

**Report to the 33rd General Assembly
FIG Congress in Sydney, Australia 2010**

FIG Commission 6 – Engineering Surveys

Report of Activities 2009

1. General

The field of interest of Commission 6 are traditional the acquisition, processing and management of topometric data and all related information throughout the life cycle of a project (at construction site), quality control and validation for civil engineering constructions and manufacturing of large objects, modern concepts for setting-out and machine guidance, deformation monitoring, analysis and interpretation, measurement of dynamic loaded structures (general), prediction of deformation and movements in engineering projects, mines and areas of geological hazard, automatic measuring systems, construction and industry and multi-sensor measuring systems, terrestrial laser systems, their usage in architecture, civil engineering and industry and standards related to the construction and deformation measurement.

The Commission 6 activities were started with creation of the Working Plan for 2007-2010 and the new Commission 6 team build by WG Chairs and Co-Chairs. Starting the new period, joint these positions 6 new colleagues, former Commission 6 delegates and members. The main topics of the Commission are covered in the former period by five WGs, which structure was completed by the sixth WG oriented for terrestrial laser scanning.

2. Working Groups

WG6.1 – Deformation Measurement and Analysis

Chair: Adam Chrzanowski (Canada); Vice-chair: Cecilia Whitaker (USA)

WG activities are focused on the automation of monitoring surveys, enhancement of geometrical modelling of deformations from integrated deformation surveys, physical interpretation of deformations including numerical modelling and prediction of deformations and back analysis. A main objective of this WG is to propose or improve techniques to analyze historical geodetic data in comparison with modern ones, mostly GNSS-based. This is expected to permit:

- to extend the geodetic information on crustal deformation in larger time and space scales; especially to compare data collected after a certain event (for instance an earthquake) with those collected before it in areas not covered yet by extensive GPS networks.
- to examine whether the pattern of crustal deformation derived from longer term data (tens to hundreds of years) differs from the short-term one, derived mainly from modern, usually satellite data. This investigation is not limited to tectonic and seismic effects (especially the local earthquake cycle) but extends also to volcanic effects and to rather

surficial effects (for instance synsedimentary faulting in young deposits, sediment consolidation, etc).

The results obtained were presented in several meetings in Greece, Germany, France, Italy, and Turkey also IUGG and IAG Symposiums.

WG6.2 – Engineering Surveys for Industry and Research

Chair: Thomas Wunderlich (Germany); Vice-chair: Peter Kyrinovic (Slovakia)

The main goal of WG activity is to provide the specialists involved in that kind of missions with the latest state of the art concerning the use of adapted survey techniques in industry & engineering, multidisciplinary collaboration between survey engineers, civil engineers, structural & mechanical engineers, R&D scientists - for a better approach of complex engineering survey problems, specific algorithms, instrumentation, equipment and techniques in engineering surveys, high precision measurements and special techniques for the large scale metrology of big equipment or structures, integration of survey & alignment sensors with actuators and/or tools for on-line monitoring and control of a given process (dynamic systems).

WG6.3 – Engineering Survey Data Bases and Facility Management

Chair: Lothar Gründig (Germany); Vice-chair: Vladimir Sereдович (Russia)

WG activity is focusing on the role of the surveying engineer as the responsible manager of spatially referenced information, support for the co-ordination of the activities of other disciplines, building concepts of data models for the mapping of relevant 4D or 5D project data, covering 3D geometry, time, and descriptive attributes, exchange, provision and presentation of facility management data in computer networks, data integration for this subject, taking into accounts the presence of redundant data and different sources of information and automation and combination of feasible data acquisition techniques.

WG6.4 – Engineering Surveys for Construction Works and Structural Engineering

Chair: Gethin Wyn Roberts (UK); Vice-chair: Joël van Cranenbroek (Belgium)

The WG is promoting the use of adapted survey techniques in industry & engineering, promoting a multidisciplinary collaboration between survey engineers, civil engineers, structural & mechanical engineers, promoting the understanding of fibre optic sensors, e.g. interferometric sensors, study the use of embedded sensor arrays and the role of advanced surveying techniques for structural monitoring, creating an awareness of surveyors through a task force 'Fibre optic sensors' of the rapidly emerging technology of fibre optic sensors as "non-geodetic" sensors to measure deformations (strain) and temperatures in civil engineering structures.

WG6.5 – Terrestrial Laser Scanners – joint WG with FIG C5

Chair: Maria Tsakiri (Greece); Vice-chair: Rudolf Staiger (Germany);

WG is promoting the usage of laser scanning for geometric documentation in a variety of environments, particularly high risk and environments which benefit of remote measurements (e.g. structures, slopes, underground surveys, structural deformations of cultural heritage

monuments), investigate existing and developing terrestrial laser scanner instrumentation for engineering applications, evaluate and compare algorithms for processing terrestrial laser scanner data (e.g. registration, surface modelling, etc.), investigate and document metrological and quality control issues for laser scanning measurements, investigate the integration of laser scanning measurements with other measuring techniques, such as conventional geodetic systems and photogrammetric techniques.

The special and actual topics in focus of Com 6 were covered by six Study Groups. Their activities were oriented to:

- SG 1 'Continuum Mechanics as a Support for Deformation Monitoring, Analysis and Interpretation', chaired by Anna Szostak-Chrzanowski (Canada)
- SG 2 'Optimal Use of Interferometric Synthetic Aperture Radar (InSAR)', chaired by Linlin Ge (Australia)
- SG 3 'Crustal Deformation', chaired by Stathis Stiros (Greece)
- SG 4 'Monitoring and Analysis of Cyclic Deformations and Structural Vibrations', chaired by Gethin Wyn Roberts (UK)
- SG 5 'Fibre Optic Sensors', chaired by Helmut Woshitz (Austria)
- SG 6 'Terrestrial-Based RF Positioning Technologies', chaired by Joel Barns (Australia)

3. Events in 2009

During the year 2009 were planned and organised many events by the Commission 6 WGs and their members.

