International Federation of Surveyors
Fédération Internationale des Géomètres
International Vereinigung der Vermessungsingenieure

Trends in Engineering Surveying

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Engineering Surveying

- **Engineering surveying is a part of surveying, which deals with local geodetic networks, setting-out, deformation measurement, measurement and control of civil engineering and industry structures**
- **New technology are used, which enables automatic or high frequency data acquisition, processing and analysis**
- **To complete the data acquisition by information about the surrounding conditions and the measured object are the systems completed by other sensors and new functionalities**

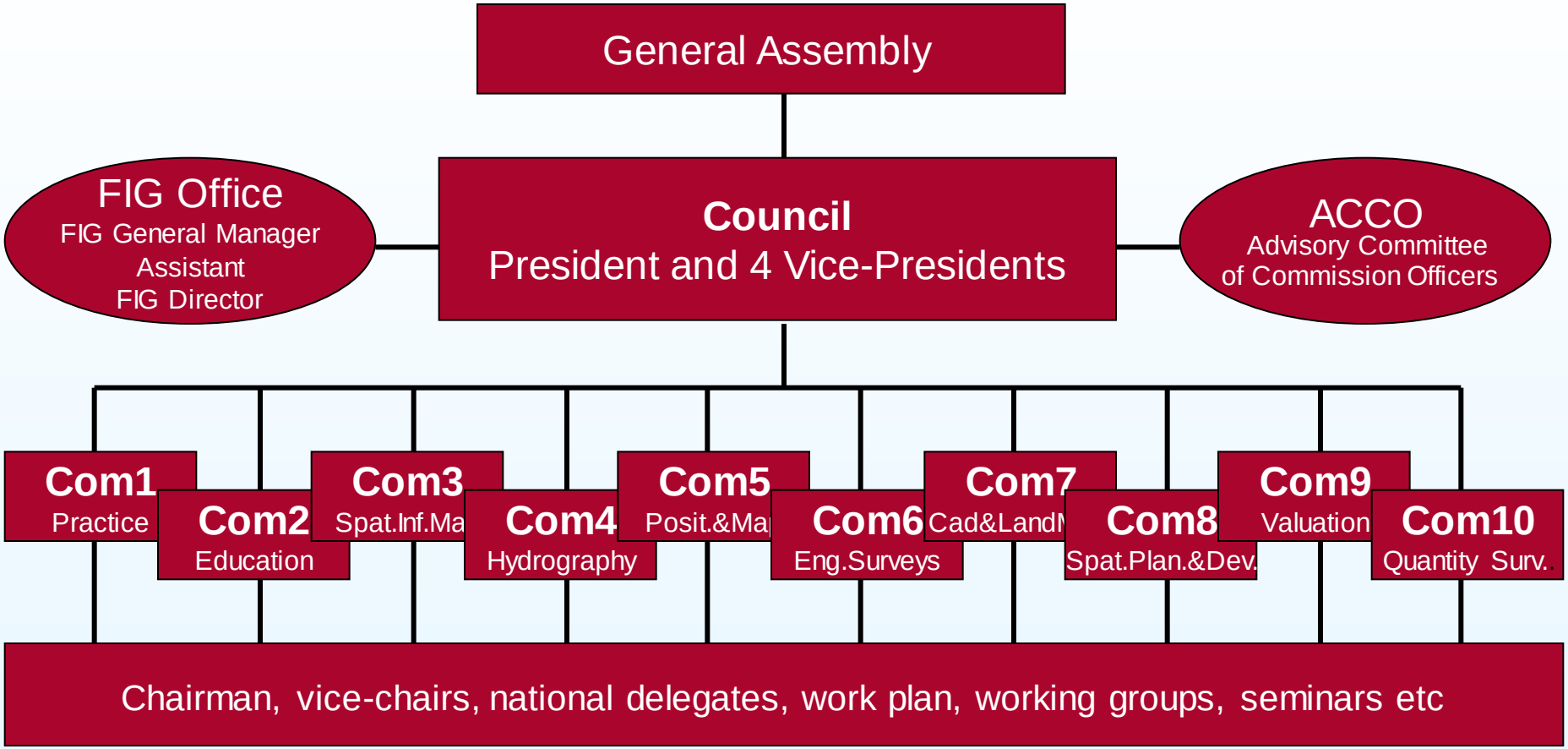
Engineering Surveying

- **The high level of automation of the measurement process opens the way for new applications, new field of interest for engineering surveyors – permanent deformation measurement of bridges, dams and industry structures, laser scanning applications, high frequency dynamic measurements, etc.**
- **New applications and usage of integrated measurement systems are connected with new data processing methodologies – time series analysis, continuum mechanics theory in deformation analysis, model building, visualisation, etc.**

