

Characterizing spatial arrangements for urban land use classification from Very High Resolution remote sensing images

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Urban land use information plays an important role in many urban-related applications. Remote sensing images have the potentials for extracting land use and monitoring land use changes at local, regional, and global scales. Land use extraction consists of three main components: (1) extraction of urban land cover features from a remote sensing image, (2) modelling of the spatial arrangement of building objects, and (3) classification of the urban land use. In particular at the local level, the growing availability of very high resolution (VHR) remote sensing images, e.g. QuickBird, GeoEye, WorldView and Pleiades images, has caused an increase in extracting urban land use at local scale. Conventional land use extraction from VHR images relies on landscape metrics calculated at well-defined land use units, such as city blocks. Commonly-used landscape metrics, however, fail to effectively characterize urban structures in complex urban areas, thus leading to poor extraction results. Studies in the past have emphasized that the use of spatial arrangements would improve the performance of land use extraction (Ünsalan and Boyer, 2011).

This study aims to characterize the spatial arrangements of land cover features for urban land use classification from VHR images. Characterization is conducted at the object level, corresponding to land cover objects. At the local urban level, a VHR image is dominated by buildings. Therefore, we characterize the spatial arrangements of building objects. Vegetation, shadow and building objects are extracted based on our previous work (Li et al., 2015). The novelty of this study is that for modelling of spatial arrangements, we propose to model the directional relationships among objects, by means of a histogram of forces (Matsakis et al., 2004). The classification is then conducted with a Bayesian classifier. The proposed urban land use extraction is applied to a piece of Pleiades image of Wuhan, China, acquired on 11 July 2013, having 0.5m and 2m spatial resolutions for panchromatic and multispectral bands.

Reference

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