

# **Full Automatically Generated True Orthophotos and Sensational Dense Matching Techniques in Cadastral Applications: Innovative Improvements of Surveying**

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## **SUMMARY**

In the verification of cadastral and topographical borders, it's not always easy for surveyors to do their measurements. Sometimes it's difficult or impossible to enter these locations because of obstacles, safety reasons next to railways or bad entries like waterways. To improve the efficiency and effectiveness of the surveying process in the Netherlands an experiment was set up by the dutch Land Registration and Mapping Agency to use photogrammetry techniques which refrains from conventional terrestrial methods. In a novel approach the verification process relies on recent and accurate aerial photographs of the topographic situation of the parcel(s) involved, which show sufficient details and have a measurement precision of 3 centimeters or less, which is in fact really sensational. In these aerial photographs Kadaster verifies borders by software full automatically. Next to reaching agreements between owners, these pictures can subsequently be used to measure the cadastral borders with high accuracy. Subsequently, a commercial service provider for unmanned aerial photography based services was hired to generate a set of aerial images along the new railway between the cities Kampen and Zwolle, which resulted in automatically generated True Orthophotos. During this experiment Kadaster has build lots of experiences with Dense Matching Techniques, cameras used, the photo collection plan, the usage of ground control markers and the calibration of the camera's. Furthermore experiences of the different used SFM software packages (Visual SFM/Bundler, PhotoScan, PhotoModeler and the Orbit software) is improved. The current conclusion of the still on-going experiments with the data, it has proven to be possible to produce automatically True Orthophotos with a geometric accuracy of 3cm, which is very promising for cadastral usage, making Digital Terrainmodels. Additionally, borders that are indicated on high resolution pictures can be indicated with at least the geo referential precision that is provided by conventional terrestrial surveying methods. However, further research is going on, on numerous areas. Results in tests with change detection methods in 3D pointclouds will be expected in December, costs of the new approach in comparison with conventional terrestrial process has to be determined , procedures for operational application of the methodology have to be established, just to name a few.