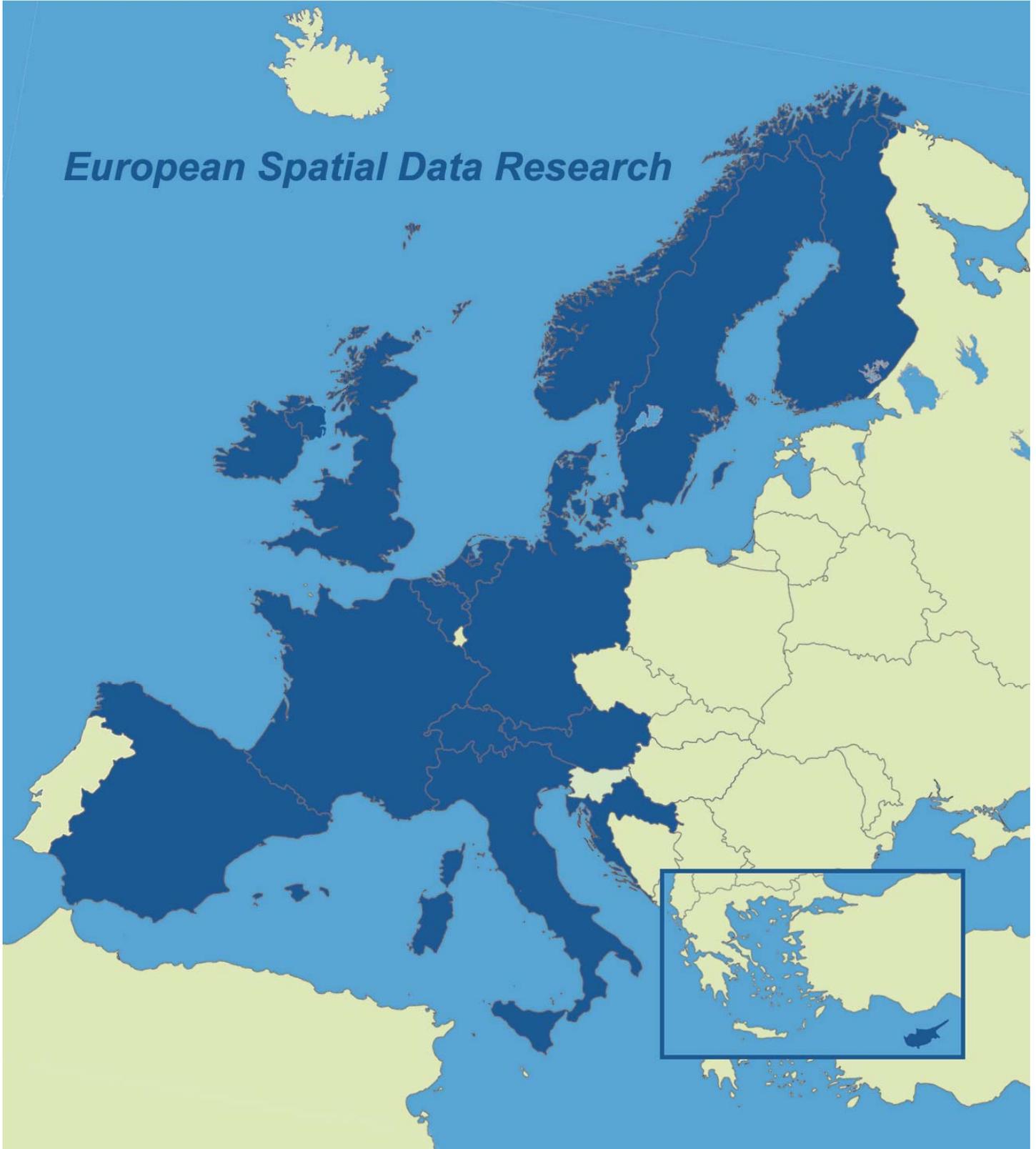




Annual Report 2011

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European Spatial Data Research



About EuroSDR

EuroSDR is a pan-European organisation established by International Treaty, as OEEPE, in 1953 in Paris in accordance with a recommendation passed by the Council of the Organisation for European Economic Co-operation. The spatial data research interests of European countries are represented through the membership in EuroSDR of national organisations from their production and research sectors.

The result is a network of delegates, from European Geographic Information organisations and research institutes, effectively and practically addressing Europe's spatial data research requirements.

