ISPRS Technical Commission I 2011 Progress Report

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Presedincey Activities

Commission I President, Vice President, and Secretary have accomplished the following activities in 2011:

1. Commission I Website:

Commission I website has been continuously updated with new activities by the WGs ,
See: http://www.commission1.isprs.org. The website includes pointers to the following:

- Commission I General Plan of Activities
- Commission I Working Groups
- Commission I Events
- Commission I Annual Report
- ISPRS highlights, Events, and calendar

2. Participation to ISPRS meetings:

- Dr. Naser El-Sheimy chaired the scientific committee of The 6th National GIS Symposium in Saudi Arabia, Dammam, April 24 – 26, 2011.
- TCI co-organize The 6th National GIS Symposium in Saudi Arabia, Dammam, April 24 – 26, 2011. During which the president of ISPRS (Prof Orhan Altan) and two TCPs presented keynotes.

- Dr. Naser El-Sheimy offered a Tutorial on "Land Based Mobile Mapping -State of the Art and Future Trends". 7thINTERNATIONAL SYMPOSIUM ON MOBILE MAPPING TECHNOLOGY, MMT'2011, Cracow, Poland, June 13 - 16, 2011.
- Dr. Naser El-Sheimy offered a Keynote address on “MEMS sensors for Mobile Mapping Applications”, 7th INTERNATIONAL SYMPOSIUM ON MOBILE MAPPING TECHNOLOGY, MMT’2011, Krakow, Poland, June 13 – 17, 2011.
- Dr. Naser El-Sheimy was selected as a Panelist – Inside GNSS Webinar on Hybrid Positioning & Technologies for Mobile Users, June 9, 2011 (attendant by over 700 expert in the field of GNSS, Navigation, and mobile devices)
- 2011: Keynote Speech, “MEMS for GIS Applications”, The 6th National GIS Symposium in Saudi Arabia, April 24 -26, Le Meridian, Eastern Province, Saudi Arabia

3. Working Group Activities and Websites

- Most of the working groups have been active and some have been very active in 2011. Each Working Group detailed activities have been listed individually in the next section.
- All Commission I Working Groups website are continuously updated – thanks to Dr. Steve Liang for his tremendous support for all the working groups
- Each Working Group website is listed in the dedicated section of each Working Group

4. Commission I Activity: The 7th International Symposium on Mobile Mapping Technology

The 7th International Symposium on "Mobile Mapping Technology" was held from June 13 to 16, 2011 at the Sheraton Hotel, Cracow, Poland. It was organized by the Association of Polish Surveyors and Polish Society for Photogrammetry and Remote Sensing with significant commitment of representatives of leading Polish technical universities in the field of photogrammetry: Faculty of Geodesy and Cartography, Warsaw University of Technology and Faculty of Mining Surveying and Environmental Engineering, AGH University of Science and Technology, people from Main Board of Association of Polish Surveyors from Warsaw and Cracow and representatives from private companies – WPG, Esri, OPGK Kraków. Symposium was held under the auspices of international organizations such as: ISPRS, FIG, ION, IAG. Other institutions such as Polish Head Office of Geodesy and Cartography and Committee of Geodesy Polish Academy of Science also became the patron of this event.

The program attracted 150 attendees from over 30 countries – eg. USA, Canada, Australia, Poland, France, Austria, Italy, Greece , Germany, Hungary, South Korea, Netherlands, Ireland, Taiwan, China, Iran, Japan, Korea, Malaysia, Sweden etc. 41 oral presentations, 27 posters; total 68 papers; 45 will be peer-reviewed; all papers in English.

MMS presented at the Symposium: Geodis (Czech Republic), Gispro (Poland, land and aerial platforms), Riegl (Austria/Poland), Czerski (Poland) and Cyclomedia (Netherlands/Poland).

Peer-reviewed papers will be published (in English) in the 'Archives of Photogrammetry, Cartography and Remote Sensing' – annually published by Polish Societies of Geo-information, including Polish Society for Photogrammetry and Remote Sensing.

WG I/1 Standardization of Airborne Platform Interface

Working Group Officers

- Chair: Andrew Roberts, Northrup Grumman Corporation, USA
- Co-Chair: Jean-Louis Brenquier, EUFAR, France
- Secretary: James Huning, SAIC, USA

Terms of Reference

- TOR 1: Coordinate a forum for discussion between the international airborne science communities (Randal Albertson).
- TOR 2, 3, 11: Develop airborne sensor interface format standards in coordination with other working groups to promote maximum sensor portability between aircraft increasing science yield from the sensors. Develop airborne satellite data relay systems use for science research programs between aircraft and ground. Develop airborne data processing standards to facilitate instrument inter-calibration and normalize international data exchange (Lawrence Freudinger).
- TOR 4: Develop an airborne science literature search to identify peer reviewed published papers and citations and make in available in a data base. These will be peer-reviewed articles only. (Jean-Louis Brenguier).
- TOR 5: Temporarily Disbanded. Support the regulatory agencies in supporting airborne science sensor certification and approval requirements for LIDAR, drop-sondes and electromagnetic spectrum emissions.
- TOR 6: Maintain an inventory of the international airborne science capabilities and report annually (Jean-Louis Brenguier).
- TOR 7: Develop a forum to discuss transnational access system(s) for airborne users (Jean-Louis Brenguier).
- TOR 8: Temporarily Disbanded. Support the use of Unmanned Aerial System (UAS) vehicle activity for science observations in civil and restricted airspace on an international basis and engage the International Civil Aviation Organization. This TOR is temporarily disbanded because of the large number of organizations who are involved in UAS operations. The TOR lead is also involved in UAS regulatory issues at NASA and FAA (Brenda Mulac).
- TOR 9: Promote the education and outreach on an international basis of airborne based science activity (Catherine Lockwood).
- TOR 10: Develop a forum to coordinate expert workshops in airborne science sensor categories (Bruce Doddridge).
- **See WG I/1 Appendix 1 for updated Progress Reports**

Mission

The primary mission of Working Group I/1 seeks to promote the standardization of instrument interfaces, data formats, and aircraft accommodations, to facilitate more efficient, flexible, and cost-effective international science flight operations.

The increased portability of instrumentation between aircraft increases the opportunities for cooperative research and can reduce the operating costs by leveraging flight opportunities. WGI/1 also will work to establish common regulatory requirements for the operation of active emitters (RF. Lidars, drop-sondes) and to effectively introduce UAS operations in international science campaigns.

Executive summary

We anticipate a representative(s) of all active Terms of References (TOR) of Working Group I/1 to participate in the XXII Congress at Melbourne, Australia in 2012. Objectives and activities of the various TORs are noted below.

The WG has now completed 2 years of activity with good progress overall in building international bridges for the airborne science communities. We have expanded/combined some of the standards or guidance which is used in the different agencies who operate airborne science programs. The WG/TOR's has participated in over 10 international meetings and conferences during this period. Our most recent meeting was in April. The meeting of the Working Group in Sydney included Dr. Chen Jun, the ISPRS general secretary, where he gave a good presentation on the ISPRS Congress meeting in Melbourne next year. As a result of this meeting at the ISRSE 34 conference - three of our TOR's were combined into one TOR, and three of the 11 TOR's were determined not to be effective and will not be reporting out in 2012 at the ISPRS congress. Some good discussions regarding the direction of the WG were conducted as well as each of the TORs reporting on their activities and future plans. Over the next year we intend to work to have the TOR's prepare their reports on the results of what was accomplished during the three years of this working group.

WG1/1 Meetings

A number of Working Group 1 members were able to attend the ISRSE 34 meeting in Sydney and as part of the conference a special session was devoted the working group. While the meeting was open to all, the conference program implied, though did not specify, that the meeting was for the working group members. The meeting did capture a number of guests, including Dr. Chen Jun, the ISPRS General Secretary.

The ISRSE 34 conference also gave working group members the opportunity to meet and discuss opportunities and constraints with colleagues from the remote sensing community, albeit the majority of them were satellite based. Airborne is a specialized area and making the connection between satellite based research and its coupling to airborne remains problematic. Progress, while slow, is being made. It was particularly positive that the best paper at ISRSE 34 was not a satellite based paper but rather an airborne paper, authored and presented by Dr. Jorg Hacker of Flinders University, Australia, and a member of our ISPRS working group.

There are two major airborne science platform organizations, the European Facility for Airborne Research (EUFAR) and the Interagency Coordinating Committee for Airborne Geoscience Research and Applications (ICCAGRA). The former is European Union based and the later US government agencies. The intent of our working group is to broaden participation by encouraging organizations from Australia, China, South America, Canada, and others, to join. Because of the lack of coordination with these other organizations there are many lost opportunities to the science community. The barriers are physical, regulatory, procedural and, to a degree, political. The Working Group recognizes that there is a need for an international forum to address these barriers.

At the special session, we had update presentations by several TOR leads or members. Andrew Roberts, Working Group I Chairman, gave an overview presentation of the Working Group Charter, Standardization of Airborne Platform Interface. Some TORs have made major progress, such as TOR 10, while others have not. At a leadership dinner meeting (see photograph at end of summary) it was voted that TORs 2, 3, and 11 would be combined (this was discussed at an earlier date, but now made formal) and that TOR 5 would be disbanded for now. TOR 5 dealt with regulatory agencies and it was considered inappropriate, at this time, for our working group to be involved in regulatory matters. TOR 8, UAS coordination, would also be disbanded. There are many other organizations involved in UAS activities and it was decided that the working group did not add significantly to the effort.

