

ISPRS Technical Commission V
Close-Range Sensing: Analysis and Applications

President: Jon Mills (UK)
Secretary: David Barber (UK)

Commission Website: <http://www.commission5.isprs.org/>
Symposium Website: <http://www.isprs-newcastle2010.org/>

1. 2010 Report of Commission V President

A. State of science and technology of Commission V topics

The individual WG reports below document the ongoing scientific and technological progress being made in the different fields of Commission V activity (note, ICWG I/V's report can be found in the Commission I Annual Report).

B. Accomplishments of Commission V during 2010

It has been another successful year for Commission V, with WG officers and members involved in a wide variety of activities, as documented in the individual WG reports provided below. Many thanks to all the WG Officers for their tireless scientific and organisational efforts throughout 2010, in particular their input to the successful Commission V Symposium (reported in a recent edition of ISPRS Highlights and elsewhere in the literature) and for submitting comprehensive reports in good time for compilation of this Annual Report.

C. Other relevant information

WG V/5 has reported that no WG activity occurred during the last year and is currently discussing the future viability of the Working Group. A decision on the future of the WG will be made early in 2011.

D. Commission Officer Address Updates

Up-to-date addresses and contact details for all WG officers is provided on the Commission V website and also on the ISPRS homepage at http://www.isprs.org/technical_commissions/wgtc_5.aspx. Persons who wish to participate in Commission V activity should make contact with the relevant WG Officers, listed together with their respective WG reports, below.

Jon Mills; Newcastle University, UK

2. Working Group activities during 2010

WG V/1: Vision metrology - best practice, systems and applications

Chair: Stuart Robson (UK)
Co-Chair: Jean-Angelo Beraldin (Canada)
Co-Chair: Thomas Luhmann (Germany)

A. State of Science and Technology of Working Group Topics

Our last report, made in November 2009, described the increasingly mature nature of non contact optical 3D measurement systems and its supporting community. This report directs those interested in advances over the past year towards the published papers and programmes of:

January 2009: SPIE 3D Imaging Metrology; San Jose, USA.
http://spie.org/x648.html?product_id=799250

January 2009: Germany's Oldenburger 3D-Tage; Oldenburg, Germany.
http://www.fh-oow.de/institute/iapg/workshop/programm_2009.php

July 2009: Optical 3D Measurement Techniques; Vienna, Austria.
<http://info.tuwien.ac.at/ingeo/optical3d>

August 2009: SPIE Videometrics X; San Diego, USA.
http://spie.org/x648.html?product_id=820194

July 2009: *Coordinate Metrology Systems Conference, Louisville, Kentucky, US.*
<http://www.cmssc.org/agenda/index.php>

November 2010: UK Large Volume Measurement Conference; Chester, UK.
http://www.lvmc.org.uk/2010_presentations.shtml

The terms of reference of the Working Group are proving well founded as we focus our efforts towards establishing and promoting best practice in the use of an increasingly flexible range of measurement technologies. These terms can be found on our website (<http://www.commission5.isprs.org/wg1>).

B. Accomplishments of Working Group during 2010

There are many international meetings organised through both academic and commercial interests in this discipline. The working group seeks to actively support events through technical sessions, tutorials, presentations and paper reviewing. The following list detail events where the working group has made a contribution.

A major contribution of the Working Group for 2010 was to the ISPRS TC V Mid-Term Symposium, "Close range image measurement techniques" held in Newcastle upon Tyne, UK, from 22-24 June 2010. Stuart Robson and Angelo Beraldin contributed to very well attended pre-symposium workshops on laser scanning and close range photogrammetry. Angelo Beraldin gave one of the conference key-note presentations. We were able to support three oral presentation sessions at the Symposium and are extremely appreciative of the number of papers received to our working group for this event. Selected papers from the Symposium will be published in a future edition of the Photogrammetric Record.