Collaborative research projects address the acquisition, management and delivery of spatial data and services while international workshops and courses, in collaboration with related organisations, address key issues in a timely and focussed manner.

Our Member States and their Prime Delegates (2011)

Austria	Michael Franzen	Bundesamt für Eich- und Vermessungswesen (BEV)
Belgium	Ingrid Vanden Berghe	Nationaal Geografisch Instituut - Institut Géographique National
Croatia	Željko Hećimović	State Geodetic Administration
Cyprus	Christos Zenonos	Department of Lands and Surveys
Denmark	Thorben Brigsted Hansen	Kort & Matrikelstryrelsen
Finland	Risto Kuittinen	Geodeettinen Laitos
France	Jean-Philippe Lagrange	Institut Géographique National
Germany	Dietmar Grünreich	Bundesamt für Kartographie und Geodäsie
Ireland	Colin Bray	Ordnance Survey Ireland
Italy	Fabio Crosilla	University of Udine
Norway	Jon Arne Trollvik	Statens Kartverk
Spain	Antonio Arozarena	Instituto Geografico Nacional
Sweden	Anders Olsson	Lantmäteriet
Switzerland	Francois Golay	Ecole polytechnique fédérale de Lausanne (EPFL)
The Netherlands	Jantien Stoter	Technical University of Delft and NL Kadaster
United Kingdom	Malcolm Havercroft	Ordnance Survey of Great Britain

Our Vision is to be the **European research platform** for National Mapping and Cadastral Agencies, Academic Institutes, the Private Sector, Industry and User Groups on issues related to the implementation of technology developments with respect to optimising the provision (collection, processing, storage, maintenance, visualisation, dissemination and use) of reference information (data serving as a spatial framework for organisations involved in monitoring, management and development) in a Geoinformation Infrastructure (GI) context.

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Message from the President

Jean-Philippe Lagrange

In this foreword, my second and last, I would like to stress the importance of maintaining and developing the activities of EuroSDR, specifically the projects that gather NMAs, academics, and private sector stakeholders to jointly work on R&D topics of common interest. This is crucial in a time of accelerating integration within Europe, noticeably within the framework of INSPIRE, of increased usage of geographic information for various decision making activities, and also of budgetary constraints that make cost sharing and innovation all the more desirable.

We were quite successful in that many leaders of the private sector came to our meetings to give keynote speeches of great interest. This is a very good development. The next step will consist in enhancing their participation in benchmarking projects, which are typical of EuroSDR, in partnership with other organisations when needed.

This leads me into another very important point: EuroSDR is one of several, European or international, organisations which deal with research issues related to geographic information provision. We are about to formalize our relationship by signing memoranda of understanding with several such organisations: the International Society for Photogrammetry and Remote Sensing (ISPRS), the International Cartographic Association, AGILE and EuroGeographics. It is worth noting that this goes along with the development of joint projects. In correlation with ISPRS we have been able to accomplish the following: the implementation of the shared distribution of an e-Newsletter; the organisation of discussions regarding joint approaches in terms of standardisation; the organisation of a joint workshop with OGC on UAVs; the preparation of dedicated EuroSDR sessions that will occur during the forthcoming ISPRS Congress in Melbourne; and two joint projects are being set-up on pattern recognition and GI for disaster management. Similarly, a project on the “Use of Crowd-sourced Data for Up-date Intelligence

and Meta-Data Enrichment of National Mapping” started in partnership with AGILE, while the “Persistent Test Bed” project is currently being developed in partnership with AGILE and OGC. Another welcomed development is the strengthening of ties with EuroGeographics, exemplified by our joint approach to the European commission, in part-

nership with AGILE, to discuss the Green paper on research and innovation funding. This will certainly be pursued while Horizon2020 is still in the making.

Our context is evolving rapidly due to the development of new sensors both ground-based or aerial-based, the new approaches to data collection and the ever-changing Web and its related implications on data processing, management and access. Add to this the societal demand for more up-to-date, if not real-time, geographic information and the INSPIRE directive implementation, and you can foresee many changes in the near future. They include: fast processing of heterogeneous large volumes of data; the development of 3D data availability; the updating of very large data bases; new approaches for fast change detection; qualification and integration of heterogeneous geographic information, etc. This certainly justifies an increased investment of our members in R&D, and more interest in such activities from all stakeholders.

