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REGION-ORIENTED INTERPRETATION OF HIGH RESOLUTION SAR IMAGE USING CASE-BASED REASONING

Abstract

More fine characteristics of a target can be acquired while meanwhile a more complex scene are obtained with an increasingly high resolution SAR sensors. In high resolution SAR images, targets will appear as an entire object or region with visible geometric contours instead of isolated pixels. Thus, it is a challenge for the current SAR image interpretation methods which are generally proposed by the pixel-based processing. Recently, there have been some region-based methods using multiple combined features, however, there are also some negative factors hindering the effective interpretation of SAR images, such as: the regions of interest target are not homogeneous, the geometric shapes of target are discrete and incomplete, and some interested targets are mixed and overlapped.

Case based reasoning (CBR), as a novel artificial intelligent method, imitates the procedure of human study and cognition and can gradually improve a priori knowledge and criterion to implement a self-learning system. Besides the improvement of accuracy in a single experiment, the case library developed in the previous classification can also be reused for another independent experiment with the same target and system parameters. Hence, CBR has been widely utilized in various fields, especially in high resolution remote sensing image interpretation.

In this paper, a region-oriented target detection and classification of high resolution SAR image using CBR is proposed. The detailed procedures are as follows: firstly, segment SAR image to obtain the region of interest; secondly, extract the effective features according to the specific application; thirdly, establish the multi-feature case library; fourthly, match the known target or region with the labeled cases with the matching criterion and then acquire the category of an interest target; last but importantly, the new case will be added into case library to optimize the case library. Therefore, the whole procedure will perform high self-learning and self-improvement ability. The verification test is implemented using MiniSAR data at a resolution of 0.1m0.1m and the results show that the detection accuracy will be gradually enhanced while the case library is supplemented. The preliminary experiments confirm the validity and reliability of the proposed CBR-based interpretation method and further experiments using the previous case library will be conduct in future.