Engineering Surveying – Professional Organisations

- **The overall and bright coverage of the engineering surveying topics is possible in the FIG, only**
- **FIG is cooperating with IAG, ISM mainly in the field of development of local geodetic networks, deformation measurement and analysis and their implementation together whit geotechnical and geodynamic methodology (concept) in the areas of geological hazard, etc.)**
- **Cooperation whit ISPRS is focused to application of laser scanning systems (TLS, InSAR, etc.) in the field of 3D (4D) model building, deformation measurement, high frequency data processing and analysis, model visualisation**

Organizational Structure



Komisie FIG

- **C1 - Professional Practice**
  Chair: Yaacoub Saade, Lebanon
- **C2 - Professional Education**
  Chair: Béla Márkus, Hungary
- **C3 - Spatial Information Management**
  Chair: Chryssy Potsiou, Greece
- **C4 - Hydrography**
  Chair: Andrew Leyzack, Canada
- **C5 - Positioning and Measurement**
  Chair: Rudolf Staiger, Germany

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Komisie FIG

- **C6 - Engineering Surveys**
  Chair: Alojz Kopáčik, Slovakia
- **C7 - Cadastre and Land Management**
  Chair: András Osskó, Hungary
- **C8 - Spatial Planning and Development**
  Chair: Diane Dumashie, United Kingdom
- **C9 - Valuation and the Management of Real Estate**
  Chair: Kauko Viitanen, Finland
- **C10 - Construction Economics and Management**
  Chair: Andrew Morley, United Kingdom

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Komisia C6 – Working Groups

WG6.1 – Deformation Measurement
WG6.2 – Engineering Survey for Industry and Research
WG6.3 – Database and Information Systems of Industry Objects
WG6.4 – Engineering Surveys for Civil Engineering Structures
WG6.5 – Terrestrial Laser Scanning

WG6.1 – Deformation Measurement

- **build in 1972 – all time active and still working**
- **automation of monitoring surveys, enhancement of geometrical modelling of deformations from integrate deformation surveys, physical interpretation of deformations including numerical modelling and prediction of deformations and back analysis**
- **improve techniques to analyze long term measurement data in comparison with short-term ones, based on different sensors and its integration (GNSS, InSAR, etc.)**

WG6.2 – Engineering Survey for Industry and Research

- **survey techniques in industry & engineering, collaboration between survey 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 – Database and Information Systems of Industry Objects

- **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**
- **the presence of redundant data and different sources of information and automation and combination of feasible data acquisition techniques**

WG6.4 – Engineering Surveys for Civil Engineering Structures

- **focused their activities sensor and measurement system development for kinematic application**
- **use of embedded sensor arrays and the role of advanced surveying techniques for structural monitoring**
- **creating an awareness of surveyors through a study group “Fibre optic sensors” of the rapidly emerging technology of fibre optic sensors as "non-geodetic" sensors, interferometric sensors, to measure deformations (strain) and temperatures in civil engineering structures**

WG6.5 – Terrestrial Laser Scanning (Joint with C5)

- **usage of TLS for geometric documentation in a variety of environments, particularly high risk and environments which benefit of remote measurements**
- **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**

FIG C6 - Study Groups

SG 1 - Continuum Mechanics as a Support for Deformation Monitoring, Analysis and Interpretation,
SG 2 - Optimal Use of Interferometric Synthetic Aperture Radar (InSAR),
SG 3 - Crustal Deformation Monitoring,
SG 4 - Monitoring and Analysis of Cyclic Deformations and Structural Vibrations,
SG 5 - Fibre Optic Sensors,
SG 6 - Terrestrial-Based RF Positioning Technologies

