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SAR image segmentation using Color space clustering and Watersheds

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ABSTRACT
SAR images data are the result of a coherent imaging system that produces the speckle noise phenomenon. Image segmentation is the process of separating or grouping an image into different parts. The good performance of recognition algorithms depend on the quality of segmented image. An important problem in SAR image application is correct segmentation.
In this paper, we consider the problem of SAR image segmentation by Histogram thresholding technique. Then we proposed Color space clustering and Watershed Segmentation for merging different region to get the segmented SAR images.

Keywords- SAR image, Watershed Segmentation, Histogram thresholding, dendrogram.

I. INTRODUCTION

SAR images find increasingly wide applications, as SAR sensor does not depend on weather condition and can penetrate clouds. SAR image Segmentation is an important examples of low-level operators that providing the basic information for classification of different region.
The motivation of this work is to develop a novel segmentation algorithm, which can be used to segment the SAR images and improve the overall accuracy. Segmentation algorithms for Synthetic Aperture Radar images have been suggested in the field of categorization. A.A.G., C.L.M. [1] proposed multi-scale PolSAR data filtering technique based on BPT for SAR image segmentation. Lionel Bombrun [2] used heterogeneous clutter models to describe the SAR data. E.V.D.Lucca and A.C.Frery [3] proposed MUM and RWSEG general means for better segmentation. C. H. Fosgate, W. W. Irving and W.C.Karl [4] used statistical differences in SAR imagery of different terrain types.

II. PROPOSED ALGORITHEM

II.1. *Histogram thresholding and color space clustering.*

Histogram thresholding is one of the widely used techniques for image segmentation. To deal with the inequalities in observation due to surface refection is to search for clusters in the color histogram in an image. For example, in an RGB histogram, clusters of pixels from an object form streaks. Hence, a non-parametric cluster algorithm in RGB space is used to identify which pixels in the image originate from one uniformly colored object. Of course more efficient techniques based on histograms are studied.

Segments a color image into some meaningful regions: a criterion for locating the best peak is defined as $f = (S_p * 100) / (T_a * F_h)$ where S_p represents a peak area between two successive valleys, T_a is the overall area of the histogram, and F_h denotes the full width at half-maximum of the peak.

One other ,the example of a method based on K-nearest neighbor (K-NN) technique for detecting fruit and leaves in a color scene, which is used to build a vision system for a robotic device. The feature vectors are based on the PUQcolor space. In order to incorporate information about shape and surface of the fruit and leaves, not only the color components of its four neighbors are included in the vector R(i, j)

R(i, j) = [P(i, j), Q (i, j),P(i + h, j), Q (i + h, j),P(i - h, j),
Q(i - h, j),U(i, j + h), Q (i, j + h),U(i, j - h), Q (i, j - h)]

Where P(i, j) and Q (i, j) are the P and Q components of PUQ color coordinates and h represents the neighbor.

