TOWARDS DISAGGREGATION - URBAN SPECTRA-SPATIAL PATTERN RECOGNITION

Mesev Victor
Geography, Florida State University, Bellamy Building, TallahasseeM, FL, USA 32306

The direct and automated inference of urban function from land cover categorization provides one of the most challenging arenas for urban remote sensing. Successful breakthroughs in research are essential for deflecting criticism and restoring flagging confidence in the applicability of remote sensing in urban applications. Zone-based and pixel-based population models have done much to restore credibility, especially in combination with the new generation of super high spatial resolution satellite sensor data. However, for precision urban mapping more disaggregated auxiliary data sets are required to support the spectral inference of land use from land cover. Such ancillary GIS-based data sets hold key spatial parameters, essential for the development of object-based, spectra-spatial pattern recognition systems. Urban neighborhoods exhibit distinctive spatial expressions in terms of their architectural, structural, and morphological composition. By employing spatial metrics to quantify these attributes it is possible to demonstrate how individual urban neighbourhoods may be distinguished and delineated from second order imagery. On-going research is exploring an agenda for building disaggregated urban models that infer spatial urban structural configurations within spectral limitations. The disaggregated models are based on point-based GIS data, from both the United Kingdom (postal records) and the United States (parcel records). Knowing the spatial distribution of these point data introduces a number of key indicators that measure parameters such as density (compactness versus sparseness) and arrangement (linearity versus randomness). These are measured using spatial metrics, adjusted by the contagion index, a measure of fragmentation, and fractal dimensions, used to measure the degree of space filling and the level of irregularity within neighbourhoods. By establishing relationships between image pixels and building spatial distributions, the long-term research goal is to facilitate reliable and accurate spatial pattern recognition and object-based multispectral classification methodologies to a level that renders resulting output irresistible to planners and policy makers. Encouraging results are documented from preliminary empirical testing on IKONOS imagery using aerial photography at 15cm spatial resolution. Also, using the software e-Cognition, a spectra-spatial classification based on nearest neighbour contextual rules produced accuracies of 95.4% compared to 90.7% from a multispectral-only classification. Further, more extensive testing is continuing.