We are beginning to focus our attention on the upcoming XXII Congress in Melbourne, Australia, 25 August – 1 September 2012. At the Congress we will propose that our working group continue although the number of TORs will be reduced and the objectives of the remaining TORs may be modified.
One exciting proposal is to have another ICARE (International Conference on Airborne Research for the Environment) type aircraft exhibition, but this time in North America. This would follow the very successful ICARE held in Toulouse, France, in October 2010.

The members also suggest that airborne sessions be planned at annual meetings of the American Meteorological Society, American Geophysical Union, and European Geophysical Union. This will increase the visibility of airborne and it is hoped lead to more collaboration with the satellite community.
Another task that has been suggested is to submit a paper to Bulletin of American Meteorological Society or the Journal of Remote Sensing on the ICARE2010 conference and the ISPRS Working Group I activities.

The officers and many of the TOR leads at the dinner meeting in Sydney. Special guests include Dr. Chen Jun, ISPRS Secretary and Jorg Hacker, a member of WG I/1 and also the recipient of the best oral paper at the ISRSE34 conference.

Future Planned Activities

- Chair, Co-Chair, Secretary and TOR 1, 7, and 10 begin planning for next ICARE type conference
- TOR leads and members consider planning airborne sessions at AGU, EGU and AMS annual meetings
- WG I/1 Secretary, in coordination with Chair, Co-chair and TOR members, prepare draft paper on Working Group for submission to (TBD) professional journal. A final report for ISPRS will also have to be prepared by the officers.
- Randal Albertson will work with other agencies on data base for TOR 4.
- Jason Tomlinson will work on inventory of airborne facilities for TOR 6.
- Catherine Lockwood will continue collaboration with Ils Reusen and put a priority on legacy of educational activities in TOR 9.
- Bruce Doddridge will continue to experiment with Facebook for TOR 10.
- All TORs should begin planning for reports and recommendations at the XXII Congress of ISPRS, 25 August-1 September 2012, Melbourne, Australia
- Advocate to have a plenary airborne oral presentation in Melbourne as well as a booth
- Several members of ICCAGRA met to discuss coordination with EUFAR, transnational access and involvement with ISPRS XXII Congress.
- Most all TORs will be represented at the XXII Congress and the Chair or Co-Chair of each has submitted an abstract for paper/poster presentation at the XXII Congress.

Working Group Officers contact information:

- Chair: Andrew Roberts, Northrup Grumman Corporation, USA a.roberts@ngc.com
- Co-chair: Jean-Louis Brenguier, EUFAR, bureau@eufar.net
- Secretary: James Huning, SAIC, USA, jimhuning@gmail.com
- Web Master: Steve Wegener, NASA, USA, steven.s.wegener@nasa.gov

State of Science and Technology

The primary mission of Working Group I/1 seeks to promote the standardization of instrument interfaces, data formats, and aircraft accommodations, to facilitate more efficient, flexible, and cost-effective international science flight operations.

The focus of Earth science is to develop a scientific understanding of Earth's system and its response to natural or human-induced changes, and to improve prediction of climate, weather, and natural hazards. Airborne Earth Science investigations continue to answer key questions regarding the composition and evolution of atmospheric and terrestal environments bridging the gap between space based and ground measurements. Airborne investigations answer questions about how environmental process function and help validate satellite observations.

WGl-1 is not focused on developing new technologies, but more on improving the productivity of airborne investigations, through facilitating collaborations and standards, which enable broader participation and enhanced utilization of resources.

WG I/1 Appendix 1

TOR 1: Coordinate a forum for discussion between the international airborne science communities (Randal Albertson). No update

TOR 2, 3, 11: Develop standards for instrument integration, data distribution and data processing associated with airborne science operations. Updated 3rd January 2012

Executive Summary:

The ISPRS WG1/I TOR2311 is formed from a merger of three former subgroups - TORs 2, 3, and 11 - and is tasked with developing standards in instrument integration, data distribution and data processing associated with airborne science operations. To address these issues, this TOR is divided into three separate, but integrated, subgroups: payload networks, data links and processing tools. The payload networks subgroup focuses on creating a standard aircraft network and hardware environment, to facilitate integration of instruments, reduce timing and spatial errors, and provide real-time situational awareness to instruments and scientists. The data links subgroup aims to develop recommendations to implement real-time situational awareness for those outside the aircraft, for example, between other aircraft, ground-based decision makers or end users. In addition, the data links subgroup will develop recommendations for remote instrument access and control via satellite link. Finally, the processing tools subgroup is developing a common data-processing toolbox alongside recommendations for data and metadata formats to enable data to be easily exchanged and inter-compared between institutions and operators.

Action Plan:

Progress to date:

Significant activities:

The year following the merger of TORs 2, 3 and 11 was an active year for TOR2311. The payload network group compiled a list of existing standards for documenting platform error propagation, and disseminated existing payload network standards to the US and European airborne communities. The data links and processing tools subgroups installed and demonstrated a real-time data distribution, cataloguing and display system to participants of ICARE2010 in Toulouse, France. The processing tools subgroup created an open-source Python-based data processing toolbox, and integration of algorithms has begun. A comparison of metadata keywords has been completed to identify similarities and overlap between vocabularies and explore the feasibility of creating a metadata translator. Finally, a standard was recommended data formats, and a common metadata convention was developed.

Conferences/meetings attended:

- ICARE 2010, Toulouse, October 2010
- TOR2, 3, 11 Telecon, February 2011
- 34th ISRSE Conference, Melbourne, April 2011
- IWGADTS meeting, Boulder, April 2011

Plans from now to 2012 meeting in Melbourne:

Significant activities:

In the year to come, we aim to undertake a survey on the current use of data links and take an inventory of the payload network architecture status to serve as a basis for further recommendations. The data link subgroup will develop and disseminate recommendations and best practices on implementation of a data link system. The framework data processing toolbox will be completed and algorithms will continue to be incorporated into the library. An online metadata creator based on the INSPIRE standard will be implemented.

Meetings/conferences, publications planned:
Possible TOR11/EUFAR N6SP meeting, Winter 2011-2012
ISPRS Congress, 2012, Melbourne

TOR 4 "Develop an airborne science literature search to identify peer-reviewed published papers and citations and make the results available in a data base". No update

Team Members:

- Gailynne Bouret (BAER Institute, USA; gailynne.a.bouret@nasa.gov)
- Phil Brown (Met Office, UK; phil.brown@metoffice.gov.uk)
- Jorge Andres Diaz (Univ Costa Rica; jorge.andres.diaz@gmail.com)

Expected Benefits:
A database of peer-reviewed scientific airborne research data will be of benefit to scientists working in the subject and wishing to review previous work (the usual first stage of any project). In addition program managers and others concerned with the funding and management of airborne research facilities will have valuable data to support their activities by demonstrating the major impact of their work.

Implementation Plan:
Both NSERC and EUFAR already have their own limited databases. Extracts from these should be merged (in an Excel spreadsheet) to provide a foundation on which others should be encouraged to build.

Deliverables:
TOR4 has accomplished the following tasks:

- Initial Meeting - ISRSE 33 / Stresa, Italy.
- Define the key database fields
- Investigate the use of search software such as Scopus
- Abstract presented at ISPRS Commission I meeting. Calgary, Canada
- Investigate the possibilities for checking citations
- NSERC and EUFAR separately to prepare Excel spreadsheets
- Develop prototype database
- Publish first database results - ISRSE 34 / Sydney. Australia

Work Performed
Work during the last year has concentrated in merging the two spreadsheets in to a single database which was presented at ISRSE 34 in Sydney, Australia last April, 2011. (DEVELOPMENT OF AN OPEN DATABASE OF PEER-REVIEWED LITERATURE ON AIRBORNE SCIENCE. Several technical challenges have been raised in this initial database that needs to be corrected before making it available to the scientific community. It is recommended the help of a professional librarian for the final version.

Future Plans:
TOR4 is expecting to accomplish the following tasks in the next 12 month:

- Transition prototype database to open access software and secure server location.
- Resolve technical issues with professional librarian help and software engineer.

- Conduct new literature searches to update database and update NSERC and EUFAR data with information from localized NSF, NASA, NOAA and other databases
- Release Beta version of database to WG1/I for feedback
- Present TOR 4 advances at ISPRS XXII meeting in Melbourne, Australia 2012
- Release open public database version

TOR 5: Disbanded.

TOR 6: Maintain an inventory of the international airborne science capabilities and report annually (Jean-Louis Brenguier). No update

TOR 7: Develop a forum to discuss transnational access system(s) for airborne users (Jean-Louis Brenguier, James Huning).

Several meetings have taken place with US government agency representatives to discuss how to improve our collaboration with each other and with the international community. Issue of State aircraft designation, security and asset sharing are in discussion.

TOR 8: Disbanded.

