Interview

Martin Rutzinger

Institute for Interdisciplinary Mountain Research, Austrian Academy of Sciences, Innsbruck, Austria

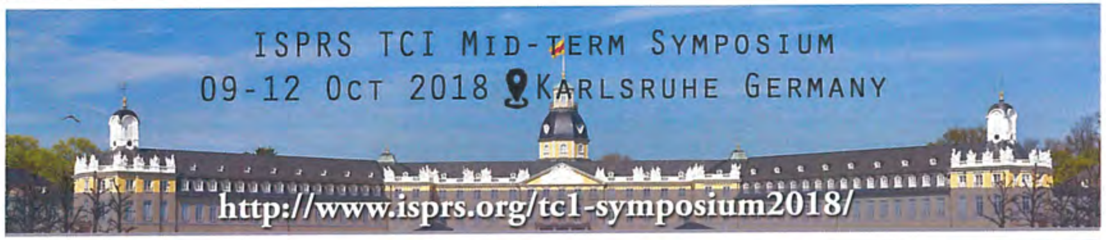
"3D mapping and monitoring of geohazards: where do we stand?"

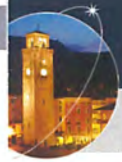
Geohazards comprise different types of environmental processes such as earthquakes, landslides, floods, avalanches, etc. threatening human living, economic wellbeing, and infrastructure. They may occur as single events, periodical or continuous processes, which can be spontaneously triggered, reactivated or accelerated with impacts on local or regional scale. 3D mapping approaches by sensing became an essential part in high-level monitoring of geohazards, enabling enhanced process understanding, risk analysis and planning of protection and mitigation measures. The ongoing development of sensors and platforms leads to reduced size and weight, by simultaneously increasing resolution and mobilisation of sensors for establishing enhanced monitoring applications in geohazard research. To date, we can make use of a large variety of sensor platforms, from static to moving, from terrestrial to aerial, to space-borne collecting data in specific radiometric, spectral, spatial and temporal resolutions. 3D mapping approaches as topographic LiDAR and photogrammetry are used with increasing flexibility in different settings, such as unmanned laser scanning in combination with sensors in multispectral and hyperspectral domain, just as one example. Current research may focus on data integration from different sensors and data sources, up- and down-scaling strategies, and ongoing automation in geodata collection, processing, analysis and interpretation. These research tasks go along with the current emerging fields of digitisation, autonomous mapping, robotics and artificial intelligence. Scientific achievements in these fields will further improve natural hazard management strategies and the development of resilient societies against geohazards.

Social Event

Welcome Party: Italian garden - Lake view, Congress Centre, 6.00 PM

Future events





Monday 4th June

Daily Programme

Morning	Registration	Exhibition	Opening session (Keynote & Companies)		
			Lunch break		
			Poster		
Afternoon			TS-WG1	TS-WG4	TS-WG10
			Coffee break		
			TS-WG8	TS-ICWG I/II	TS-WG9
			Welcome party		

Keynote Speaker

Davide Scaramuzza

Robotics and Perception group, University of Zurich, Switzerland

Davide Scaramuzza Autonomous quadrotors will soon play a major role in search-and-rescue and remote-inspection missions, where a fast response is crucial.
Quadrotors have the potential to navigate quickly through unstructured environments, enter and exit buildings through narrow gaps, and fly through collapsed buildings.
However, their speed and maneuverability are still far from those of birds.
Indeed, agile navigation through unknown, indoor environments poses a number of challenges for robotics research in terms of perception, state estimation, planning, and control.
In this talk, I will show that active vision is crucial in order to plan trajectories that improve the quality of perception. Also, I will talk about our recent results on event based vision to enable low latency sensory motor control and navigation in low light and high dynamic environment, where traditional vision sensor fail.

Interview

Christian Heipke

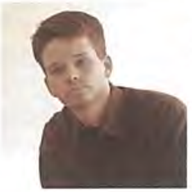
Institut für Photogrammetrie und GeoInformation, Leibniz Universität Hannover

"Where do you see Photogrammetry in 2020++?"

Photogrammetry has seen a phenomenal development in recent years. These developments are strongly influenced by progress in information and communication technology, which can be summarized under the terms of ubiquitous imaging, UAV platforms, mobile and cloud computing, as well as advances in 3D image processing such as structure-from-motion and SLAM. Most recently, automatic object extraction has seen major improvements due to innovations in machine learning and, more particularly, in deep learning based on convolutional neural networks (CNN). Other important trends have been those to carry out more and more benchmark tests to compare and improve algorithms, and the increasing amount of easy-to-use open software packages.
These changes have had a profound impact on the theory, development and operational use of photogrammetry as well as on remote sensing and spatial information science, resulting in a large variety of new applications in areas like autonomous driving, robotics and indoor positioning. At the same time, more traditional areas like precise metrology, mapping and map updating, and all kinds of monitoring and surveillance tasks have seen significant improvements.
In the years to come we will see an even closer integration of methodologies from satellite, aerial and close range photogrammetry with those from computer vision. We will also see a further integration of different sensors (optical, hyperspectral and thermal cameras, laser scanners etc.) to form geo-sensor networks and platforms for mobile mapping and robotics applications. On a more general

note, crowd sourcing and community mapping are very interesting additions to traditional data acquisition. On the processing side, we will see more and more automation for image processing, map update and monitoring tasks. Classification and, in particular, image interpretation and object extraction will significantly benefit from the developments in machine and deep learning. The need for automation is partly due to the shear amount of data being acquired every day - think about the millions of images being uploaded to the web. Real-time processing is another trend which will become more important. Besides obstacle avoidance in autonomous driving and UAV photogrammetry, tasks such as traffic monitoring, disaster management and image processing for personal use such as pedestrian navigation and personalised location-based services, demand fast results as well. ISPRS, as the premier international scientific society in the field, has been documenting and shaping developments in photogrammetry for the last 100 years. The society is and will remain a reliable partner to forecast and determine the future of our fascinating discipline for scientists, practitioners and educators alike.

