



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

FIG Commission 5 Position and Measurement October 2012 e-Newsletter

Dear Colleague,

Welcome! It is now only a month away till the 8th FIG Regional Conference, "Surveying towards Sustainable Development" is to be held in Montevideo, Uruguay. I hope to see many familiar faces at this event. There is still time to register so please navigate to the conference website – <http://www.agrimensores.org.uy/8RegionalConference/> for more information. Also, the call for papers for the FIG Working Week 2013 in Abudja (Nigeria) is open. Please consider to participate and present.



I also hope you will enjoy reading this newsletter as it summarises the Commission's activities since the Rome WW.

Regards Mikael Lilje, (Mikael.Lilje@lm.se)
Chair of FIG Commission 5

FIG/IAG Special Issue in the Journal of Applied Geodesy

Guest Editors, Dr Allison Kealy (IAG Commission 4 and FIG Commission 5) and Dr Volker Schwieger (FIG Commission 5) are facilitating a special issue for the Journal of Applied Geodesy on the topic "Multi-sensor positioning and navigations systems". They are inviting papers that investigate new technologies and techniques for multi-sensor systems that deliver enhanced positioning and navigation capabilities. Papers that describe new integration architectures, algorithms and applications for multi-sensor systems are particularly encouraged.

Refer to Website: <http://www.degruyter.com/view/j/jag>

Topics of this Special Issue include, but are not limited to:
MEMS INS; Cooperative or collaborative positioning; Indoor positioning systems;
Mobile Mapping systems; Multi-GNSS positioning systems; Pedestrian navigation;
Land Mobile Applications; Kinematic positioning; GNSS Augmentations.

If you decide to contribute, please contact either Allison or Volker, and you may send your manuscript now or up until the deadline. Authors are also encouraged to send their tentative title and short abstract by e-mail for approval to Allison Kealy: akealy@unimelb.edu.au or Volker Schwieger: volker.schwieger@ingeo.uni-stuttgart.de . Please note, if you cannot meet the deadline but are still interested in making a submission, please feel free to contact us.

Please visit the Instructions for Authors before submitting a manuscript:
http://www.degruyter.com/view/supplement/s18629024_Instructions_for_Author_s_en.pdf .

Manuscripts should be submitted through the online manuscript submission and editorial system at <http://mc.manuscriptcentral.com/jageo>. Deadline for manuscript submissions: **10 December 2012**.

PPP-RTK & Open Standards Symposium

By Commission Vice Chair, Prof. Volker Schwieger, Germany

In Frankfurt am Main, Germany, the first PPP-RTK & Open Standards Symposium was held on 12-13 March 2012 followed by a hands-on-workshop on 14 March 2012. The whole symposium was well organized by BKG (Federal Agency for Cartography and Geodesy). Surprisingly it attracted more than 180 participants from more than 30 countries and from different industry sectors such as positioning developers, manufacturers to practitioners and academics. This shows that PPP is a hot topic for geodesists and surveyors all over the world. The number of participants and presentations from Asia were remarkable!

FG Commission 5 was represented by Vice-Chairs Dr. Neil Weston and Prof. Volker Schwieger, who gave a brief introduction to FIG Commission 5 and kinematic GNSS issues. Further openings were given by the chairs of GGOS (Global Geodetic Observing System), Hansjörg Kutterer, and IGS (International GNSS service), Urs Hugentobler.

On the first day the presentations dealt with RTCM standards, ionospheric issues, regional and local augmentations as well as detailed research activities with respect to phase biases and ambiguity resolutions. The second day was directed to tools, services and products. A variety of existing services as well as research activities to establish new services and solution strategies were shown and partly explained in detail.

The main topic of the symposium was the accuracy and convergence time of PPP in real time and the combination of PPP with elements of RTK to PPP-RTK solutions. Different approaches for modelling essential parameters as well as already working world-wide PPP services were presented. The presenters show a commensurate mixture of scientific and application-oriented contributions. For the workshop on the third day different possibilities were offered dealing with RTCM for PPP-RTK standards, RTKLIB usage and the BKG Ntrip client and caster.

The question, if real time PPP will make RTK networks obsolete, could not be answered completely at that moment. In any case the symposium has shown that this technology will touch the whole surveying community in the future.

