An Optimization Approach for High Quality Image Segmentation using Mean Shift Filtering

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***Abstract*- Analysis of image is to deal with image semantic, image is not represented in single pixels it is an meaningful image objects and their mutual relations. High-resolution remote Sensing image contain complex structures, it have common brightness but with week boundaries and fail to detect edges of image objects. Then boundaries posterior probabilities are predicted by the model and associated with weights in the mean-shift filtering iteration, finally filtered image is put in to segmentation methods instead of the original image. The method can smooth the inner pixels of objects and preserve the boundaries of complex image (Remote sensing image in spatial and spectral resolution). It produces a more accurate image and higher classification accuracy. Image analysis application is multi source data fusion integration of different data types plays an important role in the remote sensing area, it can also work in "PSYCHOPHYSICS". In this RGB image is converted to HIS image then given as an input, in experiments the regression model is used with an aerial image, which is tested with an aerial image and a QuickBird image. For the evaluations of image two popular segmentation methods used, those are fusion method and multiresolution. The goal of this work is both quantitative and qualitative evaluations reveal that the presented procedure facilitates a high image segmentation result and higher classification accuracy.**

Key words*— *Image segmentation, classification, mean shift filtering, HIS image, segmentation accuracy.

I. INTRODUCTION

Human-marked boundaries and automatically found boundaries by computer have low-level vision, which makes difficult to get correct result a noise level which may cause local decisions unreliable. Remote sensing data (image) in spatial and spectral resolution should improve, for this a research shift from pixel based to object based approaches has observed. Feature space-based analysis of image is a model which can improve performance of low level vision task. The nature of feature space is application dependent, both the advantage and the disadvantage of the feature space. The uniformity movement of recursive mean shift procedure, to the nearest stationary point it is used in detecting the modes of the density (a measure of the amount of matter contained by a given volume). As stated above object-based image analysis consists of two blocks 1.Segmentation and 2.Classificatio [2][3].

There is error in humans segmentation process, two central problems in vision are image segmentation and recognition [17]. The segmentation done by different humans are not identical. Considering the humans perceptual in a hierarchical tree structure, if two observers have exactly the same image to segment there segmented image will not same. Even though simple image segmented easily but it is a difficult task for the complicated images and special images. To evaluate the performance of segmentation we are using many computerized methods, a reliable standard which to evaluate different computer algorithms for image segmentation. Segmentation tools are java application that can use to divide an image in to segments where a segment is a set of pixels. The segmentation advantages are first within less time anyone can segment image by using internet second the process produces accurate partitions of the pixels into segments (groups). But it has the problem of image segmentation on firm, quantitative ground.

Entropy rate superpixel segmentation is another computer vision application that used for object recognition image segmentation and single view 3D reconstruction [16]. The main use and advantages of using superpixels is computational efficiency, it also helps for spatial support for computing region based features. The superpixel segmentation used for graph based image segmentation because of that, it get difficulty in clustering problems. Clustering problem can be reduced by an entropy rate of a random walk on a graph and balancing term on the cluster distribution but still it is not clear that can used for general clustering problem [16]. The superpixel segmentation problem is also an optimization problem on graph topology.

This letter presents image segmentation as mentioned before there are many different approaches are followed, few of them lead to more convincing results but many of them are robust under operational settings. Segmentation results in an automatically extract all objects of interest in an concerning a certain task in expected, the improved mean shift filtering method that use RGB color mode [1], it is implemented by the HSI color model that performs more accurate results then RGB. For regional segmentation algorithm embedding that maps small structure to large structure with two complementary edge cues, in the iterative (to achieve desire out come repeated steps) process this serves as general preprocessing step. This focus on the segmentation accuracy. That test multispectral image two local edge cue are evaluated, by logistic regression model two cues are combined that shows boundary confidence map. Finally the map is integrated into mean shift filtering step. Then using two algorithms the filtered image is segmented and tested, faltered image is used for the fusion

method and multiresolution methods instead of using original input.

APPLICATIONS

- Accurate image segmentation and classification.
- Directly used for Quickbird image (high resolution earth observation satellite) [1].