TOR 9: Promote the education and outreach on an international basis of airborne-based science activity (Catherine Lockwood, Ils Reusen). Updated 9th January 2012

Accomplishments:

- Compilation of inventory of Airborne Science programs and training courses.
- Distribution of education/promo outreach materials (brochures, fact sheets; links on ISPRS WG I/1 website)
- Education and Outreach in Airborne Science session for ISRSE34, Sydney, Australia April 2011
- Three (3) EUFAR training courses (including theory, hands-on, flight)
    - ADDRESSS (Hyperspectral remote sensing and LIDAR), 19-26 August 2010, Lake Balaton, Hungary
    - TETRAD (Turbulence research), 10-18 September, 2010 Hyères, France
    - QAD (Quality of Airborne Data), 26 October- 5 November 2010, Toulouse, France
- NASA Airborne Science Program (ASP) education activities Student Airborne Research Program (SARP), June-July 2010, United States
    - 29 students from 28 different universities in 20 states

Major meetings

- AGU, San Francisco, California, USA, December 2010
    - Presentation: NASA SARP 2009 campaign
    - Poster: Geospatial Education: Working with the NASA Airborne Science Program
- ISPRS, Toulouse, France, February 2011
- ISRSE34, Sydney, Australia April 2011
    - Presentations: Airborne Science Program's Student Airborne Research Program,
    - Developing Multiple Components of an Environmental Education Model for an Airborne Science Program,
    - AmericaView's Remote Sensing Education Mission
    - Poster Presentation: WETMAAP ties Airborne Science to Geospatial Education

Planned future activities:

- Fall 2011/Spring 2012: Workshops on Airborne Science and use of airborne platforms and sensor data for the Deepwater Horizon Oil Spill.
- Summer 2012: NASA's Student Airborne Science Program (SARP)
- EUFAR on-board training opportunités to advance airborne research

TOR 10: The TOR10 subgroup charge is "…to develop a forum to coordinate expert international workshops in categories of airborne science sensors for both remote sensing and in situ systems." No Update

Executive Summary

We hope to energize a sustainable core group of scientists forming a vibrant community of practice around a set of topical, important and non-duplicative science questions, issues and outstanding measurement needs to coordinate a series of expert international workshops on airborne science sensors, and facilitate such interactions through professional and social networking media to

- Identify topical area(s) of expertise for a future international open workshop that does not duplicate efforts elsewhere, and
- Develop and promote a sustainable and user-friendly process by which international workshops can be identified, formulated and implemented

Action Plan from start of TOR to 2012 Congress, to include:

Incremental progress in the 12 months since last report (August 6, 2011)

Due to schedule conflicts TOR 10 did not report out at the International Conference on Airborne Research for the Environment (ICARE) meeting held in Toulouse, France on 25-30 October 2010.

The TOR 10 members have been working during the past year in refining our target concepts and implementing our approach: using social media as an outreach and advocacy tool. More specifically, we have worked toward implementing a working dissemination vehicle using Internet web links and/or an automatic Wiki-type alert system for announcing items of interest to the community of practice and/or future workshops of wide interest.

The TOR 10 vision is based upon the following: that airborne measurements complement and augment in situ space-based and observations, and are key in the scientific data and discovery. We are at a time when the scientific and societal need for a robust international capability in aircraft research and surveillance has never been greater. In developing a community of practice the TOR 10 team is working to:

- Promote the scientific and societal importance airborne science
- Publish a form of on line Blog to inform the community of activities
- Provide an open and interactive global virtual forum to discuss emerging technology, instrument concepts, measurement strategies, planned and ongoing airborne missions

On March 20, 2011 a Facebook (www.facebook.com) page entitled "Working group on advancing airborne science sensors (ISPRS)" was established by the TOR 10 working group and went live at URL: http://www.facebook.com/#!/pages/Working-group-on-advancing-airborne-science-sensors-ISPRS/198240340198806 .

Targeted e-mails were sent over the following couple of weeks to a number of key contacts with a request to further disseminate the existence of the site to their communities, with a view to engaging as wide a an international community of practice as possible with interest in developing in situ and remote sensors for airborne science. Groups contacted included: WG1 members in other TORs, US

Federal agency representatives, US federally funded research and development center leaders, and several key community working group leads.

The TOR 10 "social media experiment in airborne science" was unveiled to the general public at the 34th International Symposium on Remote Sensing of Environment (ISRSE) meeting held in Sydney, Australia April 10-15, 2011. A presentation detailing the vision, implementation and results of the TOR 10 working group were presented, highlighted by the public showcasing of the Facebook site.

The TOR 10 Facebook site is administered and moderated by the TOR 10 working group, with a commitment to balancing openness against proper standards of professional behaviour and interaction, and also being very mindful not to allow dissemination of any prohibited or improper content or material. The site contains postings on community events of potential interest to the membership, posted by the site moderators, including announcements of international meetings and airborne field campaigns. We hope that as the site catches on members will also initiate similar posts themselves, although this has been slower in coming than we expected.

As of this time, the TOR 10 Facebook site has 28 active members from 6 countries. New members have been slow in coming but the membership is rising with time, albeit slower than we had hoped. This year the TOR 10 group will be exploring creative and innovative ways to boost the membership of this site to a level we feel will foster regular and vibrant exchange.

Plans from now to 2012 meeting in Melbourne

Now that the TOR 10 has initiated the Facebook site we will work on optimizing the site to meet information needs of the target community of practice and also attract new membership.

To do this we will work on innovative ways to do the following:

- Inform appropriate scientists of the existence of the Facebook page
    - A major challenge will be how to target community scientists, engineers and technologists broadly through the international community in order to advertise the TOR 10 Facebook site and encourage participation. Clearly offering benefit value of membership for the individual is a key factor with respect to attractiveness.
- Encourage opinions from members on what topics (for discussion, or as a final goal, a future community workshop) are thought to be the most important and their interests, needs and priorities
    - Some initial thoughts on general topics include:
        - Testing state-of-art technologies and instruments – discuss the role of aircraft in testing state-of-the-art technologies and instruments.
        - Unique measurements types – provide examples of measurements best suited for aircraft
        - Satellite validation – show/discuss examples on satellite validation
        - Bridge data gaps – discuss how aircraft can be used to bridge the gap between satellite missions
        - Model Validation – show/discuss some examples on validation of Earth system science models
        - Future platforms – how should future aircraft platforms look? What are the future needs of aircraft platforms?
    - And some additional thoughts on disciplinary science topics:
        - Extreme environments (volcanic plume, pyroCu, etc.)
        - Vertical profiling of the atmosphere - aerosols/cloud studies
        - Satellite validation & ground truthing

- Explore through Facebook discussion an opportunity for a moderated “round table” or “town hall” discussion at the upcoming ISPRS conference in Melbourne, Australia
    - If we get some “traction” here a special ad hoc session at the 2012 XXII ISPRS Congress in Melbourne could easily be organized that would be a fitting success metric for the Facebook experiment.

The TOR 10 working group plans to report out on progress and results at the XXII *ISPRS* Congress to be held 25 August–1 September 2012 in *Melbourne*, *Australia*.

Web links supporting your TOR

http://www.facebook.com/#!/pages/Working-group-on-advancing-airborne-science-sensors-ISPRS/198240340198806

List of TOR 10 members (Alphabetical):

- Phil Brown (Met Office, UK; phil.brown@metoffice.gov.uk)
- Bruce Doddridge (NASA Langley, USA; bruce.g.doddridge@nasa.gov) Chair
- Charles Gatebe (USRA and NASA GSFC, USA; charles.k.gatebe@nasa.gov)
- Manfred Wendisch (Uni Leipzig, Germany; m.wendisch@uni-leipzig.de) Co-Chair

WG I/2 - LIDAR, SAR and Optical Sensors for Airborne and Spaceborne Platforms

Working Group Webpage:

http://www.commission1.isprs.org/wg2/

Working Group Officers

- Chair: Dr. Boris Jutzi, Institute of Photogrammetry and Remote Sensing, Universität Karlsruhe
- Co-Chair: Dr. Charles Toth, Center for Mapping, The Ohio State University
- Co-Chair: Dr. Franz Meyer, Geophysical Institute, University of Alaska Fairbanks
- Secretary: Dr. Naci Yastikli, Department of Geodetic and Photogrammetric,Yildiz Technical University

Terms of Reference

- Evaluation and assessment of systems for processing and integrating SAR, LIDAR and optical data
- Address challenges in low-frequency spaceborne SAR system design and data processing
- Address challenges and applications of high-resolution spaceborne SAR systems (e.g. TerraSAR-X, Cosmo Skymed)
- Evaluation of Systemsfor generation DEMs (Resolution I.3)
- Evaluation of Multi-frequency SAR, polarimetric InSAR systems
- Evaluation of Multi-pulse and full-waveform LiDAR
- Evaluation of Range imaging with array sensor systems
- Data quality and performance validation of SAR, LIDAR and optical systems
- Liaison with external groups such as CEOS, IGARSS and EuroSDR

Mission

Active sensor-based SAR and LiDAR technology, introduced in the late 90s, has received wide acceptance in airborne surveying as a leading tool for obtaining high-quality surface data in an unprecedentedly short turnaround time. The adoption of the new technology was fairly smooth and quick, primarily due to the high-level of automation of the data processing. LiDAR systems nowadays do range measurement with an increasing number of points per surface, count multiple returns per single shot, deliver reflectance values of the illuminated surface and capture the full waveform of the backscattered laser light. The role and capabilities of Interferometric SAR

(InSAR or IFSAR) continue to expand, particularly with respect to wide area DEM creation. Areas of significant technical interest and application include Polarimetric InSAR and Differential InSAR with respect to quite different but important applications. Fusion of high resolution SAR images with optical is again of interest as new techniques are applied.

