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SHADOW DETECTION FROM VERY HIGH RESOLUTION SATELLITE IMAGE USING GRABCUT SEGMENTATION AND RATIO-BAND ALGORITHMS

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Abstract. Very-High-Resolution (VHR) satellite imagery is a powerful source of data for detecting and extracting information about urban constructions. Shadow in the VHR satellite imageries provides vital information on urban construction forms, illumination direction, and the spatial distribution of the objects that can help to further understanding of the built environment. However, to extract shadows, the automated detection of shadows from images must be accurate. This paper reviews current automatic approaches that have been used for shadow detection from satellite images and comprises two main parts. In the first part, shadow concepts are presented in terms of shadow appearance in the VHR satellite imageries, current shadow detection methods, and the usefulness of shadow detection in urban environments. In the second part, we adopted two approaches which are considered current state-of-the-art shadow detection, and segmentation algorithms using WorldView-3 and Quickbird images. In the first approach, the ratios between the NIR and visible bands were computed on a pixel-by-pixel basis, which allows for disambiguation between shadows and dark objects. To obtain an accurate shadow candidate map, we further refine the shadow map after applying the ratio algorithm on the Quickbird image. The second selected approach is the GrabCut segmentation approach for examining its performance in detecting the shadow regions of urban objects using the true colour image from WorldView-3. Further refinement was applied to attain a segmented shadow map. Although the detection of shadow regions is a very difficult task when they are derived from a VHR satellite image that comprises a visible spectrum range (RGB true colour), the results demonstrate that the detection of shadow regions in the WorldView image is a reasonable separation from other objects by applying the GrabCut algorithm. In addition, the derived shadow map from the Quickbird image indicates significant performance of the ratio algorithm. The differences in the characteristics of the two satellite imageries in terms of spatial and spectral resolution can play an important role in

estimation and detection of the shadow of urban objects.

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