OBIA

This month we present a Product Survey on Remote Sensing Image Processing Software. The most central modules in such software concern supervised and unsupervised classification. Without these modules image processing software is not suitable for land-use mapping, change detection and other remote-sensing applications. Conventionally, classification of multispectral images is based on statistical pattern recognition methods; the individual pixels are considered as objects and the reflectance values in the diverse spectral bands as features. In supervised classification the features of each pixel are compared with the prototype reflectance values of each class, usually derived from selected training samples. The pixel is then assigned to the class to which its spectral values exhibit the closest resemblance according to a decision rule. Basically, the comparison can be done on the statistical means of spectral values, their dispersion, or both, resulting in such well-known classifiers as nearest-neighbour, parallelepiped (box), or maximum likelihood classification, respectively. In unsupervised classification, the features of the individual pixels are grouped, prior to class-assignment, in clusters. The analyst then assigns scene-related classes to these clusters.

It is obvious that the treatment of individual pixels as separate objects to which classes are assigned is rather an artificial decomposition of reality. Furthermore, an assumption that spectral classes correspond one-to-one to scene-related classes is more often than not violated. A low accuracy of pixel-based classification is the result. To improve accuracy, more information may be incorporated than just the spectral values of individual pixels. For example, the variation of spectral values of neighbouring pixels can be expressed in texture values and used as an additional feature. External data such as soil types can provide a priori probabilities to be incorporated into the classification by means of Bayesian statistics. Another method, and one gaining increasing in practitioner interest, is grouping neighbouring pixels together in regions on the basis of spectral and/or texture values. After this initial segmentation stage, statistical measures such as mean and variance of spectral and/or texture values, and shape and size parameters, are calculated for each region. Adjacent regions may be joined on the basis of a priori defined thresholds. This refinement stage enables reduction in fragmentation. Boundaries may thus also be smoothed, and buildings squared. The region is then assigned to the class to which it exhibits the closest resemblance. Since there is a high probability the resulting regions in the image correspond with objects in reality, the method has been termed Object-based Image Analysis, usually abbreviated to OBIA, or more specifically GeOBIA. It is a more natural method than pixel-based classification, and accuracy is comparable with human visual interpretation, even for such fragmented scenes as urban areas (see Jalan and Sokhi).