Review on Image Segmentation

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Abstract-*Image segmentation is the process of partitioning a digital image into multiple segments which plays an important role in applications of computer vision, objects recognition, object tracking and image analysis. There are a large number of methods present that can extract the required foreground from the background. Proposed work aims to partition an image which uses interactive information. Interactive image segmentation technique is based on adaptive constraints propagation (ACP).*

This system is known as ACP Cut. Input provided by user is very important factor to improve the effectiveness of system.

Initially in proposed work superpixels are generated for a complete pixel based image by using the Simple Linear Iterative Clustering (SLIC) method. These superpixels are used to extract color based features which are further used to derive pairwise constraints. These pair-wised constraints are further used by ACP seed propagation method to differentiate foreground object from background portion of an given input image. Additionally, Graph Decomposition ILP Segmentation (GDIS) method based on clustering contributes in foreground extraction which aims to improve the time efficiency and accuracy of image segmentation.

Keywords- Adaptive constraint propagation, super pixels, seed propagation, interactive image segmentation.

I. INTRODUCTION

Because of the significant advances in imaging devices and technologies, digital images play a more imperative part in our life. A images records a scene of this present reality in a numeric representation which will be stored, transmitted and contemplated thereafter. The outstanding precept “a picture is worth a thousand words” demonstrates that a picture has an effective capacity of portraying the rich data it carries. Image processing is the use of computer algorithms to perform image processing on digital images. As a subcategory or field of digital signal processing, digital image processing has many advantages over analog image processing. It allows a much wider range of algorithms to be applied to the input data and can avoid problems such as the build-up of noise and signal distortion during processing. Since images are defined over two dimensions (perhaps more) digital image processing may be modeled in the form of multidimensional systems. Image processing image processing has become the most common form of image processing and generally, is used because it is not only the most versatile method, but also the cheapest.

In computer vision, pictures are utilized to perform perception tasks, for example, object detection, classification, feature extraction, multi-scale signal analysis, pattern recognition, projection among others.

Image segmentation is the task in which the image is divided in multiple components in such a way that the each part/component has some significance. As an image is consist of various pixels the segmentation issue can be taken as a labeling issue that concentrates on assigning a label to every pixel showing a specific component in the scene. Alternatively retrieving boundaries in various objects can be named as segmentation so that the image is divided in meaningful areas with respect to the boundaries. When the segmentation of given image is performed, it not only enables the computer to know about the image composition, but also enables the computer to analyze the qualitative and quantitative properties of the object of interest based on its segmented region in the image.

In proposed system dataset of images is taken as an input and pixel generation is performed on the dataset. Superpixels are generated for a complete pixel based image by using the Simple Linear Iterative Clustering (SLIC) method. After that generate feature extraction and pairwise constraints by mean shift segmentation. GDIS segmentation is used for the correlation clustering of same color histograms and after seed propagation foreground image segmentation is performed.

In this survey, Section II gives the Literature review for Image Segmentation.

II. LITERATURE REVIEW

In paper [1], authors apply efficient implementations of integer linear programming to the problem of image segmentation. The image is first grouped into super pixels and then local information is extracted for each pair of spatially adjacent super pixels. Given local scores on a map of several hundred super pixels, use correlation clustering to find the global segmentation that is most consistent with the local evidence. Probabilistic modeling of image segmentation based on correlation clustering and an efficient algorithm of the ILP optimization problem.

In paper [2], authors approach introduces the higher order cliques, energy into the co-segmentation optimization process successfully. A region-based likelihood estimation procedure is first performed to provide the prior knowledge for our higher order energy function. Then, a new co-segmentation energy function using higher order cliques is developed, which can efficiently co-segment the foreground objects with large appearance variations from a group of images in complex scenes.

In paper [3], authors uses supervised hierarchical approach to object-independent image segmentation. Starting with over segmenting super pixels, we use a tree structure to represent the hierarchy of region merging, by which we reduce the problem of segmenting image regions to finding a set of label assignment to tree nodes. Formulate the tree structure as a constrained conditional model to associate region merging with likelihoods predicted using an ensemble boundary classifier. Final segmentations can then be inferred by finding globally optimal solutions to the model efficiently.

