An Assessment of Three Image Classification Methods for Urban Landscape Characterization[1]

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Abstract

In connection to a collaborative research project for mapping Beijing's landscape change, we conducted a study aiming to find the most appropriate classification method for urban land use/cover characterization from Landsat ETM+ data. Preliminary evaluation of commonly available classification algorithms produced the following three candidate techniques: Gaussian Maximum Likelihood (GML) classifier, Extraction and Classification of Homogeneous Objects (ECHO) classifier and Spectral Angle Mapper (SAM) classifier. The GML method is probably the most widely used spectral classifier. The ECHO method is a spatial-spectral classifier, which uses both spectral and spatial information in the decision-making process. The SAM method is actually an image match classifier, which is built upon the 'angular distances' in feature space. The study area is part of the Beijing metropolis, which contains a mosaic of complicated landscape types. Training samples were carefully selected for seven major land use/cover types, which were used for supervised classifications of the 2004 ETM+ image scene. The same training samples were used for each method, and each classified map was accuracy assessed using the same set of reference data derived from field mapping and photographs, topographic maps and SPOT panchromatic image interpretation. It is found that the most accurate classification was generated by the use of ECHO method (73.43%), which slightly outperformed the GML classifier (73.14%). This may be attributed to the incorporation of spatial information in the classification process by the ECHO method. The classification generated by the SAM method shows the lowest overall accuracy (66.86%), which suffered from its poor performance in resolving the spectral confusion among the classes of orchards, grass and forest. However, the SAM method yielded consistently better performance for other four categories including two urban classes (*i.e.* intensive and extensive urban). Further work is suggested to test the classification performance for Beijing's metropolitan landscape characterization over large areas.

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