Volume XXXIX-B3

Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci., XXXIX-B3, 115-120, 2012
www.int-arch-photogramm-remote-sens-spatial-inf-sci.net/XXXIX-B3/115/2012/
doi:10.5194/isprsarchives-XXXIX-B3-115-2012

AUTOMATED RECONSTRUCTION OF WALLS FROM AIRBORNE LIDAR DATA FOR COMPLETE 3D BUILDING MODELLING

Y. He, C. Zhang, M. Awrangjeb, and C. S. Fraser
Cooperative Research Centre for Spatial Information, Department of Infrastructure Engineering University of Melbourne, VIC 3010, Australia

Keywords: LIDAR, Three-dimensional, Principle Component Analysis, Segmentation, Feature extraction, Vertical wall

Abstract. Automated 3D building model generation continues to attract research interests in photogrammetry and computer vision. Airborne Light Detection and Ranging (LIDAR) data with increasing point density and accuracy has been recognized as a valuable source for automated 3D building reconstruction. While considerable achievements have been made in roof extraction, limited research has been carried out in modelling and reconstruction of walls, which constitute important components of a full building model. Low point density and irregular point distribution of LIDAR observations on vertical walls render this task complex. This paper develops a novel approach for wall reconstruction from airborne LIDAR data. The developed method commences with point cloud segmentation using a region growing approach. Seed points for planar segments are selected through principle component analysis, and points in the neighbourhood are collected and examined to form planar segments. Afterwards, segment-based classification is performed to identify roofs, walls and planar ground surfaces. For walls with sparse LIDAR observations, a search is conducted in the neighbourhood of each individual roof segment to collect wall points, and the walls are then reconstructed using geometrical and topological constraints. Finally, walls which were not illuminated by the LIDAR sensor are determined via both reconstructed roof data and neighbouring walls. This leads to the generation of topologically consistent and geometrically accurate and complete 3D building models. Experiments have been conducted in two test sites in the Netherlands and Australia to evaluate the performance of the proposed method. Results show that planar segments can be reliably extracted in the two reported test sites, which have different point density, and the building walls can be correctly reconstructed if the walls are illuminated by the LIDAR sensor.

Conference Paper (PDF, 3094 KB)

Citation: He, Y., Zhang, C., Awrangjeb, M., and Fraser, C. S.: AUTOMATED RECONSTRUCTION OF WALLS FROM AIRBORNE LIDAR DATA FOR COMPLETE 3D BUILDING MODELLING, Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci., XXXIX-B3, 115-120, doi:10.5194/isprsarchives-XXXIX-B3-115-2012, 2012.

Bibtex EndNote Reference Manager XML