

CHANGE DETECTION: LAND REGISTER AUTOMATION USING eCOGNITION AND INPHO

REALTY DATA AT THE CLICK OF A MOUSE

AT THE RHINELAND-PALATINATE SURVEY AND LAND REGISTER OFFICE (VermKV) IN GERMANY, LABOR-INTENSIVE UPDATES TO CADASTRAL DATA BY MANUAL EVALUATION OF AERIAL PHOTOGRAPHS ARE A THING OF THE PAST. BUILDING ALTERATIONS CAN NOW BE RECOGNIZED AUTOMATICALLY USING THE TRIMBLE® eCOGNITION® SOFTWARE SUITE. THIS INNOVATIVE AND STANDARDIZED PROCESS SAVES A GREAT DEAL OF TIME AND IS MORE ACCURATE THAN THE PREVIOUS METHOD. CADASTRAL DATA UPDATES THAT USED TO TAKE SEVERAL YEARS TO IMPLEMENT CAN NOW BE BROUGHT UP TO DATE IN JUST A FEW MONTHS.



BACKGROUND

Changes to land use data in the German State of Rhineland-Palatinate, i.e. property boundaries, used to be recorded manually. General geospatial data was identified by visually comparing aerial images and previously recorded property data. An employee would have to mark any deviations by hand, and these were then checked and confirmed by an on-site survey. These manual processes were time-consuming, labor-intensive and expensive.

The challenge was to improve overall work processes and provide a more efficient support for updates to the state's official land registry information system data set. They needed a program

to not only process data and images but also automatically extract useful information and make it easily available. Another concurrent goal was to counter the high risk of error associated with manual data entry.

REQUIREMENTS

The Rhineland-Palatinate Survey and Geodetic Data Office (LVermGeo) initiated a feasibility study. They were in need of an automated process to detect changes in buildings. They chose Trimble and its eCognition software suite. eCognition automatically identifies building from aerial images and through segmentation and classification processes it quickly produces a precise overview of new or altered building features.

An initial test run using an in-house dataset proved that Trimble's eCognition solution was an ideal fit to meet their challenge. Through a comprehensive consultation process, Trimble developed two workflow components: a fully automated eCognition rule set to detect building changes and a eCognition Architect solution for quality control. Both application components met the requirements of the overall survey and land registration bureau. In addition, LVermeGeo obtained additional eCognition Server, which allows parallel image analysis processes based on the fully automated rule set. Finally, Trimble provided employee training to support the immediate implementation of eCognition within the Survey and Geodetic Data Department.

GETTING THERE WITH ECOGNITION

There are two elements to Trimble's solution:

Trimble's Inpho photogrammetry software is used to prepare and process aerial image and surface data, pre-processing the data to create the basis for recognizing building alterations. Inpho provides a starting point for eCognition to apply a set of rules that will identify changes in the overall landscape.

The seamless workflow between the software interfaces makes it possible to extract building data information automatically using aerial images. New and altered buildings are now detected and identified by the software.

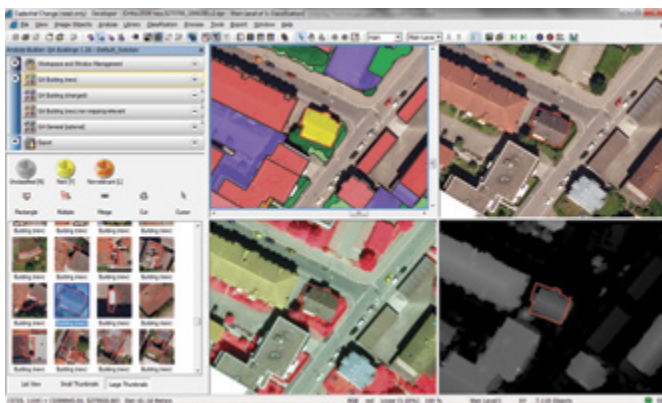
This substantially cuts down the time spent in field survey and makes it easier to plan field surveying routes. An area or building only needs to be re-surveyed if the eCognition program identifies a change. The standardization of results gives a clear benefit in time and money. Also, maintaining a digital record of sites that have been filtered out provides efficiency through the years.

"There are numerous advantages to the new system. It is intuitive and saves lengthy manual work processes."

