A New Context-based Procedure for the Detection and Removal of Cloud Shadow from Moderate-and-high resolution Satellite Data over Land

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Lots of pixels, contaminated by shadows, exist in moderate or high resolution satellite imagery. The shadows may result from multiple sources such as high buildings, rugged terrains and clouds in the sky, so they lead to great difficulties of remote sensing image process, especially on their automatic classification, and reducing accuracy of quantitative remote sensing retrieval. Hence, it is very important to correctly and effectively identify various shadows and correspondingly remove and correct the shadow pixels in those images, which is basically required in an accurate follow-up processing of remote sensing images.

This paper has focused on a new automated detection and removal of cloud shadows of remotely sensed data to service quantitative interval of atmospheric parameters, using the FengYun-3(FY-3), moderate spatial resolution and HuanJing-1(HJ-1), high spatial resolution satellite data. Comparatively, although some research results about cloud shadow detection and removal were obtained using other satellite data in the recent years [1,2,3,4], they have still been well unsatisfactory and researchers are promoting to explore new associated models and algorithms[5,6]. Taking into account interaction between neighboring pixels in remote sensing images, this research aims at the special context relationships that are used to detect cloud shadows and then being carried out on related pixel match and cloud shadow removal. It follows: (1) An approach of computing ratio between thermal infrared and visible

values is utilized to initially detect cloud pixels in image data, and then preliminarily identify the possible locations of cloud shadows using the relationship between relative spatial positions of the sun, cloud and satellite; (2) based on the feature that cloud shadow pixel is more obscure over neighboring non-shadowed pixels, determine whether the pixel contains cloud shadows by analyzing the contrast ratios between goal pixel and its neighborhood pixels; (3) due to some pixels containing water body, they are characteristic with low reflectance and then it is likely that they are mistakenly identified, and therefore, the means takes advantage of cloud-free history image data to comparatively analyze the two so as to eliminate such wrong identification for cloud shadow; (4) finally, according to real requirement of quantitative interval of atmospheric parameters, select an available way of removal of cloud shadow and match and/or remove relevant cloud shadow pixels.

The tests show that the algorithm of detection and removal of cloud shadow is very simple and valid with the high discrimination accuracy and low leaking discrimination rate and so on.

Key words: cloud shadows, context-based detection, shadow removal, moderate-and-high resolution

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