Development of an Automatic Land Use Extraction System in Urban Areas using VHR Aerial Imagery and GIS Vector Data

Seyed Ahad Beykaei, PhD Candidate, Civil Engineering Department, University of New Brunswick, Canada[1]
Ming Zhong, Associate Professor, PhD, P.Eng, Civil Engineering Department, University of New Brunswick, Canada[2]
Sajad Shiravi, Master of Science Student, Civil Engineering Department, University of New Brunswick, Canada[3]
Yun Zhang, Professor, PhD, Civil Engineering Department, Geomatics and Geodesy Department, University of New Brunswick, Canada[4]
beykaei@gmail.com[1]
ming@unb.ca[2]
sajadshiravi@yahoo.com[3]
yunzhang@unb.ca[4]

Abstract

Lacks of detailed land use (LU) information and of efficient data gathering methods have made modeling of urban systems difficult. This study aims to develop a novel hierarchical rule-based LU extraction framework using geographic vector and remotely sensed (RS) data, in order to extract detailed subzonal LU information, residential LU in this study. The LU extraction system is developed to extract residential LU at a fine spatial level − parcel through morphological analysis. First, a novel hybrid pixel- and object-based land cover (LC) classification system, coupled with a sophisticated GIS post-classification correction process, is developed to extract land cover, including vegetation, parking lot, and bare soil, required for LU classification. The land cover classification system developed results in an overall accuracy of 96.4%. Residential LUs are then extracted by examining the morphological properties of individual parcels (which are derived from RS and geographic vector data) using a binary logistic model, which results in an overall accuracy of 97.5%. The above results show that the LU classification expert system developed can classify and then divide large zones with mixed LUs into single-LU subzones with a high accuracy. Therefore, it has a significant value to address several persistent issues caused by using large zones in urban modeling, such as intra-zonal travel and mixed-LU zones.

Keywords: Land Use Classification, Land Cover Classification, Remote Sensing, Morphological Analysis