Excellence in Photogrammetry, Computer Science and Geoinformatics

The 55th Photogrammetric Week[1] (see footnote) is a very special event. Since this will be last one directed by Dieter Fritsch many of his colleagues in academia agreed to present an Invited Paper on actual topics in Photogrammetry, Computer Science and Geoinformatics. For this reason photogrammetry meets experts from agriculture, cartography, computer vision, computer graphics and geoinformatics to learn about other problems and hopefully collaborate more closely in future.

It is over and over amazing, that the spirit of the Photogrammetric Week Series over the last 106 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 thought leaders 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 – it is a *Symposium Boutique*!

For this reason, the Photogrammetric Week '15, which is held traditionally in Stuttgart, from September 07 to 11, 2015, continues with a selection of three topics. The Conference 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.

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

- Remotely Sensed Data Acquisition – An Update
- Advanced Modelling in Photogrammetry, Computer Vision and Computer Graphics
- Excellence in Geoinformatics.

The introductory chapter starts with the *Conference Lecture* given by Dieter Fritsch, the PhoWo organizer for the last 23 years. He introduces a new concept for digital camera calibration and presents an update on SURE, the dense image matching software for airborne, spaceborne and terrestrial applications.

Brief lectures of the Open PhoWo partners follow – given by Hexagon Geospatial Division, Heerbrugg, Trimble, Westminster/Biberach, Integrated Geospatial Innovations (IGI), Kreuztal, Microsoft

[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 photo-grammetric professionals.

Vexcel, Graz, GerMAP, Welzheim and VisionMap, Tel Aviv. These presentations are complemented by the Young Scientist lecture of the Institute for Photogrammetry, Stuttgart.

In recognition of the contributions of Carl Pulfrich in the field of photogrammetry and mapping, Carl Zeiss, Oberkochen, introduced the Carl Pulfrich Award, already in the 1970s. Hexagon Geospatial Divison 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*. Sincere thanks go to Hexagon Geospatial Division, Heerbrugg, for maintaining this prestigious award. The Carl Pulfrich Award 2015 Ceremony is embedded in the 55th Photogrammetric Week, as in the events before.

The second chapter starts with scientific developments in oblique aerial photography and applications of laser scanning and RPAS photogrammetry for agricultural crop analysis. The European remote sensing program for the next 10 years is highlighted – this relies on the SENTINEL satellites with their open access data policy. LiDAR basics are revisited, including radiometric measurements, bathymetry and waveform capturing, and details about image-based 3D data capture in urban scenarios are presented. As most outdoors sensor systems nowadays rely on GNSS/INS integration, an update is desired - here it comes. Mobile robot navigation is a challenge and reviewed with regard to aspects in search and rescue as well as planetary applications. A review of Conditional Random Field classification applied to point clouds, multi-temporal and multi-scale satellite images demonstrates the power of this mathematical approach. Combining Structure-from-Motion and Dense Image Matching algorithms for exploiting RPAS imagery follows. An update on large-scale tie point search, incorporating unordered image sets with thousands of images, concludes this chapter.

The third chapter deals with advanced modelling in photogrammetry, computer vision and computer graphics. Real-time photometric stereo is reviewed, which is another method for 3D reconstructions and can complement photogrammetric stereo very well. An overview on the 4D CH-World project describes details to reconstruct the Testbed Calw, Germany. Details on hand motion and grasping – tools of computer graphics to enable enhanced human-computer interactions – follow, also to be used by Virtual Humans. As climate change has obviously an impact on glaciers, a detailed study is given to use photogrammetric techniques for spatio-temporal analyses of glacier motion patterns. How to map the roof of the world and caves at sea-level? Use dynamic 3D cartography. From nationwide point clouds to nationwide 3D landscape models, or which details are necessary in the Netherlands for scales 1:10,000 and larger? LoD1 is a first approximation, but how to get LoD2 for the whole country? Interesting question. Close range photogrammetry has been a driving force for many developments in digital photogrammetry – enjoy the update on its advances. A 3D Avatar is a prerequisite for intangible cultural heritage, here recent advances in camera technologies and CPU/GPU performance allow to reduce costs of 3D scanners drastically. The progress in GeoVisualization demonstrates its power by three examples: Digital Elevation Models, the use of social media and the Web 2.0. Every smartphone has many sensors on board – public sensing is the new buzzword for collecting geodata voluntarily.

Excellence in Geoinformatics is the headline of chapter four. An introductory paper deals with mobility and visualization of the digital world, demonstrated by two case studies – image mapping and visual analytics of taxi driver's behaviour. Completely different, but also excellent: The early identification of plant stress in hyperspectral images, collected by hyperspectral cameras and processed using advanced plant models. An automatic analysis of moving point trajectories detects movement constraints and provides further interpretations. Who wants to go to Broadway? CityGML does! An interesting paper integrating 26 different datasets of New York City delivers a semantically enriched LoD1 model, best-practice for many other cities around the world. Obviously, another paradigm

change is moving forward: eScience integrating geoinformatics, Interesting to follow this development for the next years. The chapter is concluded by a future-oriented paper on using RPAS or Unmanned Aerial Systems (UAS) for monitoring natural and cultural resources.

This book could not be made possible without the help and discipline of the Invited Speakers of the 55h 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 peforms the final word processing for the homogeneous book layout. Sincere thanks to Markus Englich, who does this job always with great passion. 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 2015 *Dieter Fritsch*