Working Group Workshops 2011

- WG I/2 was Co-Organizing Working Group of the ISPRS Workshop High-Resolution Earth Imaging for Geospatial Information 2011 which took place from 14-17 June 2011 in Hanover, Germany. It is a Joint Workshop organised by ISPRS WG I/4, III/4, IV/2, VII/2 and supported by ISPRS WG I/2, I/5, IV/3 and EuroSDR.
- WG I/2 was Co-Organizing Working Group of the 7th International Symposium on Mobile Mapping Technology, 13-16 June 2011, Cracow, Poland.
- WG I/2 is Co-Organizing Working Group of the ISPRS Workshop Laserscanning 2011 which will take place from 29-31 August 2011 in Calgary, Canada. It is a Joint Workshop organised by ISPRS WG V/3, WG I/3 and co-organised by WG I/2, WG III/2, WG III/4, WG VII/7, ICWG V/I. The papers have undergone a double blind review process performed by the members of the scientific committee. The double blind review process was supported by the WG I/2 officers Boris JUTZI and Charles TOTH.
- WG I/2 will be Co-Organizing Working Group of the ISPRS Workshop Photogrammetric Image Analysis PIA11 in conjunction with the other ISPRS working groups of Commission III, which will take place at the 5-7 October 2011 in Munich, Germany. Prospective authors were invited to submit full papers of a maximum length of 6 pages. There have been 54 full papers received coming from 18 countries for review. The submitted papers were subject to a rigorous double blind peer review process of full papers. 42 papers were reviewed by three members of the program committee, whereas the rest (12 papers) was reviewed by two members of that committee. In total 150 reviews from 29 reviewers were received. The double blind review process was supported by the WG I/2 officers Boris JUTZI, Franz MEYER, and Charles TOTH. Altogether 30 papers were accepted based on the reviews, which correspond to a rejection rate of 44%. Finally, 25 of the 54 papers (46%) will be published in the LNCS series.
- WGI/2 did actively contribute to IGARSS'11 by organizing a invited session on 'Ionospheric Effects in Polarimetric and Interferometric SAR Data' and chairing an additional session on "SAR/InSAR Image Extraction and Improvement Techniques", Vancouver, Canada, July 25 - July 29 2011
- WG I/2 chairmen served on Scientific Committee of the 1st International Workshop on the Quality of Geodetic Observation and Monitoring Systems (QuGOMS) of the Intercommission Committee on Theory (ICCT) of the International Association of Geodesy (IAG), Munich, Germany, 4/13 – 4/15/2011.
- WG I/2 chairmen is member of Program Committee of 'Earth Observation of Global Changes', Munich, Germany, 4/13 – 4/15/2011

Other Working Group Activities 2011

- Regular exchange of information with the WG members through letters.
- A dedicated website has been established and linked to the TC I website to support the work of the WG. See http://www.commission1.isprs.org/wg2/.
- Circular call for participation: An active approach to encouraging participation in WG activity was adopted, with a circular invitation to a wide audience. There are currently active 22 members of the WG, representing 9 different countries. Note that

there are a larger number of professionals who monitor and occasionally participate in the WG activities, though they are not formal members.

- Planning and progress meetings: The working group Chair and Co-Chair will meet during the ISPRS Workshop Photogrammetric Image Analysis PIA11 in Munich, Germany to discuss and establish future WG developments and goals.
- Representation of the Working Group at international meetings and workshops, where the chairmen of the working group assumed active roles in the organization and scientific program, included the following meetings:
    - Representing ISPRS and the WG at LARS (Latin American Remote Sensing) in Santiago, Chile, October 4 - 8, 2010 (two invited talks on LiDAR technology and waveform).
    - ISPRS Journal of Photogrammetry and Remote Sensing – Theme Issue: Advances in LiDAR data processing and applications (publication, reviewer board).
    - Kolloquium at BfG, 7. April 2011, Koblenz, Germany: Zeitgemäße Erfassung und Bereitstellung von Geobasisdaten für die WSV (invited speaker).
    - Workshop at KIT, 26. June 2011, Karlsruhe, Germany: Buddhist Historical Sites from a World Heritage Perspective (invited speaker).
    - Workshop, 7.-11. November 2011, Hyderabad, India: World Heritage in Andhra Pradesh (invited speaker).
    - International Geoscience and Remote Sensing Symposium IGARSS 2011 - July 24 - 29, 2011, Vancouver, Canada (member of the reviewing committee; organized and chaired invited Session on 'Ionospheric Effects in Polarimetric and Interferometric SAR Data'; chairman of session 'SAR/InSAR Image Extraction and Improvement Techniques'; contribution of three oral presentations).
    - Committee of Earth Observing Satellites (CEOS) Synthetic Aperture Radar (SAR) Calibration and Validation Workshop, Nov. 7 – 9, 2011, Fairbanks, Alaska (Co-Organizer of workshop; Chair of scientific committee).
    - Chair of the IEEE Geoscience and Remote Sensing Society (GRS-S) Alaska Section.
    - Representative in the Western North America Synthetic Aperture Radar (WInSAR) Consortium.
    - Member of the NASA SAR Distributed Active Archive Center (SAR DAAC) User Working Group.
    - 2011 ASPRS Spring meeting, liason to LiDAR committee.
    - Representation of working group interests by being named Co-Chair of related International Association of Geodesy (IAG) Study Group IC-SG3: 'Configuration Analysis of Earth Oriented Space Techniques'.
    - Working group officer gave a workshop on LiDAR at ILMF 2011 in New Orleans, USA from 07-02 to 09-02-2011.
    - Working group officer gave a Webinar on Waveform processing, organized by ASPRS with international audience, 15 July 2011.
    - Organizing Committee on Earth Observing Satellites (CEOS) Synthetic Aperture Radar (SAR) Calibration and Validation Workshop in Fairbanks, Alaska, USA, Nov. 7 – 9, 2011
- Awards and Honors:
    - Working group officer received the IEEE Geoscience and Remote Sensing Society 2011 GOLD Early Career Award. The award was presented during the 2011 IEEE International Geoscience and Remote Sensing Symposium (IGARSS), July 24 – 29, 2011, Vancouver, Canada.
- Workshop Reports:

- Working group officer published workshop report on 1st International Workshop on the Quality of Geodetic Observation and Monitoring Systems (QuGOMS), Munich, GERMANY, 4/13 – 4/15/2011. The report was entitled „QuGOMS'11: Ein neues Diskussionsforum für die Qualitätsanalyse von geodätischen Messsystemen" and was published in the "Zeitschrift fuer Vermessungswesen (ZfV)"

Planned Working Group Activities

2011

- Organizing Committee on Earth Observing Satellites (CEOS) Synthetic Aperture Radar (SAR) Calibration and Validation Workshop in Fairbanks, Alaska, USA, Nov. 7 – 9, 2011

2012

- Organize sessions at the ISPRS Congress 2012 in Melbourne, Australia.

State of Science and Technology

- LiDAR technology has been making consistent progress in terms of technology advancement and broadening applications. Interest has increased in water penetrating airborne laser scanning systems for investigating costal zones as well as rivers. In addition, pulse repetition rate keeps steadily increasing, providing for better performance and denser point capturing possibilities.
- In scientific applications, single-photon laser and multispectral technologies have gained some interest recently. Full-waveform systems are more and more established, but still of interest in research. Beside these scanning devices, range imaging systems (Flash LADAR), currently available in close-range, are expected operational for larger ranges in the short future. First experimental airborne platforms are already available.
- Fusion of data derived by complementary sensor systems is still and will be of interest. Especially by the fusion of radiometric (e.g. captured by hyperspectral or infrared optical devices) and geometric (e.g. captured by laser scanning or SAR devices) data, further improvements can be expected in research in the near future.
- ASPRS created a Division dedicated to laser technology approved by the ASPRS Board in 2011; note that a WG officer has been on the Board.
- Mobile LiDAR (MLS) seems to be fastest growing market segment recently; and efforts are devoted to develop industry guidelines to validate and characterize LiDAR products.