After eight years of managing the secretariat, our colleagues from DIT, Kevin Mooney and Oonagh Birchall, passed the torch to Joep Crompvoets and Anneke Heylen from KU Leuven. We are all grateful to our colleagues from the Dublin Institute of Technology (DIT) for the superb job they provided in the last eight years. Mike Jackson, now the new president of AGILE, stepped down as chair of commission V, who is replaced by Lars Bernard. Again we are quite grateful for the contribution of such a prominent researcher as Mike Jackson over the course of his tenure as chair of commission V during which he introduced many new topics. Last but not least, Anders Ostman, who chaired the Intercommission Working Group on Education and managed the Eduserv eLearning course series, also stepped down and is followed up by Marketa Potuckova. Anders was successful in maintaining Eduserv through the difficult times pertaining to the current economic crisis, a success for which we have to thank him, as he showed that there is a definite interest in such high-end eLearning sessions.

Several commission chairs will change in 2012. My term ends in May and then Thorben Hansen will start his term as the President of EuroSDR. I am confident that this influx of new blood combined with the above context, and with our Vice-President’s energy will result in the launch of even more new activities within EuroSDR.

Jean-Philippe
Lagrange
President
EuroSDR



Message from the Vice-President

Dieter Fritsch

2011 has been another remarkable year for EuroSDR. It started with the preparations for the executive management team meeting at the Dublin Institute of Technology (DIT) on February 15, 2011. At this meeting we had an open discussion about the succession of Kevin Mooney, EuroSDR Secretary General, who decided to step down in October 2011 after serving successfully for eight years. Furthermore, we decided to bring Lars Bernard on-board as successor of Mike Jackson, Chairman of Commission V and began to look for a successor for Anders Ostman, the EduServ Chairman. As is always the case during EuroSDR Executive Team meetings, the spirit was very constructive, in spite of a very dense agenda. Thanks to Kevin and Oonagh for hosting us at DIT.

I was invited by AGILE for a discussion with its Council during the 2011 AGILE Conference in Utrecht, April 19, 2011, arranged by Mike Jackson. After giving a talk about EuroSDR activities, we figured out the mutual interests of both European bodies and decided to cooperate closely in near future. Thanks to Lars and Mike for their support in bringing together EuroSDR and AGILE.

The EuroSDR Spring Meeting took place in Vienna, Austria, at the Bundesamt fuer Eich- und Vermessungswesen (BEV) from May 18-20, 2011. Local organisers Michael Franzen and Norbert Pfeifer provided all that was necessary for a smooth and successful meeting, thank you. As always, on Wednesday afternoon the host country delivered a brief excerpt about its geospatial activities, which was really impressive. Not to be forgotten was the Welcome Reception of the Vienna City Administration in the famous City Hall. It was a remarkable social event. A milestone at this meeting was the nominations of the candidate for EuroSDR Secretary General, Joep Crompvoets of KU Leuven and the Chairman of Commission V, Lars Bernard of TU Dresden. The keynote addresses included: Dietmar Gruenreich, outgoing President BKG Frankfurt/Main who covered the "Challenges of the Implementation of European and International Spatial Data Infrastructures" and Lars Bernard who talked about "From SDI 1.0 to SDI 2.0". In Vienna, two new EuroSDR projects were proposed: the joint EuroSDR/AGILE project on "The Use of Crowd-Sourced Data for Update Intelligence and Metadata Enrichment of National Mapping" (Peter Mooney/Jeremy Morley) and "3D Data Management in Urban Areas" (Volker Walter).

On May 23, 2011 a joint delegation of EuroGeographics, AGILE and EuroSDR met Patricia Reilly,

Member of the Cabinet of Commissioner Maire Geoghegan-Quinn, EU Commissioner for Research, Innovation and Science. Mike Jackson & Danny Vandembroucke (AGILE), Ingrid Vanden Berghe & Dave Lovell (EuroGeographics) and Jean-Philippe Lagrange & Dieter Fritsch (EuroSDR) submitted a short written contribution entitled "Towards a Common Strategic Framework for EU Research & Innovation Funding". Originally, there was a plan to draft an official paper to submit to the commissioner in late Autumn, but unfortunately this paper is still missing. Therefore, there is still room to improve the mutual cooperation between the three geospatial bodies within Europe.

In May 2011 EuroSDR was co-organiser of the very successful workshop on "Web Cartography" in Lund, Sweden. Thanks to Ulf Sandgren, EuroSDR Commission IV Chairman, for his continuous support.