Interview



Jan Boehm

Dept. of Civil, Environmental and Geomatic Eng., UCL, UK

"Big (geo)data"

With the rapid developments of digital capture technologies, datasets have grown massively. This is particularly evident for point clouds, i.e. collections of dense three-dimensional point samples across object's surfaces.

Modern sensors can capture millions of points per second. National mapping agencies (NMA) offer publicly available dataset with trillions of data points and terabytes of data. Geospatial data analysis is currently still dominated by desktop software systems mostly running some form of GIS software. This state of technology is obviously inadequate when looking at the available data volumes, predicted growth and breadth of analytical questions. It is therefore evident that we need to develop and adapt scalable big data techniques that are specialised on geospatial data and LiDAR point clouds in particular. The processing of massive point clouds needs development at all levels including algorithmic, parallelisation, automation and machine learning to name a few. Recent conferences and workshops have shown progress in most of these areas. Further work on large benchmark datasets will undoubtedly be crucial to shape future developments. Geospatial data forms the geometric backbone of future technologies such as Smart Cities, Internet of Things and Autonomous Public Transport Systems in addition to classic applications such as Urban Planning and Disaster Management. Geospatial data is not only point clouds but also includes maps, points of interests, building models, DEMs and photos. The fusion or combined analysis of these different data types poses a further big data problem. This is referred to as variety in the often cited 'three Vs' of big data (Volume, Variety and Velocity). This obviously stretches beyond a single ISPRS working group (WG II/3). But a closer inspection of the terms of references of the ISPRS working groups reveals that 'big data' features prominently in a variety of groups in different commissions. In 2015 we held the first Geo Big Data Workshop as part of the Geospatial Week in Montpellier, France. Maybe there can be further iterations of that workshop to bring together big data developments across the full bandwidth of research within the ISPRS community. If interested, get in touch with me!

Interview

Alper Yilmaz

Dept. of Civil, Environmental and Gedetic Eng., The Ohio State University, USA

"Image sequence analysis and videogrammetry in 2020: where are we going?"

"Alper, what happened in the last decade?"
Last decade has seen an increased use of image sequence analysis in photogrammetry. Especially, the adoption of the structure from motion (SFM) approaches that are adopted from the computer vision field played an important role in the popularity of using image sequences. The improvements observed in 3D scene recovery can be attributed to the redundancy, high overlap and the dense image-match graphs in the collected sequence data.

"Alper, what do we expect in the next years?"
Moving forward to 2020, with the proliferation of the sensing technology, the use of image sequences will see even more increasing trend. One of the drivers for this will be the processing performed on powerful and affordable GPUs, availability of fast access memory and high-resolution cameras. Combining these with the new algorithmic trends will improve the 3D scene analysis and understanding.

"And what about deep learning methods?"
Especially the adoption of the deep learning strategies since 2012 on both single image metrology, semantic scene labeling and sensor fusion make these tasks exciting. The joining of artificial intelligence with photogrammetry tasks have made a long-sought join of the computer vision, photogrammetry and the remote sensing societies a reality. Moving forward, I expect to see more of the intersociety collaboration and advancements in the field by using artificial intelligence applied on image sequences to solve photogrammetry problems which we deem to name as the videogrammetry.

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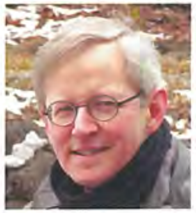

George Vosselman

Faculty of Geo-Information Science and Earth Observation, University of Twente, The Netherlands

"What are the most challenging research issues in the geospatial community?"

Extraction of large scale geospatial information from imagery and point clouds is the focus of most research within ISPRS Commission II.

For the years to come I would expect major challenges related to two important changes: changes in the sensors available for mapping and changes due to the surge of machine learning.

Ubiquitous sensing. In the past decades we've been primarily designing methods to extract geospatial information from datasets which were acquired for the very purpose of mapping. Some research has been conducted as well to reconstruct buildings or city parts from imagery available from the internet in repositories like Flickr, though this typically was restricted to locations well visited by tourists. With the arrival of the internet of things, more and more sensors become accessible. Of a particular interest are sensors mounted on cars. Be it for autonomous driving or just for parking assistance, data of such sensors have the potential to become a major resource for mobile mapping. Apart from challenges related to privacy and data ownership, more technical challenges will arise related to the tremendous amount of data to be processed, the understanding of very high resolution sensor data, and the filtering of monitored objects into those that are relevant for a particular purpose and those that can be ignored.

Machine learning. When it comes to 3D reconstruction or semantic segmentation of images and point clouds, algorithms based on the latest machine learning approaches are leading all main benchmark charts. Developments continue to go very rapidly. Leading algorithms are frequently superseded by various new algorithms within a matter of weeks. Based on end-to-end learning from original sensor data to the final output, deep learning networks do away with the need for handcrafted interest operators, feature descriptors, and cost functions characteristic for earlier research. This learning, however, requires the availability of large amounts of labelled data. To satisfy this need would be an interesting challenge for our community. After all, the mapping industry invested numerous man years in the creation of geospatial information, like topographic maps and digital terrain models. In essence, this is labelled data of very high quality and in principle valuable for learning. However, learning algorithms will then need to cope with differences caused by object definitions in geospatial data (e.g. generalisation, roof overhangs) as well as those caused by changes in between the time of capturing the data used for the production of the geospatial information and the time of capturing the data to be labelled. If these challenges can be overcome to a satisfactory degree, a lot of training data can be made available to further advance machine learning.