All presentations are available on the webpage of the symposium <http://igs.bkg.bund.de/ntrip/symp#PresentationFiles> . Some photos of the PPP-RTK & Open Standards symposium –





Working Group 5.2 - Reference Frames Update

By Commission Vice Chair, Graeme Blick, New Zealand

Since the FIG working week meeting in Rome Working Group 5.2, Reference Frames continues to be busy in several areas. Nic Donnelly has provided a separate report detailing progress towards developing a geodetic data transfer standard and the incorporation of dynamic datums. Refer to the report below following this update.

In New Zealand we continue to work on developing a simple data format for publishing the deformation model which is part of our geodetic datum, NZGD2000. The data format consists of a set of CSV files within a zip archive. The distribution will include basic tools to calculate the model at any given time and place. Once this piece of work is completed we will describe our solution and make it available.

Prior to the Rome FIG meeting, Working Group 5 and the IAG sponsored a Technical Seminar on Reference Frames in Practice. A decision made was to develop a set of brief fact sheets on various aspects of reference frames. Together these will form a document on Reference Frames that can be used as a resource for future workshops on the topic and these will be made available to others interested in the topic. Work has commenced developing this resource.

Establishing a Common Data Exchange Format for Modelling Dynamic Datums

By Nic Donnelly, Land Information New Zealand (LINZ)

Efforts to establish a common exchange format for geodetic data are continuing through the activities of the Australia / New Zealand Permanent Committee on Geodesy (PCG).

One of the most significant challenges in developing a geodetic data transfer standard is how to incorporate dynamic datums. While the 2008 version of the ISO standard ISO19111 - Spatial Referencing by Coordinates includes reference to datums with a time component (dynamic datums), what this might mean in practice is still uncertain. The discussion below presents some ideas, but it is still an area of robust debate amongst those working on this issue.

The ISO standard defines two types of coordinate operations: conversions and transformations. A coordinate transformation changes coordinates from one datum to another. An example would be 7-parameter Helmert transformation between ITRF and GDA94 (the official datum for Australia). A coordinate conversion changes coordinates from one system to another based on the same datum. An example would be converting GDA94 geodetic coordinates to UTM projection coordinates. For dynamic datums, it may be useful to define a third type of coordinate operation: coordinate propagation. This would change coordinates from one epoch to another. This could be done using a variety of techniques including a velocity model, or an individual station prediction model.

Coordinate propagation can be considered a special case of coordinate conversion: coordinates are in terms of the same datum and coordinate reference system, but at different epochs. This would require the realization epoch for coordinates to be an integral part of the metadata associated with the datum. A dynamic datum might also define a reference epoch, the main purpose of which would be to provide a common epoch at which users could compare and integrate data.

A coordinate would also need a calculation epoch. This refers to the date at which the coordinate was calculated. For example additional survey information, or a new velocity model, may lead to recalculation of more accurate coordinates at the reference epoch. In this case the calculation epoch would change, but the coordinate realization epoch would not.

There are currently variances in opinion as to what the various dates actually mean, and this is where the use of common standards such as those produced by ISO is very useful.

Multi-GNSS Experiment (MGEX)

For update on this IGS initiative please refer to the presentation by Robert Weber given at the IGS Workshop, July 23-27 2012, Olstyn, Poland at the location -

<http://www.igs.org/assets/pdf/Poland%202012%20-%20P02%20Weber%20PR53.pdf>

For more information about MGEX navigate to link <http://www.igs.org/mgex/> .

NEW IGS Site Guidelines Proposed

The IGS Infrastructure Committee has conducted a detailed review of the IGS Site Guidelines, resulting in their first major revision since 2007. The revised document can be viewed at – <http://igs.org/network/guidelines/proposed.html>

IGS Workshop July 2012

The Department of Astronomy and Geodynamics of the University of Warmia and Mazury (UWM) hosted the 2012 IGS Workshop. This 5-day workshop was held at UWM in Olsztyn, Poland from July 23-27, and it consisted of plenary sessions with invited oral presentations, poster sessions and IGS Working Group splinter meetings.

