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A Histogram Analysis Approach for SAR Image Segmentation

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ABSTRACT: SAR system provides high resolution imagery. It is usually implemented by mounting an antenna on a moving platform such as an aircraft or spacecraft, so that target scene can be repeatedly illuminated with radio waves. And the echo waveforms received from different antenna positions are Coherently detected and expressed as a digital image and then post processing is being carried out to resolve different elements. One of the fundamental task of image processing is image segmentation. In this paper we will discuss different methods and steps of image segmentation and then histogram analysis will be performed to identify different regions. This kind of analysis is based on peak value analysis of regions of regions in histogram.

Keywords: segmentation, histogram, features, corners, SAR.

1. INTRODUCTION

1.1 SEGMENTATION: Segmentation is a fundamental task in image processing used to match two or more pictures taken, for example, from different sensors at different times or from different viewpoints. Image Segmentation is a crucial step in all image analysis tasks in which the final information is gained from the combination of various data sources and multichannel image restoration .It geometrically aligns two images—the reference and sensed images. One of the applications of image Segmentation is Corner detection. the contours characteristics of the target image is determined by corners., and the number of corners is far smaller than the number of image pixels, thus can be a good feature for image Segmentation.

1.1.1 SEGMENTATION METHODS: Segmentation methods are divided in to two following categories:

Region based methods: These methods adopt correlation technique and are easy to calculate and implement but required large amount of calculations which is a serious problem

.**Features based methods:** These method extracts some common invariant features such as corners, contour etc. Corners have the merits of the rotation invariance and almost immunity to illumination conditions. It is the widely used method in image Segmentation process

1.1.2ANALYSIS METHODS: Applications of image Segmentation can be divided into three main groups according to the manner of image acquisition:

Multiview analysis (Different viewpoints) :

Images of the same scene are acquired from various viewpoints. The goal is to gain a 2D view or a 3D representation of the scanned scene.

Examples of applications: Remote sensing, Computer vision—shape recovery (shape from stereo).

Multitemporal analysis (Different times):

Images of the same scene are acquired at different times, sometimes on regular basis, and sometimes under different conditions. The main goal is to find and analyse changes in the scene which appeared between the consecutive images acquisitions. Various applications includes: Remote sensing: monitoring of global land usage, earth resource monitoring, Computer vision: automatic change detection for security monitoring, tracking motion. Medical imaging: monitoring of the tumor evolution and monitoring healing therapy.

Multimodal analysis Different sensors (multimodal analysis):

Images of the same scene are acquired by different sensors. The main goal is to integrate the information obtained from different source streams to gain more complex representation.

Examples of applications: Remote sensing—fusion of information from sensors with different characteristics like panchromatic images, color/multispectral images which offers better spatial resolution and is independent of cloud cover and solar illumination.

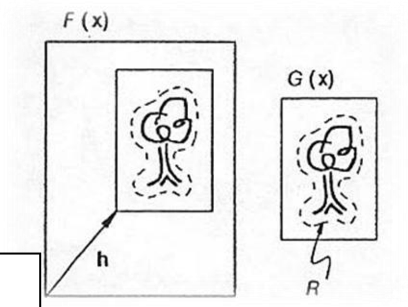
2. IMAGE.SEGMENTATION METHODOLOGY

The translational image Segmentation problem can be characterized as follows: We are given functions F(x) and G(x) , where x is a vector, which give the respective pixel value at each location x in two images, We are interested in finding the disparity vector h that minimizes some measures of the difference between F(x+h) and G(x), for x in some region of interest .

Image Segmentation is an important part of the image processing and computer vision. Image Segmentation methods usually divided into two categories: region-based methods and feature-based methods. The former adopts correlation technique to determine corresponding matching position between two images. it is easy to implement, but large amount of calculation is serious problem, especially ,due to rotation, scaling and shifting transformation influence and distortion such as shading, degradation of images, the algorithm effectiveness will be dropped dramatically; the latter firstly extracts some common invariant features, such as contour, moments, etc., next, fine matching is conducted, because of invariant features, nothing to do with the image gray level, the ambiguity of Segmentation can be effectively solved.
The commonly used automatic point feature extraction algorithms include: SUSAN operator, Harris operator, Forstner operator, Moravec operator and so on. Harris operator has been proved to be one of the best detection operators.
Many different interest point detectors have been proposed with a wide range of definitions for what points in an image are interesting. Many detectors determines points of very high local symmetry; others find areas of highly varying texture, where as some others find corner points. It is very interested to determine Corner points as they are formed from two or more edges and edges usually define the boundary between two different objects or parts of the same object. The choice of corners for feature detection is further motivated by the fact that they are stable, not only to small changes in viewing directions but also to illumination changes.