Another EuroSDR Highlight was the Special Theme Session embedded in the ICC 2011 Congress, Paris, of the International Cartographic Association (ICA) on July 6, 2011. Over 150 participants learned about the EuroSDR activities in several fields of geospatial data collection and management. A pre-event of ICC 2011 was the tutorial on "Automated Generalisation", July 2, 2011, co-organized by EuroSDR and ICA. My sincere thanks go to Jantien Stoter for her support.

I had the pleasure to invite the EuroSDR Executive Management Team for a meeting in Stuttgart on Sept. 3, 2011. After enjoying the "Stuttgart Weindorf" as a pre-social event, we all enjoyed the closed meeting in an open spirit with the ISPRS President Orhan Altan, at which we decided to cooperate more closely with ISPRS. Some talks with industrial partners followed during the 53rd Photogrammetric Week with the aim to engage them more actively in the EuroSDR business.

Fabio Crosilla and Alessandra Benvenuti organised the EuroSDR Autumn Meeting in Udine, Oct. 26-28, 2011. This meeting was held in stimulating atmospheres and we were all impressed by the Italian activities in the business of geospatial data infrastructures (Wednesday afternoon talks) and by the two keynote speeches. Neil Ackroyd, OS GB introduced "To be advised but concerning an enhanced production workflow to meet the demands of geo-spatial information generation as part of Olympics 2012 preparations" and Tobias Binz talked about "Cloud Computing". A result of this talk was that EuroSDR delegates decided

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Dieter Fritsch
Vice-President
EuroSDR



to get an update once a year about UAV applications and cloud computing. The first EuroSDR/ISPRS joint project on “Pattern Recognition” was launched and was introduced by Wolfgang Foerster. We should not forget to mention the excellent dinner in the Italian restaurant close to the Castle overlooking Udine and the walk at night. Thanks to Alessandra and Fabio for all the efforts to organise these unforgettable meetings and social events.

Last but not least another quite successful joint workshop on “3D Cadastre” was held in Delft (November

16-18, 2011). It was organised by EuroSDR, FIG and TU Delft and attracted about 80 participants from all over the world. Thanks to Jantien Stoter and André Streilein for representing EuroSDR in this workshop.

In summary, I would like to state that it is clear EuroSDR has become more visible and active in 2011 than in previous years. This is a trend we plan on continuing in 2012.

Message from the Secretary-General

Joep Crompvoets

During the EuroSDR Board of Delegates meeting in Udine (end of October 2011), I took over the role of the Secretariat-General from Kevin Mooney. He and his assistant, Oonagh Birchall, had put a lot of effort to make EuroSDR as it is now, a mature organisation addressing effectively and practically Europe’s spatial data research requirements. I am very impressed with their dedication and enthusiasm for making this organisation so strong. During the last 8 years, they committed themselves to organising the Executive team and Board of Delegates meetings, writing the newsletters and annual reports, managing the EuroSDR website, supporting the Eduserv workshops, etc. In addition, they contributed also to the transition from OEEPE to EuroSDR.

Before I took over, I was already involved in EuroSDR’s activities. For example, I was the co-principal of the research project “INSPIRE Atlas of Implementation methods”. As the new Secretary-General, I want to contribute even more to this organisation. I think that this position gives me an opportunity to become more informed about the latest developments regarding spatial data research issues across Europe, to be more involved in international projects/activities, and to meet the international key players of European and International organisations in this domain, such as ISPRS, ICA, GSDI, EuroGeographics, AGILE and OGC. In my role as Secretary-General, I would like to achieve the following:

- to strengthen the links of the national mapping and cadastral agencies with research institutes and universities for the purpose of applied research in spatial data acquisition, management and delivery;
- to contribute shaping the future of spatial data production, man-

agement and service delivery in Europe;

- to widen the scope of topics with non-technological issues such as legal, financial, organisational, and public administrative ones;
- to strengthen the links between the different EuroSDR-working groups and taskforces;
- to establish a network of researchers by (co-) organising workshops and learning courses;
- to facilitate a platform for organising the annual series of short distance learning courses;
- to improve the visibility of EuroSDR;
- to enlarge the number of EuroSDR-members and memberships;
- to make bridges with other spatial data application domains (such as planning, environment and transport);
- to initiate new relevant research topics;
- to update the research plan;
- to contribute to the EuroSDR Newsletters and annual report;
- to contribute to the publications of the official series of reports;
- to arrange the daily administrative and financial matters, and day-to-day organisational development, business development, marketing and information dissemination; and
- to organize successful meetings of the EuroSDR Board of Delegates and Executive Teams.