The 8th **Conference on Optical 3D Measurement Techniques**, 1-3 July 2009, held in Vienna (Austria) is well known between the engineering surveying community and were attended by high number of participants. Traditionally is focused to surveying, geodesy, machine-, computer- and robot- vision, spatial information systems from a variety of working areas (universities, industry, government) to discuss recent scientific and technical advancements and applications for optical static and kinematic 3D measurement techniques. The last conference were devoted to step-motor-driven and servo-controlled electronic theodolites and total stations, high resolution, low cost and smart digital cameras, capabilities for very fast or even real-time processing, visualization, animation and VR techniques are some developments leading to new procedures in photogrammetry and surveying.

FIG Commissions 5 (Positioning and Measurement) and 6 (Engineering Surveys) together with the Siberian State Academy of Geodesy (SSGA) organised a **Workshop on “Innovative Technologies for an Efficient Geospatial Management of Earth Resources”** on Lake Baikal in the settlement of Listvyanka, Russian Federation 23-30 July 2009. The conference were attended by more than 50 participants around the world.

Traditional are organised by FIG C5 and C6 and commission for Engineering Surveying and Photogrammetry of the German DVW the **seminar for Terrestrial Laser Scanning**, which was held in Fulda, 19-20 November 2009. This seminar serves to show the stage of development of the sensors, processing as well as application, furthermore a view of future developments (www.laserscanning.org).

Commission 6 was represented at the **FIG Working Week** in Eilat (Israel) by 6 sessions devoted to deformation and land slide monitoring and special engineering applications. It was organised 3 joint TSs of Commission 6 and Commission 5 devoted to terrestrial laser scanning, LIDAR and network and data analysis. Two TSs are organised in cooperation with ISM and ISPRS. Traditional annual meeting of the commission was held during the WW, during this were discussed actual topics of deformation monitoring, analysis and interpretation using continuum mechanics, monitoring and analysis of crustal deformations, optimal use of InSAR technology, terrestrial-based RF positioning technologies, methods and equipment of terrestrial laser scanning for engineering surveying procedures, analysis of cyclic deformations and structural vibrations, monitoring of dynamic loaded structures, application of automatic measuring systems multidisciplinary expertise and co-operation, which lead to integrated survey methods and systems.

Commission 6 participated in the **FIG Regional Conference** in Hanoi held 19-22 October 2009 by 10 TSs in cooperation with Commission 5, 3 and 8. The discussed topics are disaster risk management, GNSS application, mapping, areal surveying and remote sensing, Vision technology usage for monitoring also sensors and data processing in engineering surveying.

4. Co-operation with international associations

According to the increasing co-operation between FIG and other professional organisations many of the WG and SG members are active in different ISPRS, ISM and IAG commissions.

Papers and presentations were prepared for the joint organised conference in Vienna. The 8th Conference on Optical 3D Measurement Techniques is traditionally organised by ISPRS together with the FIG and last years also IAG.

100 Years ISPRS Centenary Celebrations including ISPRS TC VII Symposium “100 Years ISPRS - Advancing Remote Sensing Science” will held 5-7 July 2010 in Vienna (web site: www.isprs100vienna.org).

5. Future events

The Commission 6 members are traditionally active in preparation and organisation of many conferences and seminars. For the year 2010 are prepared follow events:

International Course for Engineering Surveying, held in Munich (Germany), 23-27 February 2010. At the 16th International Course on Engineering Surveying (IVK) in Munich, are prepared by the WG6.2 members the bridge monitoring, sensor system development, dynamic systems and data analysis, machine guidance together with documentation and ppt-scripts for participants. These activities are chaired by Th. Wunderlich (Germany). Block of presentations to the topic fibre optic sensors and their usage in civil engineering structure monitoring were prepared by SG5 members, chaired by H. Woshitz (Austria) - <http://www.iv2010.bv.tum.de/>.

In Novosibirsk (Russia) will take place the 4th International Exhibition and Scientific Congress GEO-SIBERIA 2010, which is organised by the Siberian State Geodetic Academy.

This is co-sponsored by FIG C6, namely by WG6.4 (<http://geosiberia.sibfair.ru/eng/>).

The **2nd International Conference on Machine Control & Guidance** prepared by Uni Bonn (Germany) will be held 9-11 March 2010, with participation of the WG6.2 and WG6.5 members, co-sponsored by Commission 5 (www.mcg.uni-bonn.de).

The **seminar on Terrestrial Laser Scanning** in Germany is also prepared for the year 2010. This will be organised by C5 and C6 of the FIG together with the DVW.

Commission 6 will participate at the **FIG Congress** held 11-16 April 2010 in Sydney (Australia) by 16 technical sessions devoted to the engineering survey topics – deformation using GNSS, terrestrial scanning, subsidence and landslides, quality management and standards, LiDAR and INSAR applications, remote sensing and data processing, machine guidance and integrated systems, building measurement and modelling, engineering survey. The commission annual meeting build space for presentation of the progress made by the commission WGs and study groups.

The International Conference on Indoor Positioning and Indoor Navigation (IPIN) prepared for 15-17 September 2010, Zurich (Switzerland). Co-sponsored by FIG Commission 5 (web site: <http://www.ipin.ethz.ch>).

The high number of prepared events underlines, that the year 2010 will be one of the most active and very important for Commission 6. The effort included to this events and their preparation will transform to results, which are important not only for commission members, but all specialists dealing with engineering surveying around the world.

Prof. Dr. **Alojz Kopáček**
Chair of Commission 6
January 2010

Web site: www.fig.net/commission6