**Distributed processing of Dutch AHN laser altimetry changes in the built-up area.**

Máté Cserép and Roderik Lindenbergh
-Dept. of Cartography and Geoinfomatics, Eötvös Loránd University, Budapest, Hungary
-Dept. of Geoscience and Remote Sensing, TU Delft, The Netherlands

Abstract:

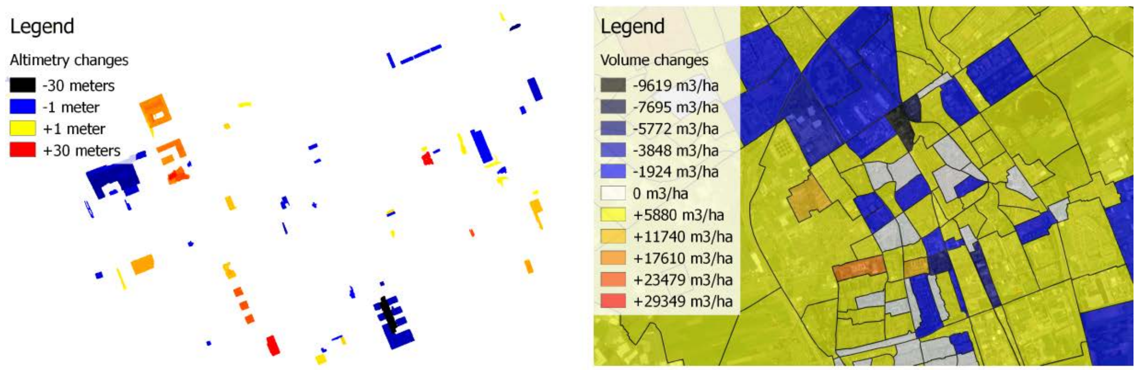
The Netherlands is probably unique in the sense that the whole country is sampled repeatedly by airborne laser scanning, within the framework of the Actueel Hoogtebestand Nederland (AHN) project. The second acquisition, AHN2, took place in 2007-2011, while the third acquisition is planned for 2014-2019, and has meanwhile been completed for about one third of the country. Although AHN has been proven successful for a variety of applications, documented research on large scale geometrical information extraction from AHN data hardly exists. A possible reason for this is that systematic large scale processing of geospatial data is difficult to manage on a normal desktop environment.

To analyse this issue a pilot study was designed with the goal of determining all changes in the built-up area between AHN2 and AHN3. Input data were all available corresponding AHN2 and AHN3 tiles, compare Figure 1. The data product used is the 0.5 m grid, which is detailed enough to capture changes at building level, but avoids the need to process the full, raw point clouds. Using the TU Delft campus area as example, a workflow was designed to identify changes in buildings, without using any other auxiliary data.

Figure 1: AHN3 tiles used in this study

The workflow starts by identifying non-terrain data. Comparison between AHN2 and AHN3 gives raw changes, including insignificant changes and changes in vegetation. To remove those, small vertical changes are removed, and after clustering, only those changes were kept that cover a connected area of at least 100 $m^2$. Finally change results were refined using morphological operators. An example result for the TU Delft campus is shown in Figure 2, left.

The workflow was implemented in C++ using GDAL/OCR and designed such that distributed computing is facilitated. Run on a standard desktop computer, the workflow took 52 hours on the full data as shown in Figure 1. The workflow was also run on the Dutch national supercomputer LISA (from SARA) which could reduce the runtime to only 30 minutes. Such reduction is essential when a tuning of parameters based on large scale initial results is required. In order to efficiently visualize results in a web-browser, results at building level were aggregated at district, neighbourhood and city/municipality level. An example of results at district level is shown in Figure 2, right. In the web browser, a user can select a municipality and immediately see the amount of gained, lost and moved building volume. This interactive visualization will be show-cased in the NCG presentation.




(a) Building level results at TU Delft (b) Aggregation on the districts of Delft

**Figure 2. Building changes detected by comparing AHN2 vs. AHN3.**