In order to achieve this all and run the EuroSDR secretariat, I will have the support of my colleague Anneke Heylen. Anneke is also employed at the Public Management Institute of Leuven University and is committed to making the future of EuroSDR even stronger. On behalf of Anneke and myself, I would like to express that we look forward to cooperating with you in the near future in developing a stronger EuroSDR community.

Joep Crompvoets
Secretary-General
EuroSDR



Sensors, Primary Data Acquisition and Georeferencing

Michael Cramer

The activities related to the EuroSDR commission I in year 2011 exemplarily could be used to illustrate the current variety of systems and technologies in primary data acquisition: in the case of airborne imaging the well-known, large format, sophisticated, high-end digital imaging systems are only one part of the spectrum. Now smaller format, light-weight not only sensors but fully equipped, completely autonomous or remotely controlled unmanned platforms (UAV) are completing the spectrum. They may be used for more flexible, and perhaps unconventional, projects for smaller area application and thus may supplement the other sensors.

One of the most recognisable activities in the UAV field in 2011 was the UAV-g (Unmanned Aerial Vehicles in geomatics) meeting organised by the Institute of Geodesy and Photogrammetry (IGP) at ETH Zurich and supported by ISPRS Working Group I/V and EuroSDR. This meeting was organised for the first time; nevertheless it already attracted about 220 attending scientists, users, delegates of government authorities and manufacturers 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. This transfer of experience and user relevant knowledge also was the motivation to open the conference with a one-day pre-conference tutorial.

Still it is very interesting to see, that besides this – a science-oriented UAV-g meeting – UAV is “en-vogue” also from the application oriented point of view. This especially was highlighted at the last Intergeo Nuremberg, Germany in October 2011. UAV was the main issue on this year’s Intergeo and with that the new “eye catcher”. UAV clearly took the role of mobile mapping, which was the main focus of previous years at Intergeo. Currently available UAV platforms can al-

ready be used as measuring systems 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 specific authorisation from 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.

However, there is not only the discussion of flight regulations, all this UAV-technology is also increasing in acceptance from the user’s and also from authorities’ perspectives. It should be noted that the first national mapping agencies already showed interest in this technology. This is definitely not to get rid of the standard large format sensors but rather to support their work, especially when there are special applications with limited region size or strong time or other limitations.

But besides all this progress in UAV, the major focus in airborne data acquisition is still on the improvement of large format cameras and other sensors. This especially was highlighted in the most recent Photogrammetric Week 2011 in Stuttgart, Germany, where the issue of “Multi-ray photogrammetry meets advanced LiDAR” was discussed. It was interesting to see that there are improvements not only on the imaging and LiDAR hardware, but also processing concepts and software, which finally allow for supplementary use. There also has been a fusion of products, such as point clouds, derived from both image matching and LiDAR. For sure, the most recent sensors, like the new Vexcel UltracamEagle imaging sensor flagship now providing 260 Mpix, following the syntopic imaging concept and for the first time with an exchangeable lens system, have to be highlighted. Different to this, Intergraph/ZI’s system DMC II 250 now provides up to 250 Mpix pan images from one single monolithic CCD, which is different from the concept of merging smaller format CCD frames in order to derive a large format but virtual image. This DMC II 250 is using the world’s largest CCD frame sensor in

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serial production.

But besides this, there also is quite some progress in the so-called “medium-format sector”, which now is reaching up to 80 Mpix per camera head and offering improved image quality due to forward motion compensation concepts and, in the case of the Leica Geosystems RCD30 parallel RGB and NIR, image acquisition.

This also shows the increased role of multi-spectral data acquisition, which now merges the former clearly separated worlds of geometrically focused photogrammetry and remote sensing relying on multi-spectral data classification. Radiometry in general is increasing in importance, as it already was analysed within the EuroSDR project on “Radiometric aspects of digital photogrammetric images”. This project was completed in 2011.

It is interesting to note that Intergraph/ZI and Leica Geosystems are now both part of the Hexagon group. With that, two former competitors – following two different product philosophies – are now partners. It will be interesting to follow how this will influence their future product lines and software chains.

For sure other EuroSDR activities, like developments of standards for sensor calibration and validation and discussions on certification of such systems, have been continued in the year 2011. As experience has shown, it has to be seen as more long term activities which will continue in the next years also. It would be interesting to see which other activities will be part of the future of EuroSDR commission I activities, continuously serving the link between recent developments in science and their later practical applications. Any future support or even active participation is cordially invited.



