Fit-For-Purpose Boundary Mapping with Low-Cost Gnss Receivers and Opensource Software

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SUMMARY

The paper focuses on new methods for data capture and calculations within the field of cadastral surveying. During fieldwork in Northern Norway, two different low-cost GNSS-receivers have been tested for the purpose of mapping boundaries. These two receivers, Emlid Reach RS2 and Trimble Catalyst DA2, have been used together with smartphones and opensource software. On different types of smartphones, we have tested two different solutions based on the opensource GIS-software QGIS. One solution makes use of the smartphone-app "QField", and the other solution makes use of the smartphone-app "MerginMaps". The latter solution is cloud-based, while QField stores the data locally in the device. For both solutions, the captured data are stored within a QGIS-project. For computations in compliance with the Norwegian standards for cadastral surveying, new functionality is added to QGIS by making of a plugin called GNSSCAD. In this plugin we implement the current procedures for cadastral surveying computations in Norway. This includes weighted least squares adjustment computation, with blunder detection and reliability analysis. Also implemented is a suggested refinement of the current procedures, to make them more fit-for-purpose. The refined procedures that we propose are considered more suitable for calculations on GNSS point observations than the traditional methods, which originate from the time when total station was the main and preferred instrument for the cadastral surveyor. In addition to describing the procedures and results, the paper also presents a comparison of the results achieved with traditional equipment and software, and the results from the low-cost alternative. It is found and shown that the results produced by the low-cost alternative fully satisfy the demands concerning data quality found in the Norwegian standard for cadastral surveying. But it is also demonstrated that there are some challenges concerning data flow and assurance against blunders.

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