

From High Definition Point Clouds to 3D Virtual Reality Models

In order to continue the discussions of the 53rd Photogrammetric Week, in which the complementary features of Dense Image Matching (DIM) and LiDAR have been agreed on, 2013 will offer a forum also for point cloud post processing. The 54th Photogrammetric Week¹ (see footnote) – would like to highlight new hardware, software and workflows to collect even more complete point clouds and processing schemes delivering 3D virtual reality models. For this reason photogrammetry will meet experts from computer vision and other fields to find optimal workflows and strategies for the benefit of all disciplines and to collaborate more closely in future.

It is over and over amazing, that the spirit of the Photogrammetric Week Series over the last 104 years did not change at all. It was, is and will be a *Scientific Symposium* and *Further Education Course*, which – owing to the lack of space – can treat selected topics at one event only. These topics are presented by international masterminds and the Open PhoWo partners – companies offering hardware, software and workflows. Therefore, a systematic and detailed review of every topic is often not possible. On the other hand, however, a one week course has a special attraction. It is the stimulating atmosphere of a collection of individual views presented in one-track sessions in the mornings, the demonstrations in the afternoons, and the social events in the evenings, which makes every photogrammetric week very special.

For this reason, the Photogrammetric Week '13, which is held traditionally in Stuttgart, from September 09 to 13, 2013, continues with a selection of three topics. The Conference, Keynote and Invited Speakers give their reflections in the mornings and the Open PhoWo Partners are pleased to welcome the participants for interactive demonstrations in the afternoons. An attractive social program complements the scientific program to leave ample time for open discussions, intercultural relations and making new or to maintain old friendships.

Although we have got requests to organize the Photogrammetric Week Series annually, we have decided to maintain the biennial structure for the following reasons: First, hardware, software and workflow developments in photogrammetry and the Earth sciences are not that fast and dynamic to allow for comprehensive reporting and demonstrations once per year. Secondly, offering an attractive program and inviting and having every year far more than 400 participants in Stuttgart would be a challenge, which is not easily to resolve by a university institute. Thirdly, there are many other interesting scientific symposia, workshops and fairs we do not want to interfere with the Photogrammetric Week Series. Therefore, the 54th and 55th Photogrammetric Weeks will maintain the same spirit and structure as in the years before.

¹ In order to represent the statistics of “The Photogrammetric Week Series” properly it should be mentioned here, that after World War II Carl Zeiss, Jena tried to continue this series in photogrammetry for the Eastern Block countries, parallel to those jointly organized by Carl Zeiss, Oberkochen and University Departments in West Germany. Horst Schoeler and Erich Feldkeller organized two courses as the 21st Photogrammetric Week (April 14 to May 12, 1958) in Prague and the 22nd Photogrammetric Week (June 6 to July 1, 1961) in Budapest, mainly for Eastern European photogrammetric professionals.

Following the structure of previously published proceedings of this biennial Scientific Symposium and Further Education Course, the following three topics are discussed this year:

- Data Collection From Air, Space and Ground – An Update
- Advanced Methods of Computer Vision and Photogrammetry
- Solving the Future Mapping Problem, All About 3D Modeling.

The introductory chapter starts with the *Conference Lecture* given by Uwe Franke, an industrial expert in computer vision. Stereo vision systems and real-time DIM processing are in the meantime part of driver assistance systems in the car industry.

Brief lectures by the Open PhoWo partners will follow – given by Hexagon Geosystems, Heerbrugg, Trimble, Munich, Ingenieurgesellschaft für Interfaces (IGI), Kreuztal, Microsoft Vexcel, Graz, BAE Systems, San Diego, and VisionMap, Tel Aviv. These presentations are complemented by the Young Scientist lecture of the Institute for Photogrammetry, Stuttgart.

In recognition of Carl Pulfrich's contributions in the field of photogrammetry and mapping, Carl Zeiss, Oberkochen, introduced the Carl Pulfrich Award, already in the 1970s. Hexagon Geosystems is continuing the tradition of awarding scientists with cutting-edge contributions to these fields. By the way, it was Carl Pulfrich who launched the Photogrammetric Week Series 1909 as a *Vacation Course in Stereo Photogrammetry*. My sincere thanks go to Hexagon Geospatial Division for maintaining this prestigious award. The Carl Pulfrich Award 2013 Ceremony is embedded as in the years before in the 54th Photogrammetric Week.

The second chapter highlights new hardware for 3D data collection. Some Open PhoWo partners present new oblique aerial photogrammetric camera systems, which are able to combine nadir and oblique cones, in PentaView mode. This will help to complement DIM point clouds, especially for 3D city and corridor mapping, and in highly undulated terrain. It seems that Remotely Piloted Aerial Systems (RPAS) have found their niches in mapping applications. Therefore it is interesting to see best-practice reports and the progress in this fast-growing market.

The third chapter reflects image and point cloud processing from three perspectives: the computer vision view, the photogrammetric view and using LiDAR experiences. One topic has to be solved in near future – the semantic enrichment of point clouds, no matter which technology is used. The report about the EuroSDR Benchmark on Image Matching is recommended for all those who are interested to use DIM in NMCA environments. The DIM implementation using GPUs is superior to classical CPU processing software, as stated in a follow-up paper.

The panel discussion will actively examine the headline of this year's event: "From High Definition Point Clouds to 3D Virtual Reality Models". The panelists are: Sebastian Carl, GAF Munich, Luc van Gool, ETH Zurich & Leuven University, Jürgen Dold, Hexagon Geosystems, Andreas Ullrich, Riegl, and Juha Hyyppä, Finnish Geodetic Institute, Helsinki. The panel is chaired by Dieter Fritsch, the organizer of the Photogrammetric Week Series since 1993. Pros and cons of photogrammetry, computer vision and LiDAR technologies will be given and, most important, the participants can actively contribute asking questions the panel will answer or to give some remarks resulting from own experiences.

Bringing virtual life into virtual 3D city models is the keynote topic of the fourth chapter. This future scenario needs simple and complex 3D models which are not yet feasible in large scale. Obviously

archaeology offers already advanced methods and modelling strategies other professions may benefit from. Furthermore road design and traffic modeling expects 3D models as well. The chapter is closed by an expert's report on progress in the virtual globe business.

This book could not be made possible without the help and discipline of the Conference, Keynote and Invited Speakers of the 54th Photogrammetric Week. The editor gratefully acknowledges their cooperation to finish the papers in due time. Since the introduction of pre-printed PhoWo proceedings (1993), the Institute for Photogrammetry (ifp) of the University of Stuttgart carried out the final word processing for the homogeneous book layout. Sincere thanks goes to Markus English, who does with great passion always an excellent job. Finally, we have met the deadline of the publisher, what is most important. Last but not least, we thank the publishing house Wichmann/VDE, Berlin and Offenbach, for publishing the book and cooperating with us since 1993. Let me also thank Martina Kroma for her continuous support in organisational matters.

The book is also available in softcopy format (CD/DVD-ROM) for fast digital data access. Moreover, we offer the book content on the ifp Web Server for Open Access. Since 1975 all proceedings of the Photogrammetric Week Series are on the Web and are "mirroring" the developments in photogrammetry, remote sensing and geoinformatics hopefully well.

Stuttgart, September 2013

Dieter Fritsch