Renewal of the Cadastral Map of the Netherlands, an Iterative Adjustment Approach

Frank van den Heuvel, Juriaan Lucassen, Eric Hagemans, Gerbrand Vestjens, Mark van den Broek and Lense Swaenen, Wim Florijn, Stefan Bussemaker (Netherlands);

Key words: Cadastre; Digital cadastre; Positioning; surveying; network adjustment; map renewal

SUMMARY

The current positional accuracy of the Dutch cadastral map is considered not to be sufficient for future use. Therefore, the Cadastre started a project aiming at renewal of the cadastral map (Hagemans et.al., 2021). The information needed is already available in the form of more than 5 million historical field sketches containing the original survey information. Software has been developed that is able to largely automatically read and vectorise these field sketches (Franken et.al., 2021). Large survey networks are set up and adjusted using the collected measurements. The goal of the adjustment and testing is the validation of this information before it is used for improving the current cadastral map. The focus of this paper is on the last step of this process: an iterative approach of adjustment. Currently, the complete process for the production of the reconstruction map is being tested.

The iterative approach adopted for the production of the reconstruction map is based on the Delft method of testing where quality control is performed in all steps of the process (Van den Heuvel et.al., 2021). In this paper the developments in our map renewal project are presented, with a focus on the geodetic aspects and especially the iterative approach in calculating the improved geometry of the cadastral map. For the final step in the production process we developed dedicated adjustment software in corporation with Sioux Technologies (www.sioux.eu). This software connects two point fields while accounting for the precision of both point sets represented by their full covariance matrices. The point fields to connect are firstly the current cadastral map, and secondly the point fields that result from the survey network adjustments of a group of vectorised field sketches. An artificial covariance matrix is adopted for the current cadastral map as there is limited to no information on the quality of this map. This covariance matrix is chosen in such a way that it facilitates the interpolation of points of the cadastral map for which no measurements are present in the field sketches. The covariance matrix of the point field of the survey network results

from the large-scale network adjustment.

As adjustments with full covariance matrices are very computation-intensive, the processing speed is definitely one of the main challenges. However, it is obvious that this adjustment cannot be performed for the whole country in one calculation. Therefore, an iterative approach is adopted that aims at adjustments in which a few thousand points are processed in one go. Currently, we are investigating how the cadastral map is best subdivided in segments for processing, and how to choose the overlap between neighbouring segments in order to avoid inconsistencies on the borders of neighbouring segments.

The paper will present the challenges, and solutions adopted for the adjustment calculations involved in the country-wide cadastral map renewal of The Netherlands.

References:

- Franken, J., Florijn, W., Hagemans, E., Hoekstra, M., 2020, ”Rebuilding the cadastral map of The Netherlands, the artificial intelligence solution”, proceedings FIG-2021.

- Hagemans, E., Busink, R., Grift, J., Schouten, F., 2020, ”Rebuilding the cadastral map of The Netherlands, the overall concept”, proceedings FIG-2021.

- Van den Heuvel, F., Vestjens, G., Verkuijl, G., Van den Broek, M., 2020, ”Rebuilding the cadastral map of The Netherlands, the geodetic concept”, proceedings FIG-2021.