Edge-aware simplification of roof and façade point clouds into a uniformly dense point cloud

- *P5 reflection report*

Jiale Chen 4302877

J.Chen-10@student.tudelft.nl

Geomatics, Faculty of Architecture, TU Delft

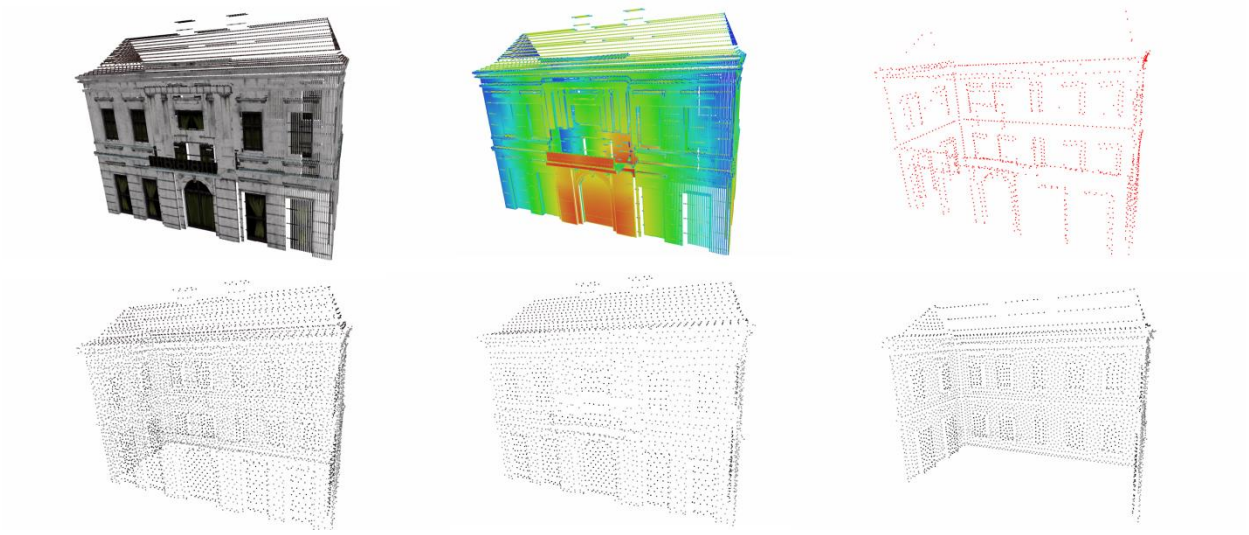

Figure 1: Process of our simplification algorithm pipeline

Point clouds are an effective and popular representation of real world geographical information. In this thesis, an algorithm pipeline is proposed that is able to take in an outlier-ridden, noisy and non-uniform roof and facade point clouds and combine and generate an outlier-removed, edge-aware and uniform point cloud. The algorithm pipeline can be divided into two independent phases: outlier removal and simplification. The outlier removal algorithm can remove singly scattered and small cluster of outliers, whereas the simplification algorithm pipeline is able to generate a noise-reduced, uniform and edge-aware point cloud. The pipeline is validated to be able to achieve the objectives. Proof of efficiency in running-time is given, so that it can be used for processing large-size real-scene point clouds.

We give our reflection of this thesis with respect to the following questions.

- Aspect 1

The relationship between the methodical line of approach of the Master Geomatics and the method chosen by the student in this framework.

Geomatics mainly researches about the whole application procedure of collection, storage, analysis, processing and visualization of geo-information data. Point clouds have been widely used in many geo-information applications such as making digital elevation models of the terrain, reverse engineering of industrial sites, tree reconstruction and creating 3D models of urban environment. This thesis follows the general processing procedure of Geomatics. Most of these processing steps are performed in the thesis from getting and pre-processing point clouds to process and visualize the simplified result.

- Aspect 2

The relationship between the conducted research and application of the field geomatics.

This thesis is a joint research of Geomatics and Computer Graphics and has close connections with both fields. Computer Graphics focuses more on geometry and algorithms while Geomatics concerns more on applications in real-world scenarios. We design algorithms either by developing ourselves or using existing methods from the domain of Computer Graphics to apply in Geomatics applications that is able to process in a large scale. Different from computer graphics considering more on general cases, this research considers the scenario of integration of airborne LiDAR, terrestrial LiDAR and panoramic imagery point clouds.

- Aspect 3

The relationship between the project and the wider social context.

As more and more point clouds have been collected in the market, outlier removal and simplification of these collected point clouds are in great need for less storage space and many post-processing applications. The output of this thesis can be directly applied in market level production since it is tested by multiple demos with different data sources and different levels of complexity and proved to be running time efficient.