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WG I/3 - Multi-Platform Multi-Sensor Inter-Calibration

Working Group Officers

- Chair: Dr. Ayman Habib, Department of Geomatics Engineering. The University of Calgary, Canada
- Co-Chair: Dr. Mostafa Madani, Intergraph Corporation USA
- Co-Chair: Dr. Cheng Wang, National University of Defense Technology China
- Secretary: Taher Hassan, Department of Geomatics Engineering. Ain Shams University, Egypt

Terms of Reference

- Multi-platform data acquisition and Inter-Calibration
- Multi-source data Quality Control and Quality Assurance Methods for land-, air-, and space-borne imaging and ranging systems – collaborate with WGI.5, ICWGV/I, WG II/4, and WG V/3
- System calibration (sensors and inter-sensors)
- Collaborate with EuroSDR in the development of commonly accepted standards procedures for the inter-calibration and testing of Multi-Platform Multi–Sensor systems
- Liaison with EuroSDR COM

Mission

With the increasing development of new sensors, the integration of multi-platform systems as well as enhanced networking and fusion of multiple sensors are considered a central issue for several geo-spatial applications. For example, integration of terrestrial, airborne, and space-borne sensors can provide an enhanced capability for comprehensive modeling, monitoring, and validation. In disaster management and environmental monitoring applications, for instance, the availability of multi-sensor/multi-platform imaging and non-imaging systems for a continuous, real time monitoring is quite desirable. Research has been largely devoted to the exploitation of individual sensors and the fusion of the resulting sensory data. As fundamentals of the future applications of multiple sensors and multiple platform systems, developing standards and procedures for the calibration, quality assurance, and quality control of multi-sensor/multi-platform mapping systems are becoming new research focuses. There are a variety of recent activities in IEEE/ISPRS and government remote sensing programs geared towards exploiting multi-sensor/multi-platform sensing systems. In support of these activities, WG I.3 will coordinate activities in addressing the scientific, technological, and engineering issues for terrestrial, airborne, and space borne sensor integration. More specifically, WG I.3 will be focusing on the integration of imaging and non-imaging sensors, mission planning of multi-platform sensors, and standards for quality assurance and quality control procedures. This Group will

maintain a close link with WGI/5, ICWGV/I, WG II/4, WG V/3and the EuroSDR for the development of commonly accepted standards procedures for the inter-calibration and testing of Multi-Platform Multi–Sensor systems.

Working Group Workshops

- International workshop on Multi-platform/multi-sensor remote sensing and Mapping, January 10 – 12, 2011, Xiamen City, Fujian, China
- ISPRS Workshop, Laser Scanning 2011, University of Calgary, 29 – 31 August, 2011 (Co-organized by WG V/3 and WG I/3)

2011 Activities

- The International Workshop on Multi-platform/multi-sensor Remote Sensing and Mapping (M2RSM2011) was held at Science and Art Center in Xiamen University, Xiamen, China, in Jan 10-12, 2011. The workshop was sponsored by ISPRS WG I/3 and IC I/V, and technically cosponsored by IEEE GRSS. Other sponsors included the Chinese Society of Image and Graph and the National Foundation of Nature Science Foundation Chinese. The organizers were Xiamen University, National University of Defense Technology, China and the University Of Calgary, Canada.

  A total of one hundred and sixteen papers had been submitted to the workshop by the authors from six countries around the world. All the papers were peer reviewed by at least two program committee members of the workshop. Totally 65 papers were accepted and included in the proceeding.

  During the two day period of the workshop, Professor Jun Chen, the Secretary General of ISPRS and Professor Jon Benediktsson, the President of IEEE GRSS had given keynote speeches. Both of them also represented for the tow major sponsors, ISPRS and IEEE GRSS. The workshop last for two days. 55 authors attend the workshop and presented their works in 10 sessions. Five papers were awarded the Best Student Paper Certificate.

  The workshop's proceeding had been published by IEEE eXpress Conference Publishing with ISBN 978-1-4244-9403-3, and is accessible at IEEE Xplore, and indexed by the EI.

International workshop on
Multi-Platform/Multi-Sensor
Remote Sensing and Mapping
January 10 – 12, 2011
Xiamen City, Fujian,

- Collaborating with the USGS/ASPRS to develop guidelines/best practices for the Quality Assurance and Quality Control (QA/QC) of LiDAR mapping. A comprehensive document is being prepared to highlight the major systematic errors in LiDAR data acquisition, efficient procedures for the estimation of these errors during the system calibration procedure, and tools for checking the internal and external accuracy of the delivered LiDAR point cloud.
- Co-organize the ISPRS laser scanning workshop together with WG V/3, which took place in Calgary, Canada (August, 29 – 31, 2011). The workshop received more than seventy papers that went through a double-blind review process (sixty papers have been accepted for oral and poster presentations in the meeting). The workshop had three key-note speakers (one for each day of the workshop). Best oral and poster presentations awards have been granted at the end of the event.

Other Working Group Activities

- Website: A dedicated website has been established and linked to the TC I website to support the work of the WG. See http://www.commission1.isprs.org/wg3/.
- Circular call for participation: An active approach to encouraging participation in WG activity was adopted, with a circular invitation to a wide audience at the end of 2008. There are currently 30 members of the WG, representing 9 different countries.
- Liaison with ICWG V/I - Land-Based Mobile Mapping Systems
- Liaison with WG V/3 – Terrestrial Laser Scanning and 3D Imaging
- Liaison with WG I/5 - Integrated Systems for Sensor Georeferencing and Navigation
- Currently collecting multi-sensor data including terrestrial images, laser scanner data, and navigation data and will be posted soon.
- Collaborating with the USGS/ASPRS to develop guidelines/best practices for the Quality Assurance and Quality Control (QA/QC) of LiDAR mapping.

Future Activities

2011

- Co-organize the ISPRS laser scanning workshop together with WG V/3, which will take place in Calgary, Canada (August, 29 – 31, 2011). The workshop has received more than seventy papers that went through a double-blind review process (sixty papers have been accepted for oral and poster presentations in the meeting). Detailed information about the program can be found at the following link: http://www.ucalgary.ca/laserscanning2011/.

2012

- Organize sessions at the ISPRS congress in Melbourne, Australia.
- Co-organizing of EuroCOW 2012 with WG I/5. The workshop focus is on sensor orientation and calibration

State of Science and Technology

For GNSS/INS-assisted multi-camera/laser scanner Mobile Mapping Systems (MMS), a general system calibration procedure needs to be developed for the estimation of the individual sensor parameters as well as the mounting parameters relating theses sensors. This procedure should be flexible enough to handle any number of imaging sensors on board the MMS. The ability to perform such a task through a single step procedure will have a positive impact in increasing the accuracy and reliability of the estimated parameters as well as reducing the control requirement for the system calibration process. For easier implementation of this procedure, some of the established concepts in photogrammetry should be revised. For example, the concept of the Exterior Orientation Parameters (EOP), which refers to the position and orientation of a single imaging unit, should be revised. Instead of having different sets of EOP for the individual sensors at different locations on board the MMS at a given time, the EOP should refer to the position and orientation of the navigation frame, usually the IMU body frame onboard the MMS, at the time of data acquisition while the mounting parameters between the IMU body frame and the individual sensors are estimated during the system calibration procedure. Such a redefinition would reduce the number of involved parameters. Other than revising this concept, careful analysis of the control and data acquisition configuration for accurate yet economical system calibration should be investigated.

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WG I/4 - Geometric and Radiometric Modeling of Optical Spaceborne Sensors

Mountains from space: K2-view from north-west. A Worldview-2 stereo-triplet was used to generate DEM, orthoimage and panoramic view, no additional data are used.

Working Group Officers

- Chair: Dr. Peter Reinartz, German Aerospace Center (DLR)
- Co-Chair: Dr. Daniela Poli, European Commission, Joint Research Centre (JRC)
- Co-Chair: Dr. Karsten Jacobsen, Leibniz University Hannover
- Secretary: Dr. Gurcan Buyuksalih, BIMTAS, Istanbul

Terms of Reference

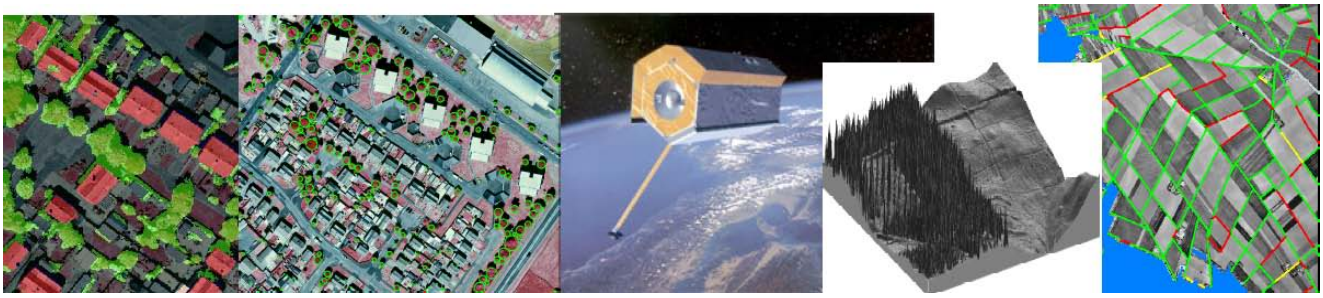
- Geometric/radiometric calibration/evaluation of optical space sensors including laboratory (including long-term stability) and in-flight calibration activities
- Comparison of existing and evolving algorithms for geometrical modeling of optical space images
- Analysis of available direct sensor orientation and modelling changes during satellite lifetime
- Evaluation of line sensors for DEM generation (cooperation with working groups VII/2 and III/4)

Mission

The aim of the working group is the investigation of the mathematic model and also operational approximations for the correct handling of optical space borne images. Special conditions of sensors having more than one view direction will be respected. For absolute positioning without control points, the long and short term quality of the satellite direct sensor orientation shall be investigated. Based on the determined sensor orientation, the optimal method of digital elevation model generation, analysis and improvement is included. The activities of the WG as expressed in its terms of reference are promoted through various initiatives and events in co-operation with ISPRS, other international organizations, international space agencies and private companies.

