Torwards generalization processes of LiDAR data based on GRID and OGC Web Processing Services

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Using airborne laserscanner data (LiDAR, Light Detection and Ranging) very detailed high resolution Digital Elevation Models (DEM) can be detected. However, massive data sets results by data acquisition due to the high measuring point density. Hardly data storage, processing and generalization could be managed within current classical desctop GIS. Both computing power for data processing and storage organization supporting data access are required. To achieve high processing performance and storage load the use of GRID Computing is a fine option. Access these pre-processing generalization functionalities of massive LiDAR data to a standardized web interface we develop a Generalization Web Processing Services (WPS) based on the specification of the Open Geospatial Consortium (OGC). This WPS Generalization Service is made accessible as GRID service which is one of the objectives of our work package within the german project GDI-Grid (www.gdi-grid.de).

The goal of the WPS Generalization Service is to offer multi-scale 3D-models with different Levels of Details (LOD). Especially in a real-time environment, the dense surface meshes from raw LiDAR data must be generalized in a pre-processing step to provide adaptive mesh resolution and to use the main advantages of LODs, the data reduction, the fast data access and the hierarchical processing. For example, view-dependent generalization using high resolution objects in the forground and lower LODs for distant improve performance for visualization objectives. The surface geometry is stored as Triangulated Irregular Network (TIN). Therefore different surface simplification algorithms are developed e.g. by DeFloriani (1996) or Lindstrom (1996). Depending on specific application requirements, we implement diverse generalization algorithms to handle geometric data efficiently via different multiresolution models. Firstly, we implement a surface simplification algorithm, which used quadric error metrics, provided by Garland and Heckbert (1997). The algorithm is based on an iterative generalization of edge aggregation by vertex pairs contraction. The error approximation for simplification of each vertex is the sum of squared distances to the planes.

The OGC WPS standard (version 1.0.0, passed in December 2007) defines a web-based standardized interface to distribute and execute geospatial processes in different complexity. We access the WPS Generalization service by the standardized OGC WPS interface operations *GetCapabilities*, *DescribeProcess* and *Execute*. To compute and store huge amount of LiDAR data performantly linking the GRID and the OGC world is essentially. Therefore the implemented generalization processes, which are wrapped

and accessed by the WPS, are transported into the GRID. This grid-enablement of the WPS infrastructure takes place within the deegree framework (Kiehle et al. 2008). The WPS Generalization service is full embedded into the grid infrastructure as standardized GRID service (WSRF-service, Web Service Resource Framework).

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