OBLIQUE AIRBORNE PHOTOGRAMMETRY: USERS' AND VENDORS' VIEWS

EuroSDR **Survey**

Today, oblique airborne images are a powerful source of geodata, particularly for applications in urban areas. Although the cost of capturing is higher, object identification and creation of dense 3D point clouds is easier and more reliable compared to conventional vertical imagery. To better understand the current practice and possible user needs, the EuroSDR initiated a survey on the use and expectations of obliques. The questionnaire went online in spring 2014 and was targeted at both users and providers of hardware, software and services. Here, the authors summarise the key findings from the survey.

In recent years, aerial multi-camera systems which are able to deliver oblique and nadir imagery simultaneously have become standard. The interest in oblique imagery for mapping is primarily driven by the disclosure of the entire façade and, normally, the footprint of buildings. The use has evolved from simple visualisation or reconnaissance to cartographic mapping. The multiple applications of aerial obliques include extraction of dense point clouds for 3D city modelling, identification of structural damage to buildings, road updating, monitoring services, urban area classification and administration services.

EUROSDR SURVEY
Eleven questions were directed towards users and seven questions to vendors/suppliers. As of October 2014, more than 130 participants had responded to the survey, including 11

vendors. The largest group of respondents comes from academia, followed by national mapping agencies (Table 1).

A key question addressing users was: "In your institution or company, which applications would you see for (or are you already serving with) high-resolution oblique airborne images?". Similarly, vendors were asked: "What do you anticipate is the major application of oblique airborne images?". Figure 1 shows the percentages of positive answers given to the question on the use of obliques (multiple choices are possible); users and vendors largely agree. The respondents from academia and NMAs see mapping of buildings as offering important potential. Dense image matching is also seen as significant, as facades are often visible and therefore buildings can be reconstructed in 3D. Figure 2, which shows a point cloud

computed from Microsoft Osprey imagery of Graz (Austria) using the Micmac tool, demonstrates the current level of dense image matching. The denser and more complete 3D point clouds are, the greater the challenge is to transform them into structured and detailed building models. This is still an open and 'hot' research topic.

IMPROVEMENT OF TASKS
Which tasks improve with oblique airborne images? "Easier identification of objects," replied 71% (Figure 3). Indeed, recognition and identification of buildings and other elevated objects is easy in obliques. Just 40% say they expect an increase in automation, which seems quite pessimistic, whereas around 60% expect increasing reliability. Interesting comments include:
- "One can easily identify features such as trees and buildings while editing automatically generated DSM for producing DTM."
- "Since SAR images are also looking from a slant direction, obliques can be used as valuable complement to radar images." ▶
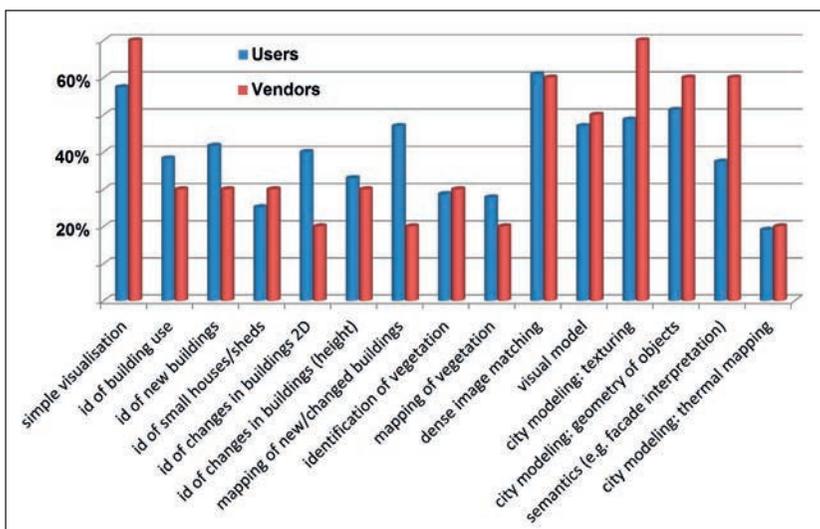

▲ *Figure 1, Usage of oblique images: users' and vendors' views.*

Users	
Universities/Research Institutes	44.7%
National Mapping Agencies (NMA)	20.6%
Other Users	14.9%
Data or Information Providers	5.7%
Cadastres/Land Administration	3.5%
Municipalities	1.4%
Real Estate Companies	1.4%
Vendors	
Software	5.0%
Hardware	2.8%
Total	100%