2011 Working Group Workshops

- 2011: Co-organizer of: SMPR 2011: Sensors and Models in Photogrammetry and Remote Sensing, May 18 – 19, Tehran, Iran
- 2011: Co-organizer of the ISPRS Hannover Workshop 2011 on High-Resolution Earth Imaging for Geospatial Information June 14 – 17, Hannover, Germany, together with WG III/4, IV/2, VII/2 and supported by WG I/2, I/5, IV/3 and EuroSDR



2011 Working Group Activities

- Improvement of benchmarking data sets: Stereo data from Cartosat-1 and Worldview-1 for three areas in Catalonia, Spain for testing DSM generation and DSM quality analysis for HR and VHR sensors. Organization of a high quality reference data set for the same area from airborne laser scanning and DMC flights from the Cartographic Institute from Catalunya (ICC). The goal is the comparison of resulting DSM and preparation of the use of quality figures for DSM and DTM evaluation. Data are on-line since June 2010. First presentations were made at the Hannover workshop and a special session is planned for the ISPRS congress in 2012.
- The workshop SMPR 2011 on Sensors and Models in Photogrammetry and Remote Sensing, in Tehran, Iran, has been a very good success, about 200 participants and 34 high level scientific presentations and intensive discussions on the presented topics. Event Report on the SMPR 2011 Tehran Workshop: Modeling of optical airborne and space borne sensors.
- The ISPRS Hannover Workshop 2011 “High-Resolution Earth Imaging for Geospatial Information” hosted by the Institute of Photogrammetry and Geoinformation of the Leibniz University Hannover was held from 14th to 17th June 2011 in cooperation of the Working Group I/4 with II/4, IV/2 and VII/2. As usual, the presentations have been on a high level with participants from 30 countries. 62 papers are available under http://www.isprs.org/proceedings/XXXVIII/4-W19/start.htm. A report can be seen under http://www.isprs.org/news/newsletter/05-Jul-2011/13_ISPRS_Hannover_Workshop_2011.pdf.
- The working group officers and members have been working on several research projects related to DSM generation as well as DSM and DTM quality analysis.
- To show the capabilities of the new generation of very high resolution stereo imaging from space, a very nice DEM of the second highest mountain in the world, K2, has been created from Worldview-2 data, including perspective views and animations, see also http://www.dlr.de/dlr/desktopdefault.aspx/tabid-10212/332_read-921/ (see above)

Other Working Group Activities

- Website: A dedicated website has been continuously updated to support the work of the WG. See http://www.commission1.isprs.org/wg4
- There are currently 48 members of the WG, representing 10 different countries.
- Planning and progress meetings: several communication issues have been handled by e-mail or phone between chair, co-chair and secretary in 2011.
- Liaison with other WGs: The ISPRS Hannover Workshop 2011 has been organized together with IV/2, III/4, VII/2, and supported by WG I/2, I/5, IV/3 and EuroSDR. Discussion on DEM evaluations with WG III/4

Future Activities

- 2012: Review abstracts and papers and organize sessions at the ISPRS congress in Melbourne, Australia

State of Science and Technology

The progress of the optical spaceborne sensors since 2008 was dominated by the new very high resolution sensors as WorldView-2, GeoEye-1 and lately Pleiades-1 in addition to the Cartosat-2-series, Kompsat-5 and Resurs P N1. Together with the group of satellites with slightly lower resolution the imaging capacity has strongly been improved, supported with the extreme high flexibility of e.g. WorldView-2 leading to a much easier generation of stereo scenes. The delivery of the images together with orientation as rational polynomial functions became standard. The absolute image orientation has been improved and can be used also for some purposes without ground control points. A higher accuracy of the image orientation also can be reached with very high resolution radar space images which absolute sensor orientation is independent upon satellite attitude measurement errors [1].

A continuous progress of the automatic image matching technology has been shown also with the new technology of semi-global-matching having especially advantages in build up areas, avoiding a bell-shaped 3-D appearance of buildings [2]. The improvements in Digital Surface Model (DSM) generation, also by using several viewing directions, will foster the usage of spaceborne stereo data for many more applications worldwide in the future. The benchmarking test of the WG I/4 with stereo data from Cartosat-1 and Worldview-1 for three areas in Catalonia, Spain for testing DSM generation and DSM quality analysis for HR and VHR sensors is going on with the advantage of better comparison of different matching strategies.

Also the radiometric quality of the spaceborne data is improved and with the higher radiometric resolution of WorldView-2 both, the high geometric and the high radiometric resolution can be combined.

Several of the progress steps have been published at the Commission I midterm symposium in Calgary in 2010 and at the ISPRS Hannover Workshops in 2009 and 2011, all papers are available as ISPRS proceedings.

[1] Reinartz, P., Müller, R., Schwind, P., Suri, S., Bamler, R. (2011). Orthorectification of VHR optical satellite data exploiting the geometric accuracy of TerraSAR-X data. ISPRS Journal of Photogrammetry and Remote Sensing, 66 (1), 124-132

[2] Alobeid, A., Jacobsen, K., Heipke, C; (2010). Comparison of Matching Algorithms for DSM Generation in Urban Areas from Ikonos Imagery, Photogrammetric Engineering & Remote Sensing, 76 (9). pp. 1041-1050

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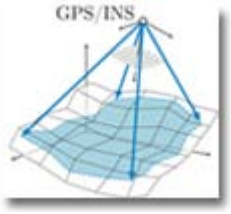
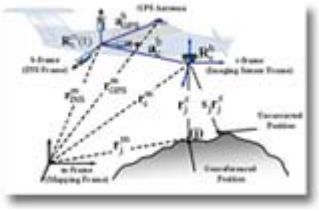
WG I/5: Integrated Systems for Sensor Georeferencing and Navigation



Working Group Officers

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- Co-chair: Michael Cramer, Insititute of Photogrammetry, University of Stuttgart, Germany
- Secretary, Klaus Legat, Versmessung AVT-ZT, Imst, Austria

Terms of Reference

- Algorithmic aspects of direct georeferencing for Active and Passive Sensors in Marine, Land, Airborne, and Space-borne environment
- Navigation technology and the methods of sensor orientation in urban, indoor and forested environments.
- Georeferencing by integrated sensor orientation - models and adjustment procedures.
- Real-time aspects: mission control, data validation, evaluation, quality control.
- Navigation redundancy, robustness and reliability: impact of system integration.
- Standards and protocols in direct georeferencing and sensor orientation.

Mission

Our working group deals with a fundamental task in photogrammetry and remote sensing: sensor orientation, both in real-time and off-line. Sensor orientation is the determination of a sensor or sensor-system orientation parameters -i.e., in a wide sense, its position, velocity and attitude. In our context, navigation is real-time orientation. Today, orientation and navigation parameters are derived from multiple sensor configurations in a number of ways. Data integration from various, usually redundant or at least partially redundant sensors, allows for a more precise, accurate, reliable, less expensive and faster orientation and navigation.

The mission of the Working Group is to promote, facilitate and communicate research and its results on the topics listed below.

Working Group Workshops

The EuroCOW is a biennial series of meetings that bring together world experts from public and private sectors to present and discuss recent findings and developments on Sensor Calibration and Orientation. These calibration and orientation workshops are highly-specialized, small-format forums to facilitate the circulation of new and useful information.

- The EuroCOW 2010 took place from February 10th to 12th, 2010.
- The EuroCOW 2012 will take place from February 8th to 10th, 2012.

General Working Group Activities

- Regular exchange of information with the WG members through letters.
- Establishment of a WEB page for the working group.
- Disseminating events related announcements via web and via the WG members mailings list.
- Announcement on our WEB page of publications in our fields (books, journals, proceedings, paper collections, bibliographic collections etc.) , with emphasis on free electronic material.
- Collection and free access at our WEB page of proceedings and tutorial notes of ISPRS events.
- Announcement on our WEB page of free or educational software with sensor orientation thematic.
- Announcement of educational and training possibilities, other than the ones offered by higher education institutions, but including information on special M.Sc. courses.
- Active participation in the Technical Commission I Symposium, June 2010, Calgary and the 22st ISPRS Congress, July 2012, Melbourne.
- Organization of events (workshops, seminars, tutorials) especially within the frame of other ISPRS events and aiming at covering regional needs of developing countries. Please refer to the Events page for the currently planned meetings.
- Deepening the collaboration between the work-group members by formulating and submitting joint research proposals.
- Collection of relevant WEB links, incl. related newsgroups and list-servers, hardware and software companies.
- Preparation of annual reports for ISPRS, as well as preparation of reports on WG-cosponsored events and WG news to be published in the ISPRS Highlights.
- Participating in the development of standards for sensor orientation in relevant organizations.