12th – 16th July 2010: Coordinate Metrology Systems Conference, Louisville, Kentucky, US. This week long event is notable for its support from the US manufacturing industry, particularly Boeing. The programme from this year's event can be found at: www.cmssc.org/agenda/index.php. Included are papers on laser trackers, laser radar, comparisons with photogrammetry, fringe projection and 3D standards. Discussions are on-going for us to take a more active role in the next CMSC.

31st August to-3rd September 2010: BMVC, Aberystwyth, Wales. The British Machine Vision Association Annual Conference has strong overlap with the broad range of Commission III and V activities. This year there were several papers on bundle adjustment, calibration and real-time measurement capability that will be of interest to working group members. <http://bmvc10.dcs.aber.ac.uk/>

2nd - 3rd November 2010: UK Large Volume Measurement Conference, Chester, UK. LVMC is principally supported by Airbus with a sustained industry presence attracting some 200 attendees over two days. Stuart Robson made a presentation on the performance of a real-time web-camera photogrammetric system and contributed to a presentation on Airbus requirements for the non-contact measurement of wing surfaces. <http://www.lvmc.org.uk>

C. Working Group News

We are presenting and disseminating 3D industrial artefact datasets collected with state of the art optical systems so that researchers can assimilate and understand current capabilities and limitations. If you are interested in these data, please contact Stuart Robson.

We are also involved in the following meetings in 2011:

23rd– 27th January 2011: SPIE 3D Imaging Metrology, San Francisco, CA, USA. This event is convened by Angelo Beraldin and follows the success of its inaugural event held in January 2009. Co-organisers are Geraldine Cheok from NIST, Michael MacCarthy from NPL and Dr. IrichNeuschaefer-Rube from PTB. A key aim of the conference is to bring industry, national standards and academics together. A call for abstracts is out now with a deadline of 28th June 2010. See <http://spie.org/ei114>.

2nd-3rd February 2011: Germany's 10th Oldenburger 3D-Tage, Oldenburg, Germany. This event, coordinated by Thomas Luhmann, continues to demonstrate the strength of our discipline in Germany - so much for economic downturn! The 2009 Oldenburg 3D Days attracted 212 participants including 33 practical users; 22 service providers; 48 system suppliers; 107 university; and 22 companies in the exhibition, we expect the 2011 event to be just as strong. The Programme for 2011 is on-line: <http://www.fh-oow.de/institute/iapg/workshop/programm.php>.

WG V/2: Cultural heritage data acquisition and processing

Chair: Paul Bryan (UK)
Co-Chair: Bharat Lohani (India)
Co-Chair: Fulvio Rinaudo (Italy)

A. State of Science and Technology of Working Group Topics

The large number of papers submitted to and presented within the WG V/2 sessions of this year's TCV symposium in Newcastle, ably demonstrated that cultural heritage remains one of the most prominent, visible and successful applications for close-range photogrammetric and laser scanning technologies. As well as the increasing use of individual technologies, such as digital imaging, GNSS and a variety of point-based measurement systems, more are being combined together into single, smaller-format devices. Alongside application on a variety of platforms, including Unmanned Aerial Vehicles (UAV's), they aim to provide more efficient, cost-effective tools for recording, analysing, monitoring and documenting any heritage object be it a landscape, building or artefact.

Alongside higher resolution imaging sensors and gigapixel devices, 3D still and video cameras (employing dual lenses to capture stereo-imagery) and multi-light imaging techniques, range cameras appear set to enter the cultural heritage domain. Although currently expensive and of limited size and resolution, the ability to capture 3D image data in real-time appears an obvious benefit to heritage users. However a need still remains for software that is capable of both manipulating and processing the millions of 3D points that such technologies can generate, and more importantly turn them into products that can be satisfactorily employed by the end-user. Here the incorporation of 'point-cloud' processing engines directly within 3D CAD packages such as AutoCAD and Microstation, both of which are widely used across the heritage sector, is an encouraging step forward alongside the emergence of open-source systems for processing and editing meshed data. However as cost remains **the** limiting factor for wider scale use of close-range sensing platforms and data across cultural heritage projects, more low-cost imaging and scanning platforms as well as open-source software approaches are to be encouraged.

