Topic Field

Building Façade Reconstruction from Mobile Laser Scanning Point Clouds

3D modeling based on geospatial data is one of the core topics in geoinformatics. Worldwide research on object reconstruction methods is pushed by the permanently increasing spectrum of virtual city model applications, accompanied by the need for efficient, accurate, and highly automated algorithms. Due to the demand for interactive visualizations covering large area, buildings have been often reconstructed from Airborne Laser Scanning (ALS) data. The generated solid models faithfully reflect roof structure, but often only feature simplified facades (c.f. Fig.1).

Figure 1. Textured 3D building models with simplified façades as planar faces.

Meanwhile, such basic representations are not sufficient since many applications require detailed models enriched with explicit semantic information on building façades, such as windows, doors, and balconies. One of the leading data acquisition technologies suited for façade reconstruction is Mobile Laser Scanning (MLS). Lidar sensors mounted on vehicles enable the efficient capture of 3D point clouds of large urban scenes along streets (Fig. 2).

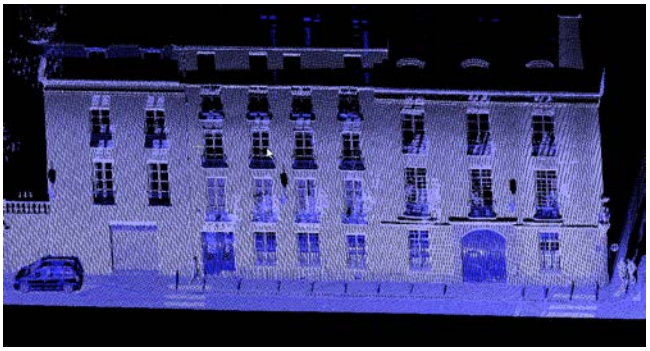

Figure 2. 3D point cloud of building façade.

Despite many advancements in the research field of façade modeling, automatic algorithms meeting present requirements still need to cope with a significant number of problems. Lower parts of façades are often occluded by various types of vegetation, vehicles, and pedestrians. This results in building point clouds with limited completeness and accuracy. Also, the façade reconstruction process itself is a challenging task consisting of several complex steps such as façade feature recognition, structuring, geometric construction, and semantic labelling. For this reason, novel strategies for processing MLS point clouds, in terms of providing suitable building façade modeling schemes that could respond to the current needs, are of great importance.

Figure 3. 3D façade model [Li et al., 2017, *ISPRS Journal of Photogrammetry and Remote Sensing, Vol.* 123].

Exemplary topics for master thesis:

- ☐ For specific topics, please refer to the display case of the chair "Methods of Geoinformation Science" at room H5121 (main building of Technische Universität Berlin).

Recommended skills:

- ☐ Spatial analysis, geometric computations, pattern recognition, programming (C++).

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