2010-2011 Activities

- After the successful EuroCOW 2010 meeting, the WG started the preparation of the EuroCOW 2012 also to be held in Castelldefels, near Barcelona, Spain. For the EuroCOW 2012 a parallel review track has been established. The traditional “abstract review track” of the past EuroCOWs will be kept and an additional “paper review track” will be added. For the latter an agreement has been made with the German Society / DGPF Journal Photogrammetrie - Fernerkundung - Geoinformation PFG in order to review and publish the workshop papers whose authors choose to

go the more demanding "paper review track." Dr. Michael Cramer, President of EuroSDR Commission 1 and co-chair of the Working Group is participating in the preparation and realization of the event.

- WG chair J. Skaloud and WG officer I.Colomina were members of the Scientific Committee of the Mobile Mapping Symposium 2011 held in Cracow, Poland, from June 13 to 16, 2011. The MMT 2011 was a joint event of ISPRS, FIG, IAG and the North American ION.
- The WG officer M. Cramer initiated number of activities at EuroSDR, such as the empirical work on radiometric aspects of digital airborne cameras, the use of medium format digital cameras and aspects of digital camera certification.
- J.Skaloud, the WG chair took part of the scientific committee of the Laser Scanning Workshop organized by the ISPRS WG I/3 and V/3 in Calgary, in Calgary, Canada, from August 29 to 31, 2011.
- WG officer I. Colomina is a member of the Scientific Committee of the UAV-g 2011 - Unmanned Aerial Vehicle in Geomatics, to be held in Zürich, Switzerland, from September 14 to 16, 2011. The UAV-g is organized by the Institute of Geodesy and Photogrammetry (IGP) of the ETH on behalf of the ISPRS ICWG I/V.
- WG officer I. Colomina is a member of the Scientific Committee of the PIA11 - Unmanned Photogrammetric Image Analysis, to be held in Munich, Germany, from October 5 to 7, 2011. The PIA11 is organized an ISPRS event organized by WGs I/2, III/1, III/4 and III/5.

State of Science and Technology

The evolution of integrated systems for sensor georeferencing and navigation went to several directions. First the navigation systems followed the path of closer integration among them and/or with optical-sensors with the goal of improving reliability and performance; second the progress of inertial technology now allows designing considerably smaller and cheaper systems, which essential opens doors to new platforms and thus georeferencing applications (e.g. mapping/monitoring with micro UAV).
More specifically:

- Inertial technology:
  - Performance of MEMS sensors has reached lower end of 'tactical-grade' sensors also in gyroscope technology, which is important for wider acceptance in direct georeferencing.
  - Significant research has been produced in the development of inertial MEMS-sensors models and their identification.
  - Important effort has been furnished in the development of processing algorithms for redundant MEMS-IMUs configuration with the aim of increased performance and navigation integrity.
- GNSS and GNSS/INS integration:
  - GNSS multi-constellation integration for inertial-assisted ambiguity resolution has become available also in commercially available software.

- Performance and reliability of the point-precise positioning approach (PPP) has improved and is reaching wider employment in direct georeferencing
-

- Integrated Sensor Orientation (and calibration):
  - Approaches to LiDAR strip-adjustment has been refined both in observation and point-cloud domains.
  - Progress has been made in the rigorous approach to the post-mission sensor integration via dynamic networks.
- New platforms
  - Concept of the navigation integrity has been investigated for the case of (micro) UAVs platforms with redundant MEMS-IMUs.
  - Micro-UAVs platforms are under construction that will allow image real-time processing, cm-level positioning and redundant MEMS-IMUs are under construction.

Working Group Officers Contact Information:

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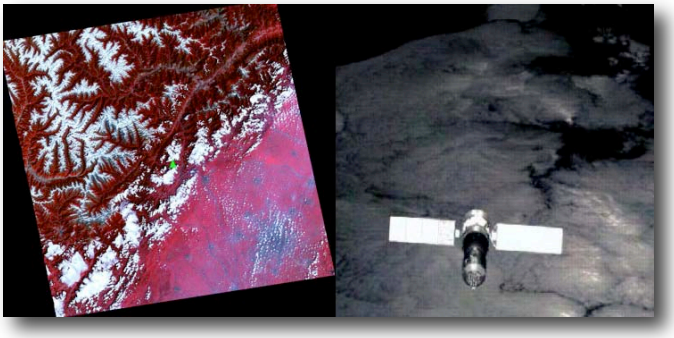
Co-chair: Ismael Colomina, Insititute of Geomatics, Castelldefels, E-mail: Ismael.Colomina@ideg.es
Co-chair: Michael Cramer, University of Stuttgart, Germany, E-mail: michael.cramer@ifp.uni-stuttgart.de
Secretary, Klaus Legat, Versmessung AVT-ZT, Imst, Austria, E-mail: k.legat@avt.at

WG I/6 - Small and Micro Satellites for Earth observation



Working Group Officers

- Chair: Klaus Briess, Berlin Institute of Technology, Department of Aeronautics and Astronautics, Germany
- Co-Chair: Dr. Ugur Murat Leloglu, The Scientific and Technical Research Council, Turkey
- Co-Chair: Professor Xiaoliang Wu, CSIRO Mathematical and Information Sciences
- Secretary: Mrs. WenXia Xu, System Department of China Academy of Space Technology

Terms of Reference

- Core observational needs of earth observation with development trend and strategy
- Assessment of the benefits of small satellites compared to other sources of information
- Challenges in managing small satellite systems Skymed)
- Small satellite platform technique and application situations, including architectures, characterization, calibration, validation, reliability, and failure treatment
- Payload design and accommodation requirements of small satellites with data procession validation
- Small launch vehicles
- Cooperation with other ISPRS WGs

Mission

Remote observations of Earth from space serve an extraordinarily broad range of purposes, resulting in extraordinary demands in many countries.

Recent years, Small satellites are offering new opportunities to address the core observational requirements of both operational and research missions. Small satellites, in particular single-sensor platforms, provide great architectural and programmatic flexibility. They offer attractive features with respect to design; observing strategy; rapid technology infusion; replenishment of individual failed sensors; and robustness with regard to budget and schedule uncertainties.

New approaches to observation and calibration may be possible using spacecraft agility in lieu of sensor mechanisms, for example. Small satellite clusters or constellations can provide new sampling strategies that may more accurately resolve temporal and spatial variability of Earth system processes

Small satellite missions, as a new element of measurement strategy, may also help provide more balance between long-term operational or systematic observations and short-term experimental process measurements, as well as between focused missions and larger, more comprehensive missions. Earth observation Programs can be more readily tailored to fiscal funding constraints when implemented as a series of smaller satellites. Small spacecraft can play an important role in Earth observation programs, providing to this field many of the expected benefits, such as rapid development and lower individual mission cost.

The WG has witness a change of leadership due to lack of engagement of the old chair.

Other Working Group Activities

1. Website: a dedicated website has been established. See :http://sensorweb.geomatics.ucalgary.ca/isprs/symposium/.
2. Planning and progress meeting: WG I/6 —Small and Micro Satellites for Earth observation in 2010, cooperating with Chinese Aerospace Association.

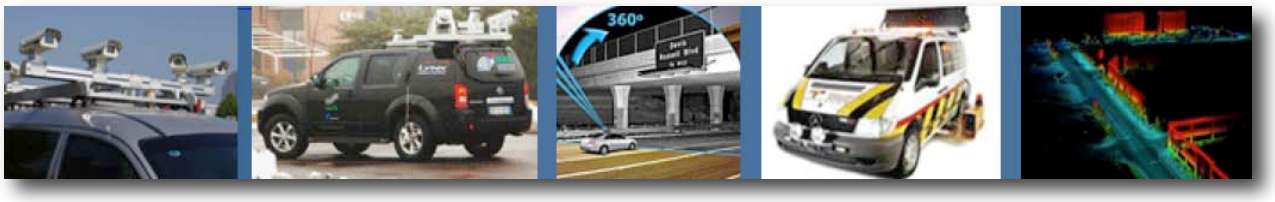
Future Activities

- 2011: A workshop on Small satellite programmatic, small satellite constellations, high-performance optical system for small satellite, spacecraft bus, subsystems, in Beijing, China.
- 2012: Assisting ISPRS Council on congress.

Working Group Officers Contact Information:

- Chair: Klaus Briess, Berlin Institute of Technology, Department of Aeronautics and Astronautics, klaus.briess@ilr.tu-berlin.de
- Co-Chair: Dr. Ugur Murat Leloglu, The Scientific and Technical Research Council, Turkey, leloglu@uzay.tubitak.gov.tr
- Co-Chair: Professor Xiaoliang Wu, CSIRO Mathematical and Information Sciences, Xiaoliang.Wu@csiro.au
- Secretary: Mrs. WenXia Xu, System Department of China Academy of Space Technology, sogosohu@sohu.com
- Secretary: Mrs. Qingyi Lee, System Department of China Academy of Space Technology, Lee_qq@126.com

ICWG V/I - Land–based Mobile Mapping Systems



Working Group Officers

- Chair: Jonathan Li (Canada)
- Co-Chair: Qingquan Li (China)
- Co-Chair: Antonio Maria Garcia Tommaselli (Brazil)
- Secretary João Fernando Custódio da Silva (Brazil)

Terms of Reference

- Design, development and evaluation of integrated, multi-sensor, land-based mobile mapping systems
- Design and development of real-time data processing algorithms for land-based mobile mapping systems
- Automation of information extraction from land-based mobile imaging and ranging sensor data
- Development of novel applications in transportation infrastructure mapping and assessment, including pavement and asset mapping, emergency response
- Cooperation with ICA, IAG, FIG, and other ISPRS WGs on 3D mobile mapping; image indexing and retrieval; 3D object reconstruction and city modelling; point cloud processing; sensor integration and multiple sensing solutions; and applications in LBS and disaster management

Mission

ICWG V/I on Land-based Mobile Mapping Systems (2008-2012) addresses Beijing Congress Resolutions V.1, V.2 and V.3, with a focus on the use of land-based mobile platforms, promotes and coordinate research and development activities in the use of land-based mobile mapping systems with innovative integration of multiple, off-the-shelf sensors for rapid 3D object and surface reconstruction, liaises with academia, service providers, and manufacturers in novel applications of land-based mobile mapping systems in transportation, urban mapping, location-based services, and emergency and disaster management sectors.

