Object-based point clouds classification using airborne waveform lidar data

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Abstract: Traditionally, multi-echo (ME) lidar only provides geometric property such as 3-D point clouds and intensity; but full-waveform (FWF) lidar provides geometric and waveform properties from the entire returned signals. A full-waveform lidar system is able to record received signal continually for analysis. As it provides more information than the conventional pulsed lidar, the waveform lidar plays an important role in land cover classification as well as object reconstruction. Nowadays, the object-based classification has been widely applied in multispectral images. The idea of object-based image classification is to merge the similar pixel into a region, then, the geometrical and radiometrical properties of regions are extracted in classification. Several investigations had been reported that object-based image classification is able to reduce the effect of mixed-pixel and also improve the classification results. However, relatively few studies have discussed the object-based point clouds classification.

The objective of this research is to develop a procedure for object-based point clouds classification using full-waveform lidar data in a complex scene. There are two steps in our scheme: (1) octree-based segmentation, and (2) object-based classification. The segmentation uses a region growing technique to merge the neighboring points with similar attributes. After segmentation, an object-based classification rather than pixel-based classification is performed. Each separated region after segmentation is a candidate object for classification. An object-based classification considering the characteristics of roughness, amplitude, echo width and shape information is performed to detect the building regions. The test data is acquired by Rigel Q680i and located in Tainan, Taiwan. The point density is 5 pt/m^2. The experimental result indicates that the proposed method may separate different land covers effectively.