Figure 1: Most recent UAV systems during flight tests at the UAV-g 2011 conference at ETH Zurich (© www.geometh.ethz.ch/uav_g/).



Figure 2: CCD frame sensors from DALSA used in the DMC II camera set-up. The large format monolithic 250 MPix pan-chromatic chip (right) and the smaller format 40 Mpix CCD frames (left), where one is used for each of the four MS bands. (© Neumann, 2011).

Image Analysis and Information Extraction

Norbert Pfeifer

Commission II is concerned with the automatic extraction of geospatial information from airborne and satellite images, but also includes dynamic acquisition from mobile, ground-based systems for the automatic reconstruction of façade information and urban furniture. Three projects are currently at different stages of execution: mobile mapping with laser scanners, dense aerial image matching for Digital Surface Model (DSM) derivation, and forest border delineation and classification.

The project “Road Environment Mapping using Vehicle-based Laser Scanning” is lead by the Finnish Geodetic Institute (FGI), Department of Remote Sensing and Photogrammetry. The objective is to investigate the quality of the extraction of building planes, single trees, poles, the terrain model, i.e. the street surface, the curbstone, road markings, and other elements of the road environment. Five systems were investigated, driving along a predefined route in Espoonlahti in Finland. All systems are comprised of a navigation unit using Global Navigation Satellite and Inertial Measurement Systems (GNSS and INS) and a number of laser scanners. The scanners measure the distance from the mobile platform to objects along the beam while the car is moving forward. The point cloud acquired differs notably between the systems, the density, e.g., depends on the laser pulse repetition rate, but also depends on driving speed and distance from the scanner. A density of several hundreds of points per square-meter at the road is a typical value. The laser range finding methods also differ in how they behave with small targets, e.g. single leaves of vegetation, and their reflection properties of snow or wet streets. Thus, the purpose for acquiring a mobile laser scanning point cloud, as well as the time of acquisition (vegetation state) needs to be kept in mind.

Reference data was acquired by terrestrial laser scanning, i.e. in a static mode, see figure 3. This served for checking the accuracy of point clouds acquired dynamically. Extracted features were evaluated against the dynamically acquired point clouds by visual interpretation.

While the quality of the point cloud depends on the navigation solution and the laser scanner itself, one of

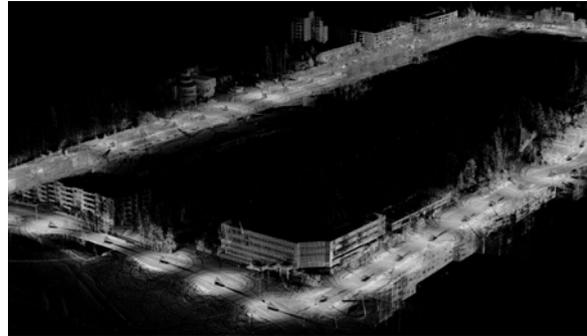


Figure 3: Reference data set for the mobile laser scanning benchmarking project, acquired by static terrestrial laser scanning [<http://www.fgi.fi/mobimap/testfield.html>].

the most influential factors noted during the test was the calibration of the multi sensor system (GNSS, INS, laser scanner). The planimetric accuracy for each of the systems was compatible with its specification and did not exceed 5cm for distances smaller than 30m. This is also true for the elevation.

The automatic extraction of façades, poles, and tree trunks was studied at FGI, ITC in Enschede (University of Twente), the University of Waterloo, and the University of Stuttgart. The detection rate depends on the distance of the object to the trajectory of the vehicle, but also on the algorithm applied. For objects at a favorable distance and appropriate size, e.g. lamp posts, the correct detection rates can be beyond 90%. The project is currently being finalised.

The project “Benchmarking of Image Matching approaches for DSM computation“ is lead by IGN France. With the advent of new algorithms for very dense matching, also applicable to photogrammetric aerial imagery, the automatic updating of detailed digital terrain models appears to become feasible. Within this project, the performance of different algorithms for matching shall be compared, taking into consideration the requirements of NMAs. The imagery provided is over different sites, includes frame and three line cameras with given orientation parameters, and the ground sampling distance lies between 8cm and 50cm. An example of the matched DSM is given in Figure 4.

From February 16-17, 2012, a workshop was held in

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Norbert Pfeifer
Chairman
Commission II

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Vienna in order to understand the needs of the NMAs and discuss the first results.