A. State of Science and Technology of Working Group Topics

In 2011, the ICWG V/I officers have been very actively involved in organizing or attending EOGC2011 (Munich, Germany) LiDAR & SAR 2011 (Nanjing, China) and MMT 2011 (Croskow, Poland). These events have shown continued R&D research interests and activities in the field of mobile mapping technology. In particular, the recent R&D efforts in mobile lidar have focused on applications in transportation, power line mapping, urban infrastructure mapping, underground and super speed train infrastructure monitoring, and cultural heritage documentation. The experiences learnt in 2011 have proved that the ICWG V/I terms of reference are well founded.

B. Accomplishments of Working Group during 2011

Website

The ICWG V/I website, managed by Jonathan Li (Chair), is available and updated at http://www.commission5.isprs.org/icwg1_5/

Conferences

- ICWG V/I co-organized the 3rd International Conference on Earth Observation of Global Change, jointly with other WGs from ISPRS, ICA and IAG, 13-15 April 2011, Munich, Germany. Jonathan Li (Chair) served as Co-Chair of the Scientific Committee.
- ICWG V/I co-organized the Joint International Symposium on LiDAR and Radar Mapping Technologies and Applications in Nanjing, China, 26-29 May 2011. This event was jointly supported by ISPRS, ICA, FIG, SPIE. Jonathan Li (Chair) served as Co-Chair of the Scientific Committee. Qingquan Li (Co-Chair), Antonio Tommaselli (Co-Chair), and João Fernando Silva (Secretary) and several ICWG members served as SC members.
- The 7th International Symposium was held in Croskow, Poland, 13-16 June 2011. Jointly supported by ISPRS, FIG, IAG and ION. ICWG V/I officers and several members served as SC members.
- Jonathan Li and Qingquan Li served as SC members of the Joint ISPRS Workshop on 3D City Modelling & Applications and the 6th 3D GeoInfo, http://www.lmars.whu.edu.cn/3DCMA2011/, 26-28 June 2011, Wuhan, China.
- ICWG V/I is involved in co-organizing the ISPRS Workshop on Laser Scanning 2011, jointly with WG V/3, I/3, and other WGs of ISPRS, http://www.ucalgary.ca/laserscanning2011/, 29-31 August 2011, Calgary, Canada. Jonathan Li serves on SC.

Planned Publications

- A special Issue of Photogrammetric Engineering and Remote Sensing (PE&RS) (ASPRS: SCI), entitled “Advances in Terrestrial Laser Scanning” including 8 peer reviewed papers are currently under peer review and will be published in Spring 2012. Jonathan Li serves as guest editor (with Bruce King).
- A theme issue featured terrestrial laser scanning: from static to mobile, Call for Papers due on 1 October 2011, will consist of 12-16 papers to be published by International Journal of Remote Sensing (Taylor and Francis: SCI) in 2013. Jonathan Li served as the Guest Editor (with Michael Chapman).

Upcoming events in 2012:

- ICWG V/I will be involved in co-organizing the International Summer School on Mobile Mapping Technology, 30 Apr - 4 May 2012, Tainan, Taiwan.
- ICWG V/I will organize technical sessions in land-based mobile mapping systems in XXII ISPRS Congress, 25 Aug-1 Sep 2012, Melbourne, Australia.

WG I/V - UVS for mapping and monitoring applications

Working Group Officers

• Chair: Jurgen Everaerts, Remote Sensing Research Unit, VITO, Belgium
• Co-Chair: Henri Eisenbeis, Institute of Geodesy and Photogrammetry, ETH-Zurich, Switzerland
• Secretary: Kris Nackaerts, Remote Sensing Research Unit, VITO, Belgium

Terms of Reference

• UVS specific issues related to navigation and position/orientation determination (incl. sense & avoid)
• UVS platforms & instruments for photogrammetry and remote sensing (especially low-cost, consumer-type)
• UVS as a tool for RS instrument prototyping
• UVS as a tool for teaching all aspects of photogrammetry & remote sensing
• Document and compare UVS systems (in photogrammetry and RS) in terms of cost, performance, application and quality
• Liaison with Com III, VIII and EuroSDR

Mission

Our working group aims at informing and activating people interested in education and training in the fields covered by ISPRS, especially colleagues working in educational institutions. We are focused on promoting the goals of the WG as expressed in its terms of reference by means of various activities and events and in co-operation with ISPRS, other national and international organizations and Geomatics-related firms.

Working Group Workshops

- The Future of Remote Sensing, Autumn 2010 – Antwerp, Belgium
- IVWG I/V workshop, 2011 – Zurich, Switzerland

Other Working Group Activities

- Regular exchange of information with the WG members through letters.
- Establishment of a web page for the working group.
- Announcement on our web page of publications in our fields (books, journals, proceedings, paper collections, bibliographic collections etc.) , with emphasis on free electronic material.
- Collection and free access at our web page of proceedings and tutorial notes of ISPRS events.
- Announcement on our web page of free software.
- Provide a web accessible knowledge base of UVS related research projects and service providers
- Active participation in the UVS related events
- Organization of events (workshops, seminars, tutorials) especially within the frame of other ISPRS events. Currently, the following events are planned:
- 2010 3rd Intl. Workshop “The future of Remote Sensing”, Antwerp, Belgium

- 2011 Zurich, Switzerland
- Collection of relevant WEB links, incl. related newsgroups and list servers, hardware and software companies.

2011 Activities

- Reviews and co-organizing of Commission I Symposium in Calgary, Canada.
- Reviews and co-organizing of Commission V Symposium in Newcastle, UK
- Third International Workshop “The future of Remote Sensing” in Antwerp, Belgium
- DFG-Rundgespräch "Unbemannte autonom navigierende Flugsysteme (UAS), Rostock, Germany
- 2011: ICWG I/V workshop in Zurich, Switzerland
- UAV-g 2011, 3 day conference in September 2010 including live demos at an airfield... Planned number of participants 200.

State of Science and Technology

UAVs (Unmanned Aerial Vehicles) are highly developed flight systems, which can be used for a great variety of applications, such as monitoring of natural hazards (landslides, flooding and volcanoes etc.) and the documentation of archaeological excavations, gravel pits, and construction sites. Furthermore, UAVs can be used for mapping of agricultural and forest areas as well as for cadastral tasks in combination with traditional surveying methods.

Worldwide interest in UAVs

The UAV-g 2011 conference was a get-together at ETH Zurich and airfield Birrfeld of 220 scientists, users, delegates of government authorities and manufacturers coming from over 30 different countries. At the conference the current research on UAVs with the emphasis on applications in Geomatics was presented and discussed under the consideration of user requirements. The focus of the conference was on the exchange of UAV-g research activities between the different disciplines (artificial intelligence, robotics, photogrammetry, geodesy, computer vision, and aerospace engineering) and furthermore, the needs for future developments were formulated.

Use of UAVs under legal regulations

In the keynote speech Roland Siegwart (Vice President Research and Corporate Relations and chair of the autonomous system lab ETH Zurich) gave a fascinating overview of autonomous navigation, positioning and collision avoidance and showed the trend towards the miniaturization of UAV systems. Currently available UAV platforms can already be used as measuring system for various mapping and monitoring applications. However, the operation of UAVs is limited by legal regulations. For example, in Switzerland autonomous flying model aircrafts with a take-off weight of over 30 kg require a particular authorization by the Federal Office of Civil Applications (FOCA). Furthermore, UAVs with a take-off weight of fewer than 30 kg can only be operated in restricted flight zones, line of sight and operated with a back-up pilot who can take over the control of the system at any time.

Fascinating live demonstrations

The experts were impressed by the live show at the airfield Birrfeld. During the demonstration various autonomously flying UAVs were presented, such as open source systems, fixed wings, a helicopter, multicopters, a blimp and a motorized kite. The best presentations of the live show were awarded with the “Most Innovative UAV Application and Demonstration - Award” sponsored by Hexagon

Technology Center/Leica Geosystems. The R-Pod system could persuade the jury due to the light take-off weight (500 g) and the flexible applicability. A quadrocopter (open source project MikroKopter) realized by a team of the Swiss College of Agriculture (SHL / BFH) was awarded with the second price, while the third price went to Ascending Technology for the Falcon 8 system.

Future research and developments will be presented at the conference UAV-g 2013 in Rostock (Germany).