The topics generally covered at this workshop were related to:

- Multi-GNSS environment
- Space vehicle orbit dynamics and attitude
- Ionosphere and troposphere – observations, modelling and issues
- Infrastructure, data / analysis and combination centres
- Biases and calibrations (including antenna)
- Real-time services and applications ; IGS Services
- Reference frames
- Tide gauge benchmark monitoring

Mr Larry Hothem, a long time representative and past Chair of FIG Commission 5, presented at this workshop on behalf of FIG. His presentation was titled – “What does FIG Surveyors expect in collaborative partnership with IGS”. A copy of this presentation can be found at -

<http://www.igs.org/presents/poland2012/assets/pdf/Poland%202012%20-%20P04%20Hothem%20PR62.pdf>

The link to the other IGS Workshop presentations is -

<http://www.igs.org/presents/poland2012/index.html>

The International GNSS Service (IGS), formerly the International GPS Service website is - <http://igs.cb.jpl.nasa.gov/>

3rd International Conference on Machine Control and Guidance

By Commission Vice Chair, Prof. Volker Schwieger, Germany

The 3rd International Conference on Machine Control and Guidance (MCG 2012) was held in Stuttgart, Germany on 27th to 29th March 2012. The conference was co-organized by the Institute of Engineering Geodesy (University of Stuttgart) and the Institute of Agricultural Engineering (University of Hohenheim).

A total of 103 participants, Engineers, Scientists and Practitioners from the fields of Agriculture, Construction, Geodesy, Informatics and Electronics, and others, were welcomed. One quarter of the participants came from abroad, 13 countries from four continents were represented. And with more than 30 % of the

participants coming from the practical side, the conference was a good combination of practical subjects combined with talks on current research.

FIG Commission 5 was well represented by its Chair Mikael Lilje, who gave an introduction by presenting FIG to this interdisciplinary audience. In the opening session, he and the rector of the University of Stuttgart, Prof. Ressel, as well as the co-chairmen of the conference Prof. Böttinger (Hohenheim) and Prof. Volker Schwieger (Stuttgart) welcomed the participants. Volker is also the Vice Chair of the Commission 5 working group 5.4 "Kinematic Measurements". Furthermore the conference was supported by FIG Commission 6 Working Group 6.3 "Machine Guidance and Control" and by numerous other organizations like the European Society of Agricultural Engineers.

A total 33 papers were accepted, 30% passed the peer review process. The conference papers were included in sessions about the topics -

- Global Navigation Satellite Systems I + II
- Kinematic Measurements
- Sensor Integration I + II
- Data Management and Communication
- Control Algorithms
- Agriculture
- Construction I – III

The content of the lectures ranged from scientific contributions e.g. regarding the development of new control algorithms to best-practise reports of construction companies as well as presentation about teaching possibilities in the field of machine control. The presentations and the proceedings are available via the webpage of the symposium <http://www.uni-stuttgart.de/ingeo/mcg2012/> .

Several social events, such as dinner and music, a visit of the new public library or the Stuttgart 21 Exhibition at the main station tower gave the opportunity to get to know the city of Stuttgart and gave room for informal discussions between the participants. Ms Bimin Zheng from the Institute of Engineering Geodesy did a fabulous job as conference manager.

The conference is held every two years at different places. The next conference will be held in 2014 and co-organized by the Institute of Mobile Machines and Commercial Vehicles, the Institute for Geodesy and Photogrammetry and the Institute of Flight Guidance at the Technical University Braunschweig, Germany.

Some photos of the Machine Control and Guidance conference.





GNSS, the Speed of Light and Neutrinos

By Commission Vice Chair, Dr David Martin, France

One of the hot topics at the recent International Workshop on Accelerator Alignment held at FERMI Lab in Chicago (IWAA2012 <http://conferences.fnal.gov/iwaa/indico.html>) centred on the remarkable results published in 2011 concerning superluminal (faster than light) neutrinos. Neutrinos are electrically neutral, nearly massless subatomic particles. The significance of this observation put Einstein's theory of special relativity into doubt. The neutrinos were to have travelled roughly 60 ns faster than expected between CERN in Geneva Switzerland and the Gran Sasso laboratory 731 km away in Italy. Special relativity requires that nothing can travel faster than light.

In February 2012, the scientific collaboration OPERA that published these results announced two possible sources of error that could have significantly influenced the results: a link from a GPS receiver to the OPERA master clock was loose; and, a clock on an electronic board ticked faster than its expected 10 MHz frequency. The superluminal neutrinos were so important in the physics world that significant efforts have been made to refute and/or corroborate them.