Traditional Conferences

- **International Symposium on Deformation Measurements**
- **International Course for Engineering Surveying**
- **Optical 3D Measurement Techniques**
- **FIG WW and Congresses**

International Conference on Current and Future Trends in Bridge Design, Construction and Maintenance

- **forum for not only bridge design and construction, but also for measurement of dynamic loaded structures**
- **application of the new geodetic technology (mainly for kinematic application)**
- **WG6.4 and SG4 participated with the joint session at the international conference organised by UK's Institution of Civil Engineers**

International Conference on Machine Control & Guidance

- **newest development and application in the field of machine guidance**
- **oriented more to guidance of construction and agricultural machines, large scale and outdoor application**
- **participation of the WG6.2 and WG6.5 members, coosponsored by C5**

International Conference on Indoor Positioning and Indoor Navigation (IPIN)

- **methodology of indoor navigation, possible technology based on WIFI, LAN, terrestrial RF sensors, GSM, etc.**
- **start the new series of conferences (next in 2011, Lisbon, Portugal)**
- **with co-operation of FIG C6, C5, IAG and other organisations**

New topics discussed

- **deformation monitoring, analysis and interpretation using continuum mechanics, monitoring and analysis of crustal deformations, deformation measurement using GNSS**
- **optimal use of InSAR technology, terrestrial-based RF positioning technologies**
- **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**

New topics discussed

- **terrestrial scanning of subsidence and landslides**
- **LiDAR and INSAR applications, remote sensing and data processing**
- **machine guidance and integrated systems**
- **quality, management and standards**
- **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**

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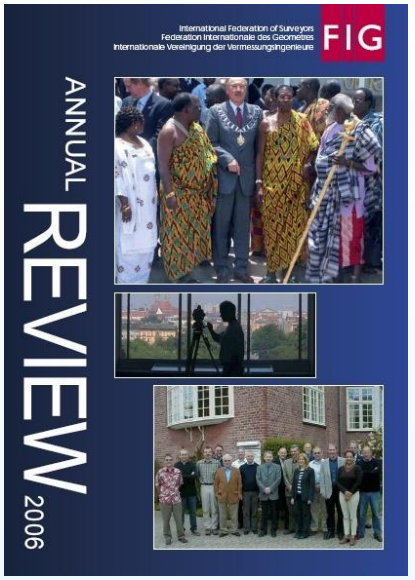
Information delivery

- **Annual Review**
- **monthly e-Newsletter**
- **commission newsletters**
- **publications**
- **congress and working week publications**
- **Surveyors Reference Library**
- **web site: www.fig.net**



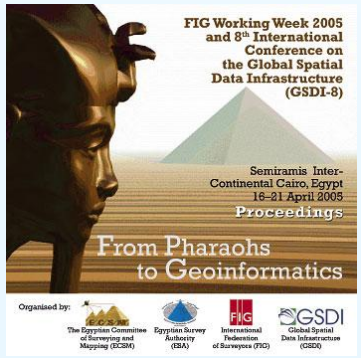


FIG Events

- **Working Week, Marrakech, Morocco, May 2011**
- **Working Week, Rome, Italy, 2012**
- **Working Week, Abuja, Nigeria, 2013**
- **XXV FIG Congress, Kuala Lumpur, Indonézia, 2014**

- **NIPI, Lisabon, Portugal, May 2011**
- **Deformation Measurement, Hong Kong, China, November 2011**
- **INGEO, Brijuni, Croatia, September 2011**
- **TLS Seminar, Fulda, Germany, December 2011**

Slovak University of Technology in Bratislava
Faculty of Civil Engineering
Department of Surveying
and
University of Zagreb
Faculty of Geodesy
Institute of Applied Geodesy

5th International Conference on Engineering Surveying

INGEO 2011

September, 22-24, 2011
Brijuni, Croatia

The 5th International Conference on Engineering Surveying INGEO 2011 held in September 22 - 24, 2011 in Island Brijuni in Croatia. The Event is organized in co-operaton of FIG Commission 6, Facutlty of Civil Engineering, Slovak University of Technology and the Faculty of Geodesy, University of Zagreb.

FIG Commission 6

Faculty of Civil Engineering
Slovak University of Technology

Faculty of Geodesy
University of Zagreb