Classification of Airborne Laser Scanning Data in Sandstone Landscapes

Abstract

This work is concerned with the classification of airborne laser scanning data in sandstone landscapes called "rock cities". Standard filters do not work reliably in such a rugged terrain covered with dense vegetation and in the results the rock formations are smoothed or even removed from the terrain. The method of classification suggested in this work is based on the procedure used in manual filtration. When exploring a sufficiently dense point cloud in 3D, one is able to distinguish rock formations from trees even though their shapes are similar. In contrast to trees, rock pillars are modeled only by points reflected off the surface and therefore they make concave elevations in the ground. Because of penetration of trees, there are points reflected off a treetop, branches, leaves and also ground under the tree. The proposed method segments a point cloud according to local minima in approximated surface and classifies these objects into classes rock, tree, and mix by inner point distribution. Objects in classes tree and mix are then filtered by lasground function from LAStools. The method was tested with merged point cloud consisted of data from the standard airborne laser scanning of the Czech Republic and experimental detailed scanning of the Adršpach-Teplice rocks. The results were compared with manually and automatically filtered point clouds. The overall agreement with manual filtration achieves 85 % whereas other automatically filtered point clouds correspond with it less reliably (the difference is approximately 10 %).

Key words

airborne laser scanning, data filtering, object extraction and recognition, rock formations, sandstone landscapes