II.2. *Watershed Segmentation With Region Merging*

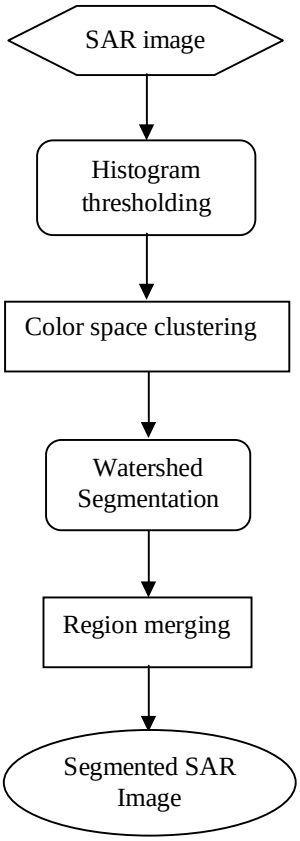
A. Background

Watershed algorithm can be described in view of simulating flooding water that fills up the valleys or merge in vaste plateaus. Watershed segmentation, the gradient image is viewed as a topographic relief that posses peaks and valleys. Mainly two rigorous approaches to watershed segmentation are based on:
first Rain-falling simulation and second Immersion simulation.
In this paper, we introduce the concept of immersion simulation that can be described as follows. Holes are pierced at the minima of the surface and the whole surface is slowly immersed in water. The water rises in through these holes and gets collected in the catchment basins. The watershed lines separate the catchment basins from one another and correspond to the boundaries in the image. The watershed lines when properly located enclose different regions which stand for a true segmentation of the original image.
After watershed segmentation of SAR images, i.e. prevent over segmentation. Furthermore, it has been pointed out that even if regularization is performed prior to gradient computation, the number of regions resulting from watershed segmentation is far from being acceptable. So, a region merging procedure is more than necessary.

B. Region Merging

In grayscale images, the region merging is relatively simple: neighboring regions that do not differ by more than a specified contrast value can be merged into each other.
We have rented from the field of agglomerative clustering. Each region is considered by a cluster characterized by the mean RGB vector of the pixels that belong to the region. That is each region has a vector attribute computed from the regularized image. The end result of these steps is a hierarchical tree or a dendrogram that consists of many up-side down U shape lines connecting nodes in a hierarchical tree.
We have observed that both region merging procedure operate equally well in reducing the number of segments to an acceptable value after watershed segmentation.

III. BLOCK DIAGRAM OF PROPOSED METHOLOGY



IV. EXPERIMENTAL RESULT

Now SAR images are used to test proposed algorithm. First Histogram thresholding was calculated and Color space clustering for image. Now Watershed Segmentation and Region merging used for SAR image segmentation. The figure (Fig 1 to Fig 3) shows the original SAR images and the figure (Fig 1(a) to Fig 3(a)) shows the segmented SAR images.

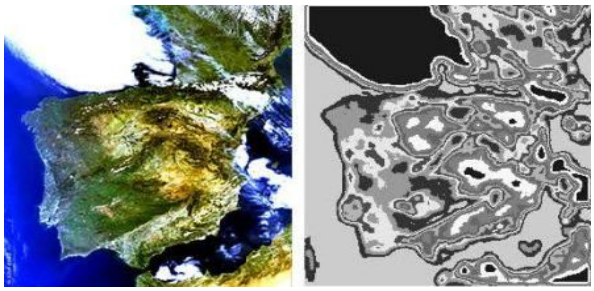


Figure 1. Input SAR image and Segmented SAR image

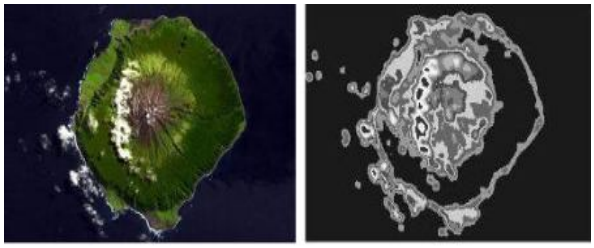


Figure 2. Input SAR image and Segmented SAR image

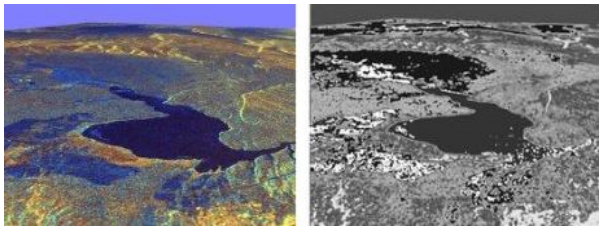


Figure 3. Input SAR image and Segmented SAR image

V. CONCLUSION

In this paper, we proposed a novel Color space clustering and watersheds based image segmentation technique for SAR image. This technique based on considering a window and calculates the Histogram thresholding of that SAR Images then store the color feature for Color space clustering. Next, Segmentation is obtained using Watershed Segmentation using region merging. It was evidenced that this segmentation procedure is a straightforward extension of the filtering algorithm based on Entropy. For this reason, our algorithm did not make mistakes; that is, a segmented image very different to get the originality of the SAR images. This may be extended to the color image segmentation. The results from this preliminary study indicated that the proposed strategy was effective.

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