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AUTOMATIC EXTRACTION OF WATER IN HIGH-RESOLUTION SAR IMAGES BASED ON MULTI-SCALE LEVEL SET METHOD AND OTSU ALGORITHM

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Abstract. Water extraction has an important significance in flood disaster management and environmental monitoring. Compared to optical sensor, Synthetic aperture radar (SAR), which has the properties of high resolution and all-weather acquisition, has been used for water extraction in this paper. Due to the presence of coherent speckles, which can be modeled as strong, multiplicative noise, water extraction in SAR image is very difficult. In order to extract water from SAR images automatically, accurately and quickly, a novel water extraction algorithm combine multi-scale level set method with OTSU algorithm is proposed in this paper. Firstly, we introduced multi-scale framework into level set method. Multi-scale framework is a method considering both global information and local information of the image. The overall structural information of the image can be maintained at coarse scales and detailed information can be kept at fine scales. Therefore, coarser scale extraction results can be used as a prior guide for the finer scale, so that not only are the statistical properties of the signal-resolution image considered, but also statistical variations of multiple resolutions are exploited. Moreover, computational complexity is reduced since much of the work can be accomplished at coarse resolutions, where there are significantly fewer pixels to process. Secondly, based on the multi-scale level set framework, the segmentation result of OTSU algorithm is used to represent the initial segmentation curve. Finally, in order to eliminate the influence of buildings shadow and road, post-processing is considered in this paper. The experiments with real SAR images demonstrate the effectiveness of the new method.

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