

Knowledge-based 3D Mapping of Urban Scenes from Point Clouds Exploiting a Hierarchy of Features and Scales

Keywords: Mobile Laser Scanning Point clouds, Knowledge-based 3D Mapping, Urban Scenes, Feature Extraction, Machine learning

OTB Department / GIS-technology

Area of Research: Laser Remote Sensing, Point Cloud Processing and 3D Mapping

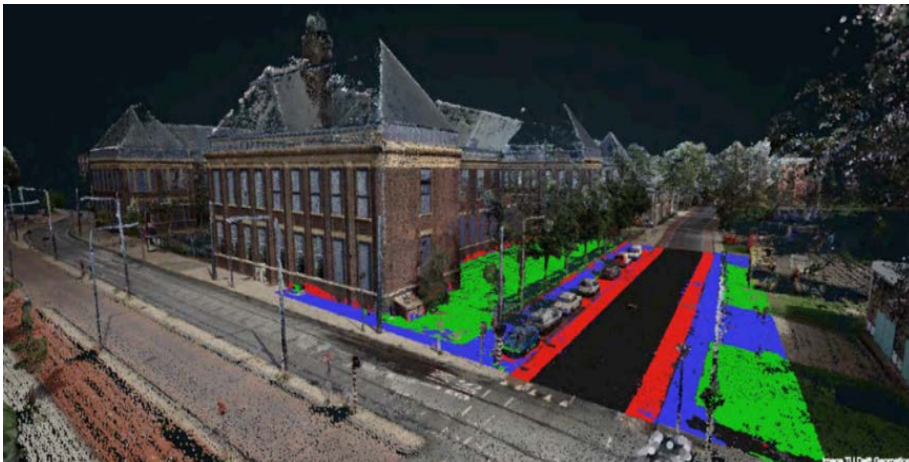


Fig. BK Faculty

Research Summary:

Advancements in laser scanning and photogrammetric dense image matching enable to increasingly produce dense point cloud data. These point clouds are important in a variety of 3D city mapping applications. For example, detailed and accurate 3D maps are essential for self-driving cars, which is a very active research area. Given the data volume and large variety of complex objects, reliable automated 3D mapping is still a very challenging task. The main aim of the research is to develop a method for the highly automatic creation of 3D maps of urban scenes from mobile laser scanning point clouds enriched with RGB values. The proposed knowledge-based approach exploits a hierarchy of scales as well a hierarchy of radiometric and geometric features. A part of feature exploiting for small complex objects will be based on Machine learning.

Research Methodology:

The methodology consists of five stages:

1. Determination of discriminative radiometric and geometric features using prototype objects at several scales. Machine learning will be considered feature extraction under specific scales.
2. Building a decision tree based on a hierarchy of features and scales
3. Post-processing of the resulting 3D map exploiting urban scene-knowledge
4. Validation of the developed approach
5. Assessment of the developed approach for practical applications.

After 3D mapping semantic information is assigned to the individual points which contributes to the concept of smart points clouds.

Key Publications:

- M. Zheng, M. Lemmens, and P. van Oosterom, "Tentative Tests on Two Rapid Multispectral Classifiers for Classifying Point Clouds," 20th conference on Association of Geographic Information Laboratories in Europe, 2017.
- M. Zheng, M. Lemmens, and P. van Oosterom, "Classification mobile laser scanning point clouds from height features," International Archives of the Photogrammetry, Remote Sensing & Spatial Information Sciences, vol. 42, 2017.
- M. Zheng, M. Lemmens, and P. van Oosterom, "Classification of mobile laser scanning point clouds of urban scenes exploiting cylindrical neighborhoods," International Archives of the Photogrammetry, Remote Sensing & Spatial Information Sciences, vol. 42, 2018.



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Main Question:

Can automated 3D mapping of the built environment be based on knowledge-based classification of mobile laser scanning point clouds using a hierarchy of features and scales?

Deliverables: The research will delivery a knowledge-based model with methodological advancements for automated 3D mapping in urban scenes. The resulting product would be concluded in PhD thesis .

Link:

<http://www.gdmc.nl/staff/>

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