2.1 STEPS INVOLVED IN IMAGE SEGMENTATION:

Image Segmentation essentially consists of following steps as shown in figure 1.2:



FEATURE DETECTION
FEATURE MATCHING
TRANSFORMATION MODEL ESTIMATION
IMAGE RESAMPLING & TRANSFORMATION

Figure: Steps involved in Image Segmentation

2.1.1 Feature detection: A feature is defined as an "interesting" part of an image. Salient and distinctive objects like edges, line intersections, contours, corners, etc) in both reference and sensed image are detected. For more processing, these features can be represented by their point representatives (centers of gravity, line endings, distinctive points), which are called control points (CPs). The features represent information on higher level.

Region features: The region-like features can be the projections of general high contrast closed-boundary regions of an appropriate size , water reservoirs, and lakes , buildings , forests , urban areas or shadows . The general criterion of closed boundary regions is prevalent. The regions are often represented by their centers of gravity, that is not varying with rotation, skewing and stable under random noise and gray level variation. Region features are detected by means of segmentation methods. The accuracy of the segmentation can significantly influence the resulting Segmentation. The segmentation of the image will be performed iteratively and in each step, the rough estimation of correspondent object was used to tune the segmentation parameters.

Line features: The line features can be the representations of general line segments, object contours roads or coastal lines. Line correspondence is expressed by pairs of line ends or middle points. Standard edge detection methods, like a detector based on the Laplace of Gaussian, or canny detector is mainly employed for the line feature detection.

Point features: The point features group consists of methods working with line intersections, centroids of water regions, road crossings oil and gas pads, curvature discontinuities and high variance points detected using the Gabor wavelets, inflection points of curves, local extreme of wavelet transform, the most distinctive points with respect to a specified measure of similarity, and corners. The core algorithms of feature detectors in most cases follow the definitions of the 'point' as line intersection. Standard corner detection methods, like SUSAN operator, Harris operator, Forstner operator, Morave operator and so on.

2.1.2 Feature matching: The correspondence between the features in the reference and sensed image established. The detected features in the reference and sensed images can be matched by means of the image intensity values in their close neighborhoods, the symbolic description of features and. Feature spatial distribution. Some methods, when looking for the feature correspondence, simultaneously determines the parameters of mapping functions and thus merge the second and third Segmentation steps. And the two major categories: one is area-based and second is feature-based methods are retained and further classified into subcategories according to the basic ideas of the matching methods.

Area-based methods: Area based methods are preferably applied when the images have not many prominent details and the distinctive information is provided by gray levels /colors rather than by local shapes and structure. Area-based methods have two principal limitations. Reference and sensed images must have somehow 'similar' intensity functions, either identical (and then correlation-like methods can be used) or at least statistically dependent (this typically occurs in multimodal Segmentation). From the geometrical view, very small rotation between the images are allowed when using area based methods (although the area-based methods can be generalized to full rotation and scaling, it is practically meaningless because of an extreme computational load). To speed up the searching, area-based methods often employ pyramidal image representations and sophisticated optimization algorithms to find the maximum of the similarity matrix.
Feature-based matching methods:
Feature-based matching methods are typically applied when the local structural information is more significant than the information carried by the image intensities. It can register images of fully different nature (like aerial photograph and map) and can handle complex between-image distortions. The common drawback of the feature-based methods is that the respective features might be hard to detect and/or unstable in time. The crucial point of all feature-based matching methods is to have discriminative and robust feature descriptors that is not varying with the assumed differences in between the images.

2.1.3 Transform model estimation: The type and parameters of the so-called mapping functions, which aligns the sensed image with the reference image, are estimated. After the feature correspondence has been established the mapping function has been constructed. It transforms the sensed image to overlay it over the reference one. Now the correspondence of the CPs between the sensed and reference images together with the fact that the corresponding CP pairs should be as close as possible after the sensed image transformation are employed in the mapping function design. The task to be solved consists of choosing the type of the mapping function and its parameter estimation.