The project “Forest border delineation and tree type classification” was approved at the 119th EuroSDR meeting in Udine. The initial round of imagery and laser scans will be made public and the requirements of NMAs for the spatial data sets on vegetation will be analysed. In the second round, different algorithms will be tested against reference data.

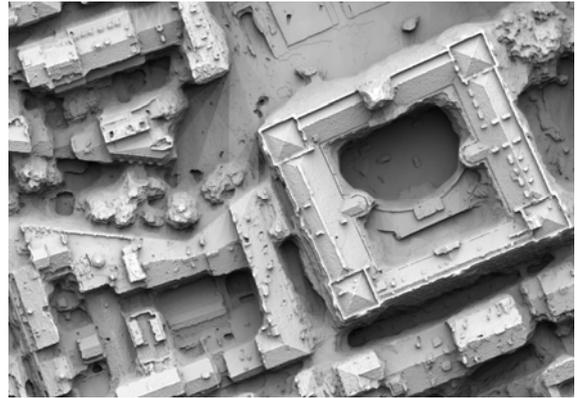


Figure 4: Detail (Marseille) of the matched DSM from images with high overlap [<http://eurosdrcbenchmarkofimagematching.ign.fr/Results-IGN.pdf>].

Production Systems and Processes

André Streilein

In 2011 the activities of Commission III were focused on rising awareness, and on networking and capacity building in new fields of research, such as change detection, 3D landscape models or the archiving of digital reference data. A number of workshops, projects, and two working groups document these activities.

Crowd Sourcing for Updating National Databases

Based upon the results of the 1st EuroSDR Workshop on Crowd Sourcing for Updating National Databases, held at the Federal Office of Topography (Swisstopo), Wabern, Switzerland on August 20-21, 2009, a joint EuroSDR/AGILE project on “the use of crowd-sourced data for up-date intelligence and meta-data enrichment of national mapping” begun.

In most cases the quality of volunteered and crowd-sourced data is not audited prior to being made accessible to the wider public and the data varies significantly in terms of its geometric quality and its semantic consistency, in terms of its comprehensiveness of coverage, and in terms of its currency. In this context it compares poorly with the authoritative data capture and mapping undertaken by national mapping agencies. However, despite these shortcomings, crowd-sourced and volunteered data is in many cases more up-to-date than the authoritative source of information, incorporates features of interest not covered by mapping agencies, and is broader and richer in the metadata captured. Crowd-

sourced data is, almost by definition, data linked to where people are carrying out their everyday lives and related to things that are of interest or importance to them. It is people-centric data and can enrich the authoritative data sources if a means can be found to relate the two data flows in a systematic manner. This project addresses the issues at two levels (1) by undertaking research scoping and definition projects through interns supervised by academic staff, and (2) by encouraging debate and communication through a program of workshops and e-communications and learning.

The project is led by Peter Mooney, National University of Ireland and Jeremy Morley, University of Nottingham. The kick-off for this project was a workshop on crowdsourcing on January 19-20, 2012, in Nottingham.

3D Data Management in Urban Areas

The small series of workshops on “3D Digital Landscape Models - From 2D cartographic to 3D topographic data” (11th to 12th March, 2010, Dublin, Ireland and 29th to 30th November 2010, Munich, Germany) dealt with the opportunities and challenges of migrating 2D cartographic data to 3D topographic data, fusion of 2D and 3D data, positional accuracy improvement, and the definition of 3D country-wide models.

One of the outcomes of these workshops was a EuroSDR project on “3D Data Management in Urban Areas”. This project will identify the requirements of 3D data management for National Mapping and Cadastral Agencies and

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deficits in existing GIS software products, it will make suggestions to software manufacturers and research tasks. The project will consist of three phases: a survey amongst EuroSDR members, a performance test with different software systems and a final project report. The project is led by Volker Walter, University of Stuttgart.



Figure 5: Example for a 3D topographic landscape model with DTM and Orthophoto in Central Europe.

European Archiving Working Group

Geo-spatial organisations across Europe face similar challenges in archiving data for public access under recent Freedom of Information legislation. A collaborative approach is proposed in preference to unilateral publication of archiving policies.

