The process to generate a nationwide 3D virtual model of the Netherlands

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In 2013 and 2014, a collaboration of the Dutch Kadaster, Universities of Delft and Twente, Geodan and Conterra GmbH adopted open source 3D mapping tools, originally built for project based processing, and transformed them into a workflow suitable for nationwide processing.

In this contribution we present the preparation and processing of calculating the third dimension of a nationwide topographic map at a scale of 1:10k. Basic idea is to fuse laser point clouds from the Dutch national height model with the national topographic map, making use of the semantics of this map. Heights are calculated at both the surfaces and the boundaries of every object. At every 5 meter on each boundary between two topographic objects, the height is calculated based on local laser points and the semantic rules given by the class of the neighboring polygons. Laser data has been filtered into ground points, which will be assigned to the map polygons with classes 'terrain', 'water' and 'roads', and non-ground points, which will engaged with 'building' polygons.

Roughly, the workflow consists of three stages: data preparation, 3D generation, and post processing. Within and between every stage, adaptions to "project based settings" are needed in order to process a nationwide dataset. Examples of these adaptions in the preparation stage are the subdivision of extremely large water polygons in open water bodies and efficient storage solutions for transferring data from one stage to the other.

General property in the 3D generation stage is that the processing is done tile-by-tile, i.e. 1x1 km. However, an additional step is needed to produce a seamless 3D model across tiles. Important for automatic processing at a national scale, is to use software and parameter settings that are valid for the whole country. Main assumption is that the input data sets are standardized in terms of data quality, point densities and mapping guidelines for the topographic map objects. A supercomputer has been used to perform the parallel processing of 30.000 tiles, in total transforming 15 Million polygons using over 100 Billion laser points. On average each tile takes 1 hour of processing on 1 CPU. The processing was done on 112 parallel CPU's.

The goal of the presentation at the workshop and of a potential full paper is to describe in detail our experiences of the process, the mandates of the consortium partners, adaptions to the original software tools, the properties of the 3D map and to give an outlook on what are the next steps in distributing and maintaining the product.