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Automated Water Regions Extraction from SAR Imagery using Log-Normal Parameter and Entropy

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The dispensation of object extraction becomes more complicated for the intrinsic speckles in SAR images. Using the conventional target extraction logic for optical image, we cannot search out supreme consequence on SAR images. Water object in SAR imagery symbolize as some continuous region with low lightness and strong speckle noise. In this paper, we proposed a novel methodology for the separation between water region and land in SAR amplitude images. The proposed technique uses region based level sets and the Entropy for the pixel intensities in both the water and the land regions. In this paper, we proposed an algorithm based on Log-normal parameter and Entropy to extract the water objects in SAR imagery. Experimental results with real SAR data are provided to illustrate the performance of the proposed algorithm.

Keywords : Entropy, Log-normal Parameter, SAR Image, Water Regions.

1. INTRODUCTION

During last 50 years, different scientists have a great role to detect and extract the water regions from SAR imagery. Various pattern classification methods dealing with segmentation, classification and extraction of terrain categories such as water, forests, fields and built-up areas have been reported. Statistical pattern recognition, image processing and computer vision algorithms were fashionable used in a conventional computer system to solve the above problem.

The problem with automatic extraction of water bodies from radar imagery has been the subject of research for same time. Different researchers/scientists have a great role to identify the different region of SAR image. Margarida Silveira and Sandra Heleno [1] proposed region based level sets and adopts a mixture of Log-normal densities as the probabilistic model for the pixel intensities in both the water and the land regions. Fabio Dell'Acqua and Paolo Gamba [2] used thresholding value and shape adjustment to extract water region. Shiqing Zhang, Hanqing Lu [3-5] proposed texture-based change detection approach to identify the flooded regions in SAR images. Yeong-Sun Song, Hong-Gyoo Sohn and Choung-Hwan Park [6][7] proposed GLCM texture information for extract water region. Tho Cong Tran and Pi-Fuay Chen [8] used neural network consisting of three layers of processing elements (PEs) for selecting water region.

The high probable water areas frequently present the characteristics of relatively lower elevation than the surroundings, lower slope due to water flow [9] and emerge lower radar backscatter coefficients in a SAR image. Due to the physical characteristics of the water area, the extent of water is also greatly affected by the local terrain [10][11]. Therefore, we expected that local terrain information could be a useful tool for improving the accuracy of the classification in the water area. In this paper, we proposed an algorithm based on Log-normal parameter and Entropy to extract the water objects in SAR imagery.

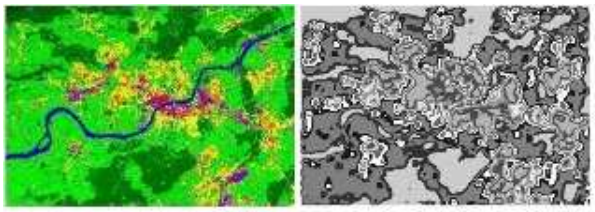

Figure 4. Original SAR Image and Segmented SAR Image

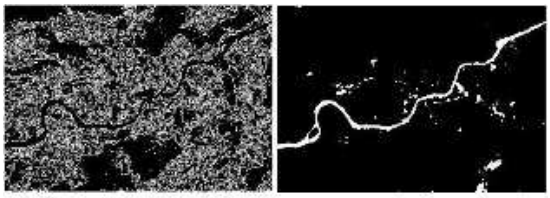

Figure 5. Edge SAR Image and Water Region Area

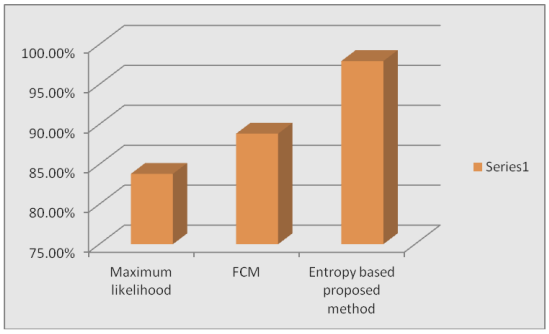

Figure 6. Compare Bar Chart

Category		Water	Overall accuracy
No of turning pixels		12365	
Classification method	Maximum likelihood	10362	(10362/12365)* 100 %=83.80%
	FCM	10984	(10984/12365)* 100 %=88.83%
	Entropy based proposed method	12108	(12108/12365)* 100 %=97.92%

Figure 7. Classification Results

6. CONCLUSION

Based on the characteristic of water target, we proposed a novel methodology employing sequential Entropy technique to extract water objects in SAR imagery and make experiments using real SAR imagery. Here we proposed an algorithm based on Log-normal parameter and Entropy to extract the water objects in SAR imagery. The results show that this approach can extract water objects in SAR imagery effectively and rapidly. The future work will focus on analyzing more stable features by integrating abundance information.

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