B. Accomplishments of Working Group during 2010

Continued emphasis has been placed on developing the working group website (www.commission5.isprs.org/wg2), promoting awareness of the working group through both existing and new members (currently standing at 60 from 24 different countries), and the organisation of and participation within related conferences:

- Gi4DM 2010 - "Geomatics for Crisis Management – co-organiser of conference on remote sensing and geo-information for environmental emergencies
- ISPRS TCV Symposium, Newcastle, UK 22-24 June 2010 - contribution of three oral and one poster session with thirty (30) submitted papers
- ISPRS Workshop on "Digital Preservation of Archaeological Heritage", Kanpur, 18-19 October 2010. Jointly organized by IIT Kanpur, ISPRS WG V-2 and University of Allahabad, the workshop attracted around 40 participants from India and neighbouring countries. It was structured on the line of presentations by experts so the participants could learn new technologies and their use for archaeological investigation, documentation and preservation. Currently, in India not many archaeologists are employing modern tools in their work and, therefore, this mode of workshop fitted well to the need of the country.

C. Working Group News

Meetings planned for the coming year include:

- WGV/2 Conference, The Kings Manor, York, UK, 17-19 August 2011;
- Participation within XXIII International CIPA Symposium, Prague, Czech Republic, 12-16 September 2011;
- ISPRS Congress 2012 Congress, Melbourne, Australia, 25 August – 1 September, both working group and themed CIPA/Australia ICOMOS sessions.

WG V/3: Terrestrial laser scanning and 3D imaging

Chair: Derek Lichti (Canada)
Co-Chair: Hans-Gerd Maas (Germany)
Co-Chair: Marco Scaioni (Italy)
Secretary: Pedro Arias-Sánchez (Spain)

A. State of Science and Technology of Working Group Topics

The past year has seen continued strong research activity in terrestrial laser scanning. Much of this has focused on applications such as forestry, structural monitoring, earth surface processes and indoor mapping. Recent activities in range cameras have focused on the modelling of the internal scattering phenomenon as well as sensor calibration.

B. Accomplishments of Working Group during 2010

Membership:

Excluding the executive (Chair, etc.) there are 48 working group members.

Conferences and Workshops:

The working group officers have been involved in many capacities (scientific committee member; session chair; keynote address) for several international conferences.

The next big event for the working group is the ISPRS Laser Scanning 2011 workshop to be held in Calgary, Canada. August 2011. Planning is well underway. The Scientific Committee has been assembled and the first Call for Papers was released in September 2010.

On-line Database:

The website for the on-line terrestrial laser scanning bibliography funded under the ISPRS Science Initiatives program was launched May 2010. The database contains 315 entries and the website features search capabilities.

Tutorial:

The Chair delivered two sessions (Optical active sensors – TOF & Phase-Shift Long-Range Sensors; Mobile Mapping Technologies) at the Commission V Symposium Tutorial Close-range Sensors and Technologies in June 2010.

C. Working Group News

Plans for the next reporting year include:

- Guest Co-Editor for a Special Issue of the Photogrammetric Record of selected papers from the ISPRS Commission V Symposium.
- Guest Editor for a Special Issue of Remote Sensing on terrestrial laser scanning.
- The 2011 Laser Scanning Workshop. The deadline for full paper submissions for double-blind review will be 1 April 2010.
- Entries will be continually added to the on-line database.

WG V/4: Image-based and range-based 3D modelling

Chair: Fabio Remondino (Italy / Switzerland)

Co-Chair: Jan Boehm (UK)

Co-Chair: Qing Zhu (China)

A. State of Science and Technology of Working Group Topics

3D modelling from image or range data is an increasing topic of interest in many research and applications fields. Procedural modelling is also gaining great success and the results are quite impressive, although generally artificial and not metric. The data and multi-sensor integration methodology is also receiving great attention as demonstrated by many recent scientific publications and it is the optimal surveying method, in particular for large and complex sites. Range-based approaches are still facing the problems of large data sets, software capabilities, automation in data editing and segmentation. Image-based approaches are instead still facing problems in dense image matching of large sites and automated orientation of complex image sequences. This implies that there is still a great amount of work to be done in the image- and range-based 3D modelling domain.

