BUILDING DETECTION FROM MULTISPECTRAL SATELLITE IMAGES USING TWO DIFFERENT STRATEGIES

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ABSTRACT:

Extracting buildings is one of the most complex and challenging tasks as the variety of the type of buildings and also the shapes of rooftops are very inconsistent. Therefore, even by using high resolution satellite imagery, and considering soft computing methods and whatever the algorithm be formulated, the quality percentage of building extraction completely depend upon the shape of building structures. In this work, two different approaches for building extraction are discussed to find out the best method to overcome these difficulties. One method is by considering region of interest segmentation and the other one is by considering region out of interest segmentation. Usually for all object detection problems, we will develop algorithms to extract the region of interest, but different methods using this concept is not to be ensured better efficiency for the case of building extraction alone. Therefore, in our work, algorithms for masking region out of interest is also developed and compared with the other method to find out the best choice.

For the first approach (method-I) focussing the region of interest having building features, utilize the possibilities of Differential Morphological Profile at the initial stage and training using artificial neural networks at the final stage. For the second approach (method-II), focusing other than the areas having building features, a dedicated algorithm is developed for masking region out of interest, so that region of interest i.e., buildings are projected in the final result. The algorithm first calculates NDVI (Normalized Difference Vegetation Index) and chromaticity to intensity ratio for the initial level of segmentation. Next, rooftops and roads are detected and eliminated. Then principal component analysis and area analysis is done to get accurate results. All the test images used in this work are PS-MS (Pan Sharpened Multi-Spectral) IKONOS level 3A 1m resolution images distributed by Space Imaging Middle East (SIME), UAE.

In method-I, by incorporating neural networks with differential morphological profiles, insignificant buildings which cannot be distinguished from the background features are able to extract with considerable degree of accuracy. In method-II, masking is performed on areas other than the region of interest which helped to achieve improved performance. It became possible to incorporate both spatial and spectral properties of the image through the use of mean shift segmentation. Utilizing statistical properties of the image with the help of principal component analysis, it is possible to achieve better adaptability for different complexity levels of urban areas. Finally extensive analysis with respect to area is done, which removes most of the unwanted pixels classified as buildings. The results of the performance evaluation for all the test images is higher for method-II compared to method - I. In method – II, the detection percentage reaches 95.3% which is very high compared to the conventional method of building detection with algorithms based on region of interest segmentation.

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