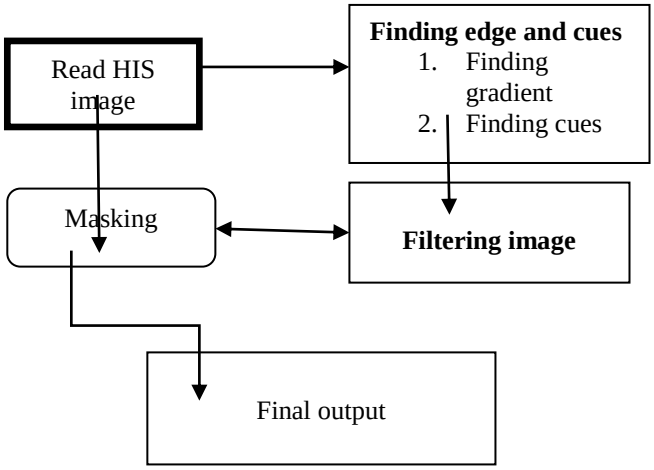

Fig 1 System architecture.

The fig1 shows the system architecture of parented model, the first step is the RGB image converged to the HIS image using the algorithm. The HIS image is given as an input image second step is finding the edge and cues using average both cue and gradients, third step is filtering the image by mean shift filtering, then masking input image with the segmented image. The final output is the accurate segmented image.

II. RELATED WORK

A. Natural Image Boundaries Using Local Brightness, Color, And Texture Cue

How can we get the boundaries automatically as like human marked boundaries of an image? Boundary detection classically referred as edge detection [13]. A boundary represents a change in pixel from one object or surface to another change in some low level image feature (shape) that is brightness or color. Edge detection is one low level technique that commonly applied to reach the goal of boundary detection. Local boundary model used in system for performing high level recognition task, the common approach to local boundary detection is to look for image brightness that shows discontinuities in image. It is difficult to detect the boundary between smooth regions which have very small change in image brightness. The main cause of simple brightness edge models made researches to develop more complex detections boundaries detection. Image brightness only improves the nearest boundary detection, which does not solve the problem of texture boundaries [13].

Humans use to combined multiple cues to improve their boundary detection, which proved by psychophysics. In natural image boundaries can be marked by joint changes in many cues that are brightness, color and texture. There are difficult problems of cue combination. Work for texture with each point in an image to get good cue combination and boundaries before adding brightness, color and texture cues in to a single detection, individually optimize each cue first the proper treatment of texture is essential for detecting boundaries in natural image. This method proposed by D.R. Martin and C.C. Fowlkes recently but if consider the special image for analyzing earths geography this method false an error.

B. Multiresolution Segmentation

Multiresolution segmentation is other method that works for special image, this is the method that process as image objects (segments) created by regional segmentation approaches are serves as basic units for subsequent semantic object classification [4]. If considering the boundaries of different semantic objects which have weak brightness and soft transitions even image with high resolution, that lead to the formation of less compact shapes. To form more compact shapes of image segmented object the multiresolution segmentation can be used special scale image analysis is also achieved by multiresolution segmentation with local and global optimization techniques. However image analysis deal with image semantics, image is not an single pixel but it is meaningful image objects and their mutual relation. Considering the spatial scale image data are more or less textured, spatial scale image analysis are playing an important role in remote sensing as airborne data, radar and VHR satellite data.

1. Air borne data: data carried by air.

2. Radar data: radar is radio detection and ranging, a method of detecting distant object and determining their position by analysis sent by radio waves.

3. VHR data: VHR is very high resolution, one of the highest image quality currently available.

Integration of deferent data types are important application in field of remote sensing, in mage segmentation the image analysis plays an important role. Texture segmentation able to reproducible for specific application in grate manner but they are applicable for less number types of image data, so an alternative segmentation method developed which helps the lower spectral and textural properties. In multiresolution segmentation image objects primitives (an original or primary) are the first preprocessing step after this step the resulting image object are the raw material for future grouping and removal of impurities procedures. The main aim of the multiresolution is extraction of meaningful image objects to solve problems of classification and refinement procedures, and segmentation method should be reproducible. The multiresolution is a process that finding the image objects required for a merge, merge ‘A’ with any neighbor object ‘B’ which the criterion is ‘best’ homogeneity.

