continuity
5. Superpixel
6. Graphlet
7. Variation of information
8. Noise
9. Threshold

C. Effect of outcome of attributes of various parameters:

1. Smaller VI shows better performances.

2. The number of all the possible graphlets increases, as per the graphlets size.

3. According to the empirical result, segmentation accuracy stops increasing when the graphlets size increases from 5 to 10.

D. How attributes and parameter are improved:

In bottom-up aggregation technique" Method of Expert" model is used which allows to control the influence of each cue, it may be texture, intensity or color. In Multiscale low rank representation, super pixels affinity can be improved by minimizing the term tr(ZsT Qs), where tr gives matrix trace and Qs is a matrix. To improve homogeneity of the graphlet, small sized graphlets are used.

E. Comparison and drawbacks:

After comparing each image segmentation techniques given in the paper, it is found that there occur some drawbacks in each of thetechniques. In bottom-up aggregation physical ambiguity occurs, where as the in the MultiScale low rank representation, region grouping problem occur. Graphlets are very descriptive, there is need to weaken it. The threshold method used in Evolving fuzzy image segmentation, gives poor result because the method is static and have no learning capability and also by using threshold methods images are extremely difficult to Binarize. Scale selection in image segmentation is difficult problem. Noise is an issue which affects the performance of segmentation, so it is also one of the drawbacks.

VI. Proposed Methodology

As shown in the previous section, different drawbacks occur in this image segmentation techniques. Main is the noise. So to handle this, voting based analysis is used, in which first every data point is encoded which sends out a vector field. This can be used to decompose the pointness, edgeness and surfaceness of the data points. And then noises present in corrupted region are removed. And by using Gaussian mixture technique segmentation is performed. This technique is robust to gaussian noise, uniform noise etc. The performance can be improved by adding local neighbourhood information in both similarity measure and membership function. Later, scale selection can be made easy by using spatial bandwidth in which mean shift algorithm is used.

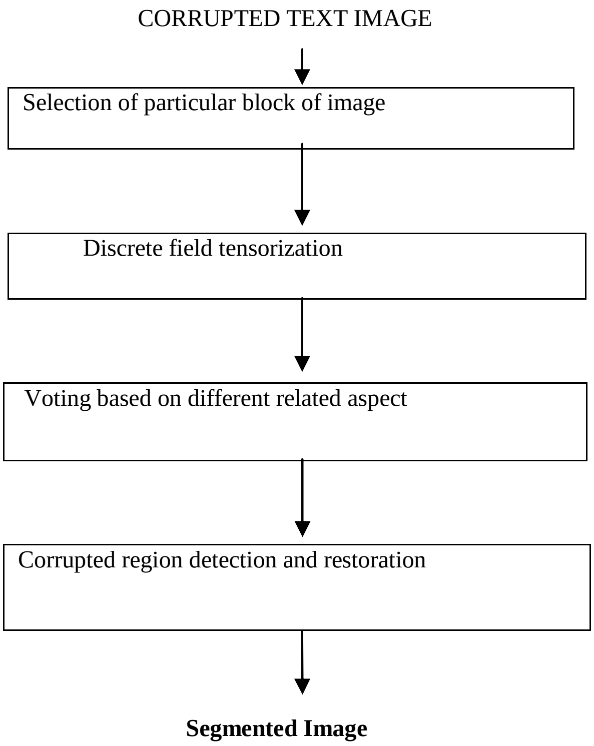

Fig.1 : Flowchart

VII. Possible Outcome And Results

In this way this paper presents how the noise in image segmentation is removed and the segmentation is made efficient.In the future there is need to investigate a semi supervised segmentation frameworkthat simultaneously decomposes an image into region and derive their semantic. Also, to verify the benefits of rule evolution and to explore different ways of integrating user feedback, the research should be done using larger data sets of real world image.

Conclusion

In this way, this paper presents comparative analysis between different image segmentation techniques, by analyzing their working and performances. Then different solutions that can be used to improve the performance of image segmentation techniques are given.

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