B. Accomplishments of Working Group during 2010

The WG has organized or participated in the organization of:

- Int. Summer School 3D Modeling in Archaeology and Cultural Heritage 2010, Durham University, UK - 17-20 June 2010;
- Tutorial "Heritage 3D" , 21 June 2010, Newcastle upon Tyne, UK;
- Tutorial "Close-range Sensors & Technologies", 21 June 2010, Newcastle upon Tyne, UK.

C. Working Group News

Forthcoming Events:

- Workshop 3D-ARCH 2011, 2-5 March 2011, Trento, Italy;
- SPIE Videometrics XI, 22-26 May 2011, Munich, Germany;
- Joint Workshop on 3D City Modelling & Applications, 26-27th June 2011 Wuhan University , P.R. China.

Journal issue:

- Theme Issue "Terrestrial 3D modelling" on the ISPRS Journal of Photogrammetry and Remote Sensing, submission deadline: April 5th, 2011.

WG V/5: Image sensor technology

Chair: Ralf Reulke (Germany)
Co-Chair: Michael Chapman (Canada)
Co-Chair: Martin Smith (UK)
Secretary: Andres Luber (Germany)

A. State of Science and Technology of Working Group Topics

Not reported.

B. Accomplishments of Working Group during 2010

Not reported.

C. Working Group News

WG V/5 has reported that no WG activity occurred during the last year and is currently discussing the future viability of the Working Group. A decision on the future of the WG will be made early in 2011.

WG V/6: Close range morphological measurement for the earth sciences

Chair: Jim Chandler (UK)
Co-Chair: Simon Buckley (Norway)
Co-Chair: Dirk Rieke-Zapp (Switzerland)
Secretary: Rene Wackrow (UK)

A. State of Science and Technology of Working Group Topics

Not reported.

B. Accomplishments of Working Group during 2010

Working group V6 has continued to grow, now with 91 members. A significant change in management personnel occurred in January, with the replacement of Dr Greg Hancock by Dr Dirk Rieke-Zapp as a Working Group Co-Chair. The website <http://isprsv6.lboro.ac.uk/> has been regularly updated throughout the year and continues to receive 10-15 hits per day.

The working group managed two technical sessions in 2010. Dirk Rieke-Zapp (co-chair) coordinated a session at the European Geomorphological Union in Vienna in early May, entitled "High Definition Topography- Data Acquisition and Analysis" (<http://meetingorganizer.copernicus.org/EGU2010/session/3047/GM2%2C1>). Simon Buckley (co-chair)

organised the working group V6 session for the Midterm Symposium, held in Newcastle, UK in June. Both sessions were well attended with high-quality presentations.

Other notable outputs during the year include the Special Issue of the Photogrammetric Record (<http://onlinelibrary.wiley.com/doi/10.1111/phor.2010.25.issue-131/issuetoc>), which consisted entirely of papers by members of the working group V6, using material presented at the V6 session at RSPSoc 2009. In addition, the second draft of our "tips" document was produced (<http://isprsv6.lboro.ac.uk/tips.html>). It was particularly pleasing that we received inputs from two recently joined members working in the commercial arena, one based in Canada the second in Australia.

C. Working Group News

Plans for 2011 include a second session at the European Geophysical Union in Vienna in early April, coordinated by Dirk Rieke-Zapp. In addition, Jim Chandler is coordinating a session at the Association of American Geographers (<http://www.aag.org/cs/annualmeeting>) annual conference to be held in Seattle, also in April. The 5 session presentations have already been identified with contributions mainly from non-ISPRS aware presenters. Finally, the working group is considering organising a summer school to be held in late August in Switzerland.