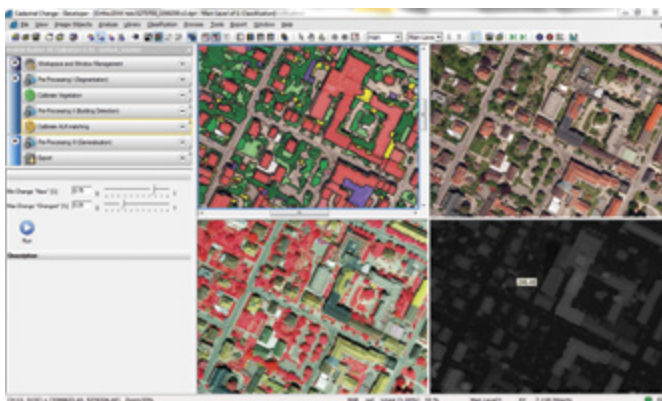
One main benefit compared to the previous process in place is a major cut down of time spent on manual field inspection. Only the sites recognized and identified in the software are the ones which need to be considered for further site inspection. Survey routes can be planned more accurately and productively. The software can also identify if a building has been incorrectly classified, and the results can be adjusted on the screen as part of the analysis.

"This automated approach using eCognition turns our image data into valuable information about each building. Less information is missed, especially in closed rear courtyards or a building with challenging access. In the past it was often impossible to check for changes in the back yard for example."

The new automated process is also future-proof. Trimble has pre-built rule sets in the eCognition program, that can easily be customized and adapted to changing Survey requirements. The versatility and scalability of eCognition means that the program can be shared with other departments with simple adjustments for different requirement profiles.



Application for visual quality assurance and manual editing. (Comparison of GIS data with building found and identification of altered buildings).



Application for optional post-adjustment of the automated rule set (Application adjustment for building detection).

“ECOGNITION AND INPHO ENABLE US TO AUTOMATE TIME-CONSUMING IMAGE PROCESSING STEPS. THEY ALSO STANDARDIZE THE CHANGE DETECTION PROCESS FOR AUTOMATED LAND REGISTRATION MAPS (“ALK”) AND REDUCE THE AMOUNT OF TIME AND EFFORT NEEDED TO INTERPRET AERIAL IMAGES AND COMPARE RESULTS WITH ACTUAL SURVEYED FIELD DATA.”

Rhineland-Palatinate Survey and Geodetic Data Office (LVermGeo)