▲ *Table 1, Classification of respondents.*

▲ *Figure 2, Dense image matching point cloud of the city of Graz, Austria, derived from imagery captured by the Microsoft Osprey camera.*
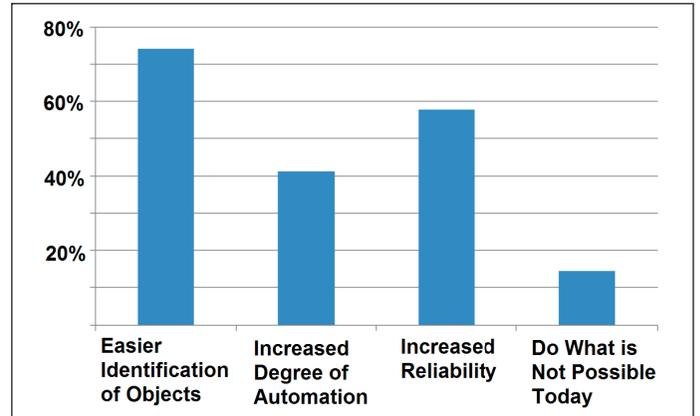
▲ *Figure 3, What can obliques do better?*

The survey also focused on automation of the image processing workflow; 75% say that their current workflow is semi-automated, although 25% comment that they already have a fully automatic workflow. Overall, the comments show that orientation and dense matching seem to work fully automatically depending on software, size of block and other features. However, some say that these initial data processing steps do not provide the results expected. In contrast, automatic interpretation is a bottleneck. Users differentiate between simple tasks, such as identification of buildings which is regarded as being realistic to conduct automatically, and the complex and detailed modelling of buildings which still requires manual processing.

DISCUSSION

56% answer yes to the following interesting and thought-provoking question: "Looking at your applications and assuming that the nadir camera is at least a middle-format, metric camera, with PAN, RGB and IR camera cones: would a combination of this nadir camera and the oblique views

replace large-format-camera nadir flights in the future?" – fodder for discussion thus. Those affirming that middle-format multi-view can replace large-format say that photorealistic 3D mapping is more important for urban areas than 2.5D representation. Others point out the increasing reliability of object identification. In contrast, some respondents state that obliques contain too much unnecessary data for traditional mapping, and the production of very-high-resolution true orthoimages still would require large-format cameras. This subject was also discussed by NMAs and academia during the EuroSDR Board of Delegates meeting in May 2014. One of them argued that flights conducted with a middle-format multi-camera would require more flight lines to cover the entire area from all directions and thus result in higher acquisition costs. However, this could be compensated for by the NMAs offering new products and services, such as property evaluation or inventory of building usage and other semantic 3D analyses. The regular and systematic capture of obliques in rural areas was not thought to be significant for the near future.

CONCLUDING REMARKS

Exploration of the potential of airborne obliques is an ongoing activity of EuroSDR. The questionnaire is still active and available at [1]. Another activity in this framework, conducted in cooperation with ISPRS, is a benchmark on multi-platform very-high-resolution photogrammetry [2] aimed at image orientation of a large block of oblique imagery and dense image matching. ◄

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Series on Oblique Photogrammetry
This is the seventh article in the series on oblique photogrammetry. The articles published in the January, February and March 2014 issues covered properties of oblique airborne imagery, automated processing and automatic building detection, respectively. Oblique camera systems were covered in the April and May issues. The September edition presented a methodology for evaluating the performance of dense image matching algorithms applied to oblique images. This series is a joint initiative of EuroSDR Comm. 1, Delft University of Technology, University of Twente (ITC) and FBK Trento, Italy. Edited by Mathias Lemmens the series is intended to cover concepts, applications and camera systems and configurations available on the market. You are cordially invited to contribute or to convey comments or additions. To do so, please feel free to contact the editorial manager at wim.vanwegen@geomares.nl or the senior editor at m.j.p.m.lemmens@tudelft.nl.

More information
1. www.surveymonkey.com/s/EuroSDR_oblique
2. www2.isprs.org/commissions/comm1/icwg15b/benchmark.html