ICWG V/I: Land-based mobile mapping systems

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

A. State of Science and Technology of Working Group Topics

In 2010, the ICWG V/I officers have been very actively involved in organizing or attending of ISPRS TC-I midterm symposium held in June 2010, Calgary, Canada and the ISPRS Workshop on Terrestrial Lidar: From Static to Mobile, held in October 2010, Zhengzhou, China, as well as the upcoming events in 2011, including the Joint International Symposium on Lidar and Radar Mapping in Nanjing, China, May 2011, 7th International Symposium on Mobile Mapping Technology (MMT'2011) in Croskow, Poland, June 2011 and ISPRS Workshop on Laser Scanning 2011 in Calgary, Canada, August 2011. All these events attempt providing forums for presenting the latest developments in land-based mobile lidar systems, including sensor modelling and calibration techniques, point cloud pre-processing techniques (hole filling and point cleaning, denoising), point cloud processing and geometric feature extraction towards 3D object reconstruction techniques; promoting R&D 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; and demonstrating innovative applications of land-based mobile lidar mapping systems in transportation, urban mapping, location-based services, and emergency and disaster management sectors. The experiences obtained in 2009 and 2010 have proved that the ICWG V/I terms of reference are well founded as we focus our efforts towards establishing and promoting best practice in the use of a rapidly growing mobile lidar mapping technology. These terms can be found on our website (http://www.commission5.isprs.org/icwg1_5/).

B. Accomplishments of Working Group during 2010

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 ISPRS International Workshop on Terrestrial Lidar: From Static to Mobile, jointly with WG I/3 and V/3, in Zhengzhou, China, 15-18 October 2010. Jonathan Li (Chair) served as Chair of the Scientific Committee and the Co-chair of the workshop. Qingquan Li, Antonio Tommaselli, and João Fernando Silva (ICWG Officers) and several ICWG members served as members. Almost all the lidar vendors setup their booth during the workshop. There were more than 40 (8 from overseas) attendants and almost 30 full papers were published in the Symposium Proceedings (DVD). Jonathan Li has been working on a proposal for

publishing the selected papers in a theme issue of PE&RS. The next series event is under planning and will be held in South Africa in 2012.

- All ICWG V/I officers served on SC of both the ISPRS TC I and V mid-term symposia to help reviewing submissions. In addition, Jonathan Li, Qingquan Li and Antonio Tommaselli attended the ISPRS TC I mid-term symposium held in Calgary, Canada, June 2010 to present their own research papers and chaired sessions.

Publications:

- The selection of 19 papers submitted to EOGC2009 have been peer reviewed and finally published by Springer in 2010 in a refereed book entitled *Advances in Earth Observation of Global Changes*. Jonathan Li serves as a co-editor (with Emilio Chuvieco and Xiaojun Yang), ISBN 978-90-481-9084-3, 283pp.
- A special Issue of The IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing (JSTARS) (IEEE: SCI/EI), entitled "Earth Observations and Remote Sensing for Environmental Management and Hazard Mitigation" including 10-12 peer reviewed papers from submissions to EOGC2009 will be published by the end of 2010. Jonathan Li serves as co-editor (with Xiaojun Yang).
- A theme issue featured *Geospatial Technologies for Disaster Management*, has published by International Journal of Applied Earth Observation and Geoinformation (Elsevier: SCI), 2010, Vol. 12, No. 6. Jonathan Li served as the Guest Co-Editor (with Rifaat Abdalla).