The multiresolution segmentation method produces accurate and homogeneous image objects in arbitrary resolution, if we process this method on complex special image it can take more time. The method provides more flexibility in detecting homogenous objects however the tuning (executing) of the scale (sequence value) and merging parameters falls into trial-and-error. Another efficient way to create image objects is regional segmentation, this method

relatively work for discontinuity preserving and smoothing edge and textures boundary. By adaptive (suitable) weighting mean shift vector is calculated, this is also can smooth the inner pixels of image objects but since local discontinuity edge is still not sufficiently considered. Because it may leave those objects which have the weak boundaries, that is not possible to consider nearest object while doing regional segmentation the method may use noise that present in original image that can lead to less compact image of segmented object.

III. METHODOLOGY AND ALGORITHEMS

The large no of complex structures remote sensing image with high resolution , which have common brightness [12]. The edge detection by gradient band is not much useful because more object with complicated texture have weak boundaries, and with a logistic regression model two complementary edge cue gradient based cue and an edge confidence cue are combined [14][15]. To get more accurate boundary response in different land objects, special and spectral image HIS color image is used instead of RGB image.

1. ALGORITHEM TO CONVERT RGB TO HIS
   - Read RGB image
   - Represent the RGB image in the range [0 1]
   - Find HIS components

$$\theta = \cos^{-1}\left\{\frac{1/2[(R-G)+(R-B)]}{[(R-G)^2+(R-B)(G-B)^{1/2}]}\right\}$$

$$\text{H(Hue)}=\begin{cases}\theta & if\ B \le G\\ 360-\theta & if\ B > G\end{cases}$$

$$\text{S(Saturation)}=1-\frac{3}{(R+G+B)}[\min(R,G,B)]$$

$$\text{I(Intensity)}=\frac{1}{3}(R+G+B)$$

the algorism coverts the RGB to HIS image that gives as input to the finding gradients and cues the average of this is weighed and filtered with mean shift filtering with algorithm [1] and final segmented image is accurate then the optimization segmentation done with the RGB image.

IV. CONCLUSION

Segmentation procedures are used for automation of images analysis application. Human eyes are strong and experienced source for evaluation of segmentation technique. No segmentation result will convince if it does not satisfy the human eyes. To reach this goal: the evaluation of image is the information which can be extracted from image objects for future successful processing. The HSI color mode can help to avoid the noise present in the original image that can be identified by the accurate color that we clearly identify the neighbor pixel by its color else avoid if it is noise. To produce segments this use the filtered image instead of original image that serves input to the two popular segmentation methods fusion method and multiresolution method that improve and avoids the disadvantage of the multiresolution.

Finally this method improves the regional segmentation and optimization of segmentation which use mean shift filtering in more general way, this method integrate local edge cues [1]. That is used as preprocessing step that form more accurate segmentation results, that preserve the boundaries of complex land cover object and smoothes the inner pixel more accurate than the optimization segmentation algorithm by using mean shift because of the HSI color model. The filtered image is used as input image for two popular segmentation methods to test the segmentation accuracy fusion method multiresolution that shows the higher classification accuracy and more accurate image segmentation. This is still under study whether if two data sets used for training and testing, it is another interesting issue to extend this method to some other segmentation algorithm [1]. This letter has discussed how to improve regional segmentation methods in a more general way. Converting RGB color image to HIS color image and giving as input a mean-shift filtering method, integrating local edge cues, is presented as a preprocessing step for segmentation methods. The method can smooth the inner pixels of objects and preserve the boundaries of complex land cover objects as well. It is tested by two popular segmentation methods, i.e., the fusion method [10] and the multi-resolution method [4]. Both visual inspection and quantitative assessment have shown that the presented procedure produces a more accurate image segmentation and, thus, higher classification accuracy.

The results suggest that the established model can be used directly for the QuickBird images or some other images that show spatial resolution in the same range. Nevertheless, it is still under study whether the method can work well if two data sets used for training and testing have a larger difference in spatial resolution or wavelength ranges and how to extend the method to hyper spectral images. Some other more efficient boundary cues and combination models are still under the investigation. Moreover, how to extend this method to some other segmentation algorithms is another interesting issue.

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