RESULT

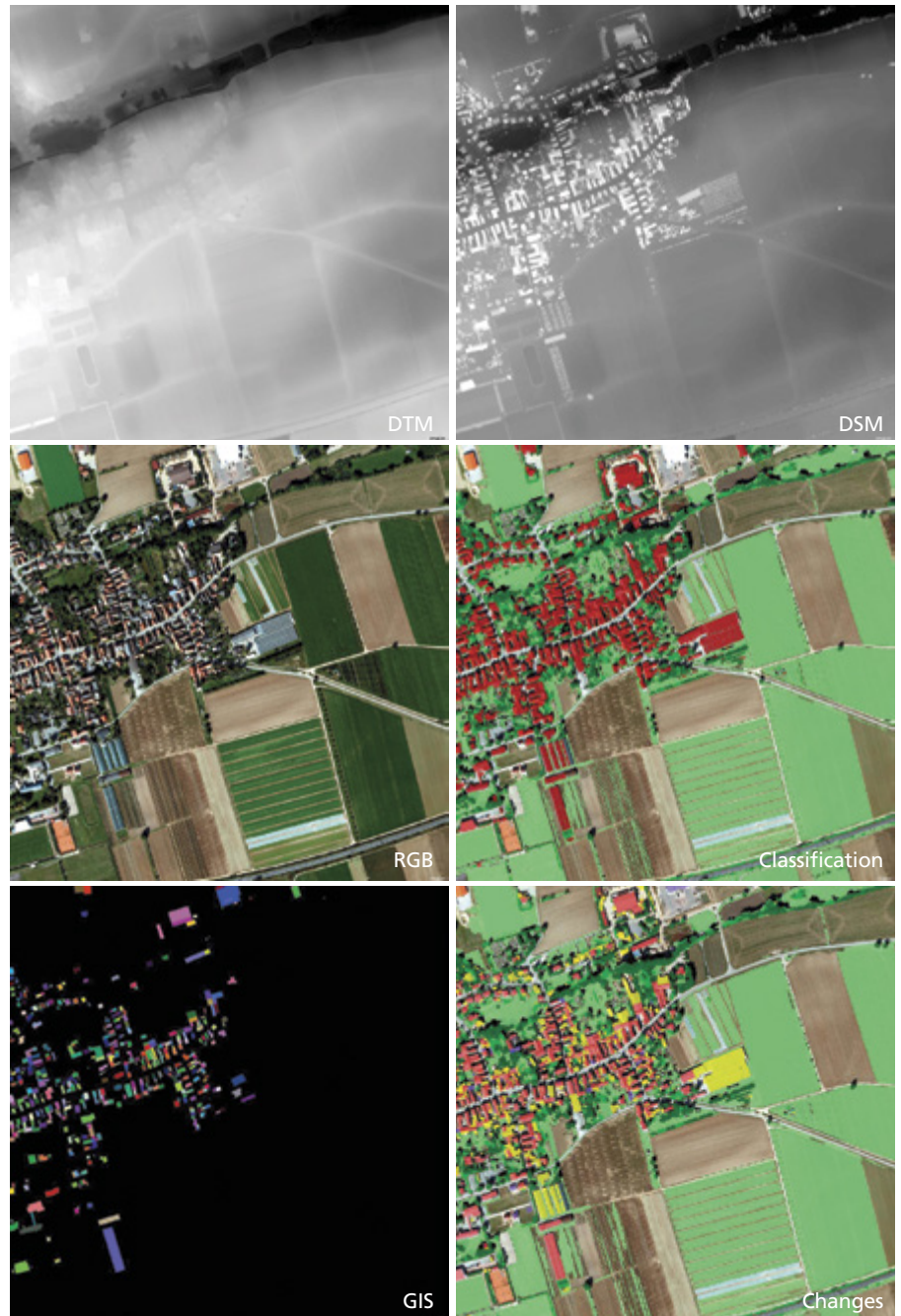
“The Survey and Land Register Department is now future-proof, with up-to-date geospatial processes in place and the flexibility to adapt to changes.”

With the implementation of eCognition, the Survey and Land Register Office is ideally set up for the future:

- Using the software and developing the regulatory framework enables it to work faster and more effectively.
- The employees appreciate the clear and intuitively arranged interface that makes day-to-day work easier and saves a great deal of time.

Building alterations have now been calculated for the entire southern area of the State (approx. 10,000 km² / 3.86 square miles of the aerial photography records generated in 2012).

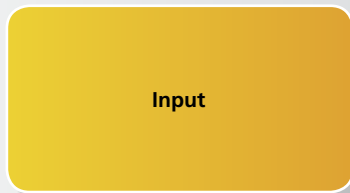
BUILDING RECOGNITION USING ECOGNITION: CLASSIFICATION BASED ON AERIAL IMAGE DATA AND GIS DATA.



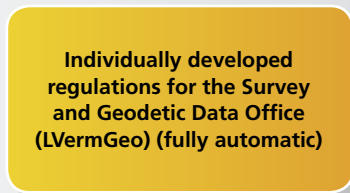
SUCCESS FACTORS FOR CADASTRAL CHANGE DETECTION USING eCOGNITION AND INPHO:

- Substantial productivity improvements through automated recognition of building alterations to keep the state's land survey register up-to-date, using a combination of Trimble Inpho® and eCognition software.
- Standardized work processes for in-house and in the field:
Maintaining digital records replaces site visits that are both costly and prone to error.
- Technological advances save time:
the Survey and Land Register Department can process changes to property records much more quickly and efficiently.
- "Future proof":
developed rule sets can be easily adapted and refined across multiple departments for future Survey requirements.

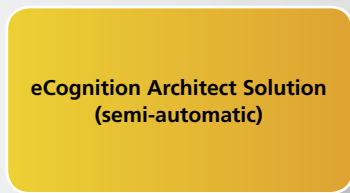
OVERVIEW OF CHANGE RECOGNITION IN LAND USE USING eCOGNITION IN THE SURVEY AND GEODETIC DATA OFFICE



Aerial image data, GIS data,
surface model, terrain model



Step 1: Building recognition
Step 2: Change detection
(Comparison of GIS data with buildings found
and identification of altered buildings)



Graphical User Interface (GUI) for quality
control customized by Trimble for the
Survey and Geodetic Data Office



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