In paper [4], authors presents an unsupervised and semiautomatic image segmentation approach where formulate the segmentation as an inference problem based on unary and pair wise assignment probabilities computed using low-level image cues. The inference is solved via a probabilistic graph matching scheme, which allows rigorous incorporation of low level image cues and automatic tuning of parameters. The proposed scheme is experimentally shown to compare favorably with contemporary semi-supervised and unsupervised image segmentation schemes, when applied to contemporary state of-the-art image sets.

In paper [5] authors presents semantic image segmentation is a fundamental yet challenging problem, which can be viewed as an extension of the conventional object detection with close relation to image segmentation and classification. It aims to partition images into non-overlapping regions that are assigned predefined semantic labels. Most of the existing approaches utilize and integrate low level local features and high-level contextual cues, which are fed into an inference framework such as, the conditional random field (CRF). It proposes an ontology based semantic image segmentation (OBSIS) approach that jointly models image segmentation and object detection. Dirichlet process mixture model transforms the low-level visual space into an intermediate semantic space, which drastically reduces the feature dimensionality. These features are then individually weighed and independently learned within the context, using multiple CRFs.

In paper [6], Image segmentation aims to separate the desired foreground object from the background. Since color and texture in natural images are very complex, automatic segmentation of foreground objects from the complex background meets a significant obstacle when foreground and background have similar features. Interactive image segmentation using adaptive constraint propagation (ACP), called ACP Cut. In interactive image segmentation, the interactive inputs provided by users play an important role in guiding image segmentation. However, these simple inputs often cause bias which leads to failure in preserving object boundaries.

In paper [7] author propose the eigenvalue problem of an anisotropic diffusion operator for image segmentation. The diffusion matrix is defined based on the input image. The eigen functions and the projection of the input image in some eigen space capture key features of the input image. An important property of the model is that for many input images, the first few eigen functions are close to being piecewise constant, which makes them useful as the basis for a variety of applications, such as image segmentation and edge detection. The eigen value problem is shown to be related to the algebraic eigen value problems resulting from several commonly used discrete spectral clustering models. The relation provides a better understanding and helps developing more efficient numerical implementation and rigorous numerical analysis for discrete spectral segmentation methods. The new continuous model is also different from energy-minimization methods such as active contour models in that no initial guess is required for in the current model.

As shown in table 1, literature review of various papers has been listed, giving possibility of research gap.

Table 1. Survey Table

Sr no.	Title	Publication/ year	Techniques	Advantages	Research gap
1.	Hierarchical Image Segmentation Using Correlation Clustering	IEEE, 2016	GDIS Segmentation Algorithm, Hierarchical Segmentation	Efficient and Better Performance	The ideas presented in this paper can be combined with task specific image partitioning to further improve segmentation and object detection results.
2.	Higher-Order Image Cosegmentation	IEEE, 2016	Likelihood Estimation, Higher-Order Energy Co-Segmentation	extract the complicated foreground objects from a group of related images.	System can be compare with other approaches
3.	Image Segmentation Using Hierarchical Merge Tree	IEEE, 2016	Itterative hiearachical merge tree model	accuracy and is competitive in image segmentation without semantic priors	the combination of merge trees from each iteration as one single model and its global resolution can be investigated
4.	Image Segmentation via Probabilistic Graph Matching	IEEE, 2016	Foreground or background image segmentation	The proposed scheme is applied in both semi-supervised and unsupervised settings	System can be used as co segmentation
5.	Ontology-Based Semantic Image Segmentation Using Mixture Models and Multiple CRFs	IEEE, 2016	ontology-based semantic image segmentation method (OBSIS)	Combined effective use of image segmentation and object detection	Can extend with more comprehensive image representations such as prototype-based features, and conduct experiments with larger databases.
6.	Interactive Image Segmentation Using Adaptive Constraint Propagation	IEEE, 2016	eigenvalue problem of an anisotropic diffusion operator for image segmentation.	ACP Cut extracts foreground objects successfully from the background and outperforms the state-of the-art methods for interactive image segmentation in terms of both effectiveness and efficiency	anisotropic mesh adaptation is essential
7.	Image Segmentation With Eigenfunctions of an Anisotropic Diffusion Operator	IEEE, 2016	eigenvalue problem of an anisotropic differential operator as a tool for image segmentation.	shown that anisotropic mesh adaptation is essential to the accuracy and efficiency for the numerical solution of the model.	--