There are two parameters required to measure velocity: distance and time. Both the distance and the time used in these experiments are determined using GNSS (GPS) signals. Centimetre distances and nanometre times are necessary to verify the speed of light over the 731 km (travel time 2.434 msec) separating the two

laboratories. Note that light travels 30 cm in 1 ns! The problem is further complicated by the fact that both laboratories are located underground and so must be connected to the surface in time and in space where the GPS signals are received.

Today several groups have shown to the 6σ level of significance (i.e. 3.4 parts per million) that indeed neutrinos do not travel faster than the speed of light. These results put Einstein's theory of special relativity out of doubt.

Several other topics related to the high precision world of accelerator alignment were discussed over the 4 day conference. Those interested in this field are referred to the IWAA2012 website (see above) or the IWAA document repository (<http://www-conf.slac.stanford.edu/iwaa/>).

Upcoming events:

- **Seventh Meeting of the International Committee on Global Navigation Satellite Systems** (ICG) hosted by the Government of People's Republic of China. Beijing, 5th November – 9th November, 2012. <http://uujoin.com/index.php?p=General%20Information>
- 26-29 November, Montevideo, Uruguay. **8th FIG Regional Conference**. Organised by Asociación de Agrimensores del Uruguay AAU and FIG. Web site: www.fig.net/uruguay
- 9-10 December 2012, **4th Asia Oceania Regional Workshop on GNSS** will be held in Kuala Lumpur, Malaysia. Jointly organized by Malaysian National Space Agency (ANGKASA), Japan Aerospace Exploration Agency (JAXA), and Satellite Positioning Research and Application Center (SPAC) of Japan. Web site : <http://www.multignss.asia/workshop.html> .
- 22-25 April 2013, Honolulu, Hawaii. **Pacific PNT** organised by ION. To be held at the Marriott Waikiki Beach Resort & Spa. Call for an abstract is now out. Web site: <http://www.ion.org/meetings/pnt2013/pnt2013cfa.cfm>
- 6-10 May, Abuja, Nigeria. Environment for Sustainability. **FIG Working Week and General Assembly**. Web site: <http://www.fig.net/fig2013>

How to Participate in Our Commission

Commission 5 Chairs of the working groups are continually developing the membership for their working groups. There is still opportunity for you to join any of the working or joint working groups. If you are interested then there are two levels in which you could actively contribute and they are –

- The first level of participation is as a “core member” of a working group contributing directly to discussions, publications, meetings, and facilitates technical sessions, etc.
- The second level of participation is as part of a “reference group” to review publications, technical papers, provide feedback on issues and general assistance, etc.

People interested in being involved in one of the working groups should contact the Chair of the relevant Working Group and send a copy to our Vice Chair for Administration, Rob Sarib (Australia) email: robert.sarib@nt.gov.au .

All responses should indicate the desired level of participation, either as a "core member" or as part of a "reference group" and also include a one or two paragraph biography of your professional career to date.

There is also another way to assist Commission 5 with their work and that is to become a National Delegate to Commission 5. Please note, we recommend that before you consider this option you will need to check with your FIG member association whether they already have a National Delegate for Commission 5 and if it has been officially listed on our website, location <http://www.fig.net/comm/natdel5.htm> .

Briefly, the role of a National Commission Delegate is to -

- establish networks within their countries to communicate information and obtain feedback for the Commission,
- be actively involved in commission activities, including responding to questionnaires or correspondence and identifying topics and authors of papers for Commission symposia and FIG congresses,
- seek and encourage funding support to attend FIG activities, including commission meetings, and
- write at least one annual report for publication in a local newsletter or technical journal or for dissemination by some other means to individual members of their member association or organisation.

If you wish to be a National Delegate for Commission 5 your FIG member association must formally submit in writing to the FIG Office the name, professional title, address, telephone and fax numbers and email address of the nominated person.

Commission 5 looks forward to your response and please do hesitate to ask any questions or if you have any further queries.

FIG Commission 5 e-Newsletter

If you would like to circulate Commission 5 NEWS to all our members please email your item for consideration to the

- Vice Chair Administration – Rob Sarib robert.sarib@nt.gov.au or
- Chair of Commission 5 - Mikael Lilje Mikael.Lilje@lm.se