Remote-sensing the urban area: Automatic building extraction based on multiresolution segmentation and classification

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Abstract

Multiresolution segmentation is a new procedure for image object extraction. It allows the segmentation of an image into a network of homogeneous image regions at any chosen resolution. These image objects represent image information in an abstracted form and serve as building blocks for subsequent classifications. An exercise was undertaken to perform and study an object oriented segmentation and classification using high resolution satellite data (Cartosat-1 fused with IRS-1C, LISS IV data) for automatic building extraction in India. The study area covered the administrative area of BHEL (Bharat Heavy Electrical Limited) colony of Haridwar, Uttrakhand (29°56'55.51"N to 29°56'11.49"N latitude and 78°05'42.45"E to 78°07'00.9"E longitude). Two approaches were used for feature extraction, namely, applying different spatial filers, and object-oriented fuzzy classification. The merged image was filtered using the different high pass filters like Kirsch, Laplace, Prewitt, Sobel, Canny filtered images. The results showed that the overall accuracy of classified image was 0.93 and the Kappa accuracy was 0.89. The producer accuracy for building, vegetation and shadow were 0.9545, 1.0 and 0.8888 respectively whereas user accuracy for building, vegetation and shadow are 1.0, 0.9375 and 1.0 respectively. The overall classification accuracy based on TTA mask (training and test area mask) was 0.97 while the Kappa accuracy was 0.95. The producer accuracy for building, forest and shadow were 1.0, 1.0 and 0.7144 respectively and the user accuracy for building, vegetation and shadow were 1.0, 0.9375 and 1.0 respectively.

Keywords: automatic building extraction, high resolution data, multiresolution segmentation, object-oriented fuzzy classification, remote sensing, spatial filter