III. PROPOSED SYSTEM

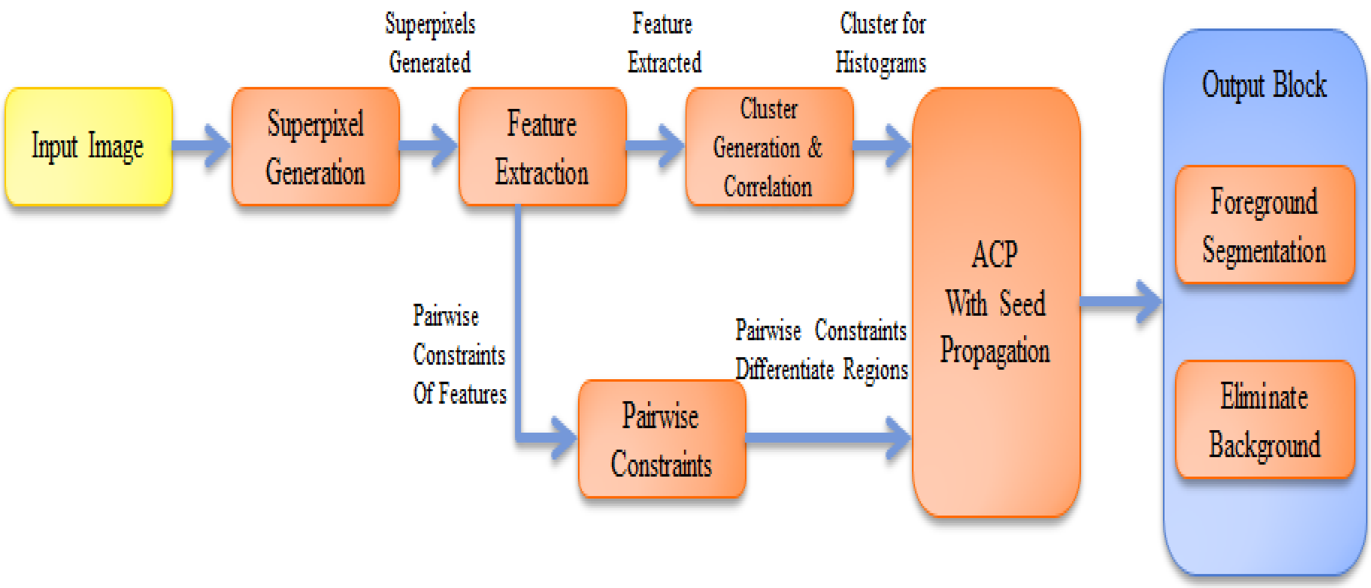

Fig 1. System Architecture

Figure 1 shows the proposed system architecture. In proposed system dataset of images is taken as an input and pixel generation is performed on the dataset. Superpixels are generated for a complete pixel based image by using the Simple Linear Iterative Clustering (SLIC) method. Then, system extracts features from superpixels obtained by mean-shift segmentation in an image.

Then, system generates pairwise constraints from the user's interactive information. Next, system performs ACP with seed propagation on both features and pairwise constraints to learn a global discriminative structure in an image. Finally, system assigns a label of foreground/background to each superpixel based on the learned discriminative structure, thus segmenting foreground objects from background.

In proposed system, ACP cut is improved with GDIS segmentation method for foreground image segmentation, which improves the time efficiency and accuracy of image segmentation output. Experimental result will prove that the proposed system outperforms the ACP Cut meth of for improved image segmentation in terms of accuracy and speed.

IV. CONCLUSION

This paper analyses various techniques used for Image Segmentation. Also given the advantages and drawbacks present in the different studies performed by various researchers. To deal with drawbacks in present systems we presented an idea of the new system.

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