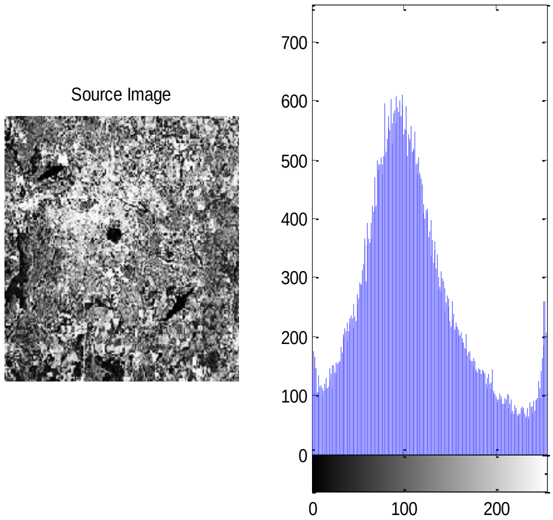
2.1.4 Image resampling and transformation: The sensed image is transformed by means of the mapping functions. The mapping functions constructed during the previous step are used to transform the sensed image and thus to register the images. Transformation function can be realized in a forward or backward manner. Then Each pixel from the sensed image can be directly transformed using the estimated mapping functions. So,this approach, is called a forward method, it is complicated to implement, because it can produce holes and/or overlaps in the output image.

3 . EXPERIMENTAL RESULT AND DISCUSSIONS

Research Design:

The presented work performs histogram analysis over sar images to identify different number of regions. For this purpose firstly data obtained from secondary source is expressed as adigital image. Then preprocessing is carried out over the image in which size, colour and intensity levels has been adjusted.then histogram analysis is carried out using peak value analysis. The number of peak values over the histogram represents different regions for target image.

SAR Image



Histogram Analysed Image

4. CONCLUSION

The present work is to discuss the various image segmentation methods and steps involved in image segmentation. The present work also performs the image segmentation on a sar image using histogram analysis.Different number of regions over the image has been estimated using this analysis. Number of peak mountains in the histogram will represent the number of regions over the image.

REFERENCES

[1] H.B. Kekre," SAR Image Segmentation using co- occurrence matrix and slope magnitude",International Conference on Advances in Computing, Communication and Control ICAC3'09, January 23–24, 2009, Mumbai, Maharashtra, India. 978-1-60558-351-8 pp 368-372

[2] Dr.P.Subashini," Quantitative performance evaluation on segmentation methods for SAR ship images", Compute'10, Jan 22-23, 2010, Bangalore, Karnataka, India 978-1-4503-0001-8/00/0010

[3] Xiuli Ma," Spectral Clustering Ensemble for Image Segmentation",GEC'09, June 12-14, 2009, Shanghai, China 978-1-60558-326-6/09/06 pp 415-420

[4] Ohlander, Ron; Price, Keith; Reddy, D. Raj "Picture Segmentation Using a Recursive Region Splitting Method". Computer Graphics and Image Processing, Vol **8**, No. 3, pp. 313–333,1978.

[5] T. Lindeberg and M.X. Li "Segmentation and classification of edges using minimum description approximation and complementary junction cues", Computer Vision and Image Understanding, vol. 67, no. 1, pp. 88-98, 1997.

[6] WANG Hongzhi, DONG Ying"An Improved Image Segmentation Algorithm Based on Otsu Method" Proceedings of International Symposium on Photo electronic Detection and Imaging, vol. 6625, 2007.

[7] Suman Tatiraju & Avi Mehta " Image Segmentation using k-means clustering, EM and Normalized Cuts" Project Proposal.

[8] Ullrich Kothe "Primary Image Segmentation",Symposium of the German Association for Pattern Recognition (DAGM), 1995.

[9] Nassir Salman,"Image Segmentation Based on Watershed and Edge Detection Techniques" The International Arab Journal of Information Technology, Vol. 3, No. 2, pp.104-110, April 2006.

[10] Shuhong Jiao, Xueguang Li, Xin Lu "An Improved Ostu Method for Image Segmentation" Proceedings of IEEE International Conference on Strategic Procurement, Volume 02, pp. 966-969, 2006.

[11] Caroline Pantofaru, Martial Hebert, "A Comparison of Image Segmentation Algorithms",Technical Report,2005.

[12] www.google.com