C. Working Group News

Upcoming events in 2011:

- 1) ICWG V/I will co-organize the International Workshop on Multi-platform/Multi-sensor Remote Sensing & Mapping, <http://www.mpmrsm2011.org/>, jointly with WG I/3, 10-12 January 2011, Xiamen, China. Qingquan Li serves as Co-Chair of SC, Jonathan Li serves as Co-Chair of LoC, Antonio Tommaselli, João Fernando Silva and several ICWG V/I members serve on SC. They have helped reviewing submissions.
- 2) ICWG V/I will be involved in co-organizing the International Conference on Sensors and Models in Photogrammetry and Remote Sensing (SMPR 2011), <http://www.smpr2011.com/>, jointly with WG I/4, May 18-19, 2011, Tehran, Iran. Jonathan Li and several ICWG V/I members serve on SC.
- 3) ICWG V/I will be involved in co-organizing the 3rd International Conference on Earth Observation of Global Changes (EOGC2011), <http://www.eogc2011.tum.de/>, jointly with WG III/5, ICA, IAG, ISDE, 13-15 April 2011, Munich, Germany. Jonathan Li serves as Co-Chair of SC, Antonio Tommaselli serves on SC. They have helped reviewing the extended abstracts.
- 4) ICWG V/I will co-organize the joint ICA/ISPRS/FIG International Symposium on LIDAR and Radar Mapping: Technologies and Applications (LIDAR & RADAR 2011), <http://www.lidar2011.org/>, jointly with ICA, FIG, IAG, and SPIE, 26-29 May 2011, Nanjing, China. Jonathan Li serves as Chair of SC and Editor-in-chief for a SPIE Volume, featuring *Advances in LIDAR and Radar Mapping: Technologies and Applications*, which will include 80 selected refereed papers. Qingquan Li, Antonio Tommaselli and several ICWG V/I members serve on SC.
- 5) ICWG V/I will be involved in co-organizing the 7th International Symposium on Mobile Mapping Technology (MMT'11), <http://www.mmtcracow2011.pl/>, jointly with other ISPRS WGs, FIG, IAG, ION, etc., Crakow, Poland, 13-16 June 2011. Jonathan Li, Qingquan Li, Antonio Tommaselli, João Fernando Silva and several ICWG V/I members serve on SC.
- 6) ICWG V/I will be 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.

In addition, ICWG V/I offers are also serving on SC of the following conferences:

- Jonathan Li and Qingquan Li: 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.
- Jonathan Li: ICA International Scientific Committee, 25th International Cartographic Conference (ICC 2011), www.icc2011.fr/, Paris, France, 3-8 July 2011.
- Jonathan Li: Technical Program Committee, 1st AfricaGEO Conference, <http://www.africageo.org/>, Cape Town, South Africa, 31 May to 2 June 2011.
- Jonathan Li: Scientific Advisory Board, 5th International Symposium on Advances in Science and Technology (5thSASTech), <http://www.5thsastech.khi.ac.ir/>, Mashhad, Iran, 12-18 May 2011.

Planned Events for 2012:

- 1) ICWG V/I will co-organize the 2nd ISPRS International Workshop on Terrestrial Lidar: From Static to Mobile, Cape Town (TBA), May 2012 (TBD).

- 2) All ICWG V/I officers will serve as session chairs in the XXII ISPRS Congress 2012, 25 Aug-1 Sep 2012, Melbourne, Australia.

Planned publications for 2012 and 2013:

- 1) Jonathan Li & Xiaojun Yang (eds.), 2012, "Mobile Laser Scanning: Techniques and Applications" (tentative), to be published by CRC Press/ Taylor & Francis, in July 2012, proposal under review.
- 2) Yang, X. and Li, J. (eds.), 2012 (expected). Advances in Mapping from Aerospace Imagery: Techniques and Applications, CRC, Taylor and Francis (in process).
- 3) Jonathan Li and Bruch King (eds.) 2012. Advances in Terrestrial LiDAR Techniques and Applications, Photogrammetric Engineering & Remote Sensing, April 2012.
- 4) Jonathan Li and Michael Chapman (eds.) 2013. Terrestrial Laser Scanning: From Static to Mobile, International Journal of Remote Sensing, March 2013.
- 5) Rifaat Abdalla and Jonathan Li (eds.) 2013. Geospatial Intelligence for Emergency Response, Photogrammetric Engineering & Remote Sensing, April 2012.