By utilising interdisciplinary experts from across Europe in discussions with geo-spatial stakeholders, it is hoped that consensus on best practices and combined learning can be achieved to inform beneficial adoption and practical implementation of legislative obligations. Some of the key issues that require investigation and resolution in order to facilitate consistent adoption include:

- Definition and application of public records to geo-spatial records;
- Formulation of data archiving policies;
- Which geo-spatial data should be archived and why;
- Data management and structure;
- Technology challenges – both for storage and access – also succession;
- Which data formats are appropriate for archiving;
- How migration of data should be managed;
- Archival models – internal and external drivers and solutions;
- Distributed national archives;
- Assessing data value – commercial impact, IPR and non-financial values.

The working group is led by Paul Mason (OS GB) and

has 12 active members from 8 different countries. The membership includes both data and archive specialists. An inaugural meeting took place on 17-18 November 2010 in Southampton. The objective of the meeting was to understand the challenges that we all face and to identify the key topic areas that we need to focus on in future activities. The work was continued during the 2nd meeting on March, 14-15, 2011 in Munich and a 3rd meeting on September, 14-15 in Bern. The input from the participants was substantial and the output of the working group, a policy paper on archiving of geo-spatial datasets with an ordered list of principles, was finished by the end of 2011.

It is intended to start a revision/comment/approval process with EuroSDR, Eurogeographics and EBNA (European Board of National Archivists) by the beginning of 2012. The feedback will be collected by the end of March 2012 and a proposed breakout session at the EuroSDR spring meeting in 2012 will then consolidate the results. A final meeting of the working group to review and discuss comments as well as updating the paper is planned between May and September 2012.

Working group on “Common goals and requirements for NMA’s in change detection”

In March 2010 EuroSDR and Ordnance Survey Great Britain organised the 1st EuroSDR Workshop "Automated change detection for updating national databases" to baseline research and to provide a stimulus for practical implementation of automated change detection methodologies. The objectives were:

- Baseline the current state of automated change detection research;
- Identify the common needs of NMCA's;
- Highlight best practice, current technology or case studies of practical implementation;
- Identify routes through to wider implementation.

Based on the outcome of this workshop it was decided to create a working group with individual members of EuroSDR in order to define the common goals and requirements for NMA's in change detection. The elaborated white paper will then act as the basis for a NMA testbed for change detection, where research and industries can show their degree of success and get clear directions for expected improvements.

The working group is led by Isabelle Sargent (OS GB) and currently has 8 members from 8 different countries. Two meetings were held since the kick-off meeting in November 2010. A smaller subgroup of this working group prepared a first draft of this white paper to be circulated amongst all members of the work-

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ing group. Once this review process is done a proposal will be made to the EuroSDR steering committee for further actions.



Figure 6: Automatic extracted forest and trees compared with existing map information.

2nd International Workshop on 3D Cadastres organized by FIG, EuroSDR and TU Delft

Following a successful 1st International Workshop on 3D Cadastres workshop in November 2010 the second workshop held on 16-18 November 2011, at the TU Delft, The Netherlands, emerge its existence from the need to evolve from “if” to “how” and make further progress on the subject. As 3D technology transitions from a purely technical tool into a decision making tool in the hands of all stakeholders, 3D is now being used in a wide range of applications like architecture, communications, town planning, security, design and transport. The increasing popularity of 3D needs for high definition data along with information on rights, use, and value in complex spatial and/or legal situations. It is difficult to reflect the vertical dimension of the legal status of real estate objects, which may be important in current cadastres with most 3D relationships registered administratively, as an attribute of defined parcels, using condominium or strata title legislation.

Since Cadastres aim at registering legal status and property right associated to land, it needs to progress towards a better cadastral management as well and prevent registration complications in the future. Despite all research and progress during the last decade, still no country in the world has a true 3D cadastre, and the functionality is always limited in some manner (e.g. only registering of volumetric parcels in the public registers, but not included in a 3D cadastral map, or limited to a specific type of object with ad hoc semi-3D solutions, for instance, for buildings or infrastructures). The aim of the Workshop on 3D Cadastres is to consider the 3D issue of cadastral registration in an international context.

The objective of the workshop was to have a fruitful exchange of ideas and to address further the technical, organizational and legal aspects by sharing best practices.

This workshop included participants from 41 countries, allowing a range of sectors to be represented including governmental, public sector, universities, consulting institutes etc... The workshop addressed in particular: land registrars (lawyers) for the institutional matters of law and regulation concerning 3D and for the registrative part of the cadastre; geodesists (surveyors) for the geometric part of the cadastre; ICT professionals for the ICT-tools to deliver support for the registration process; decisions makers who are confronted with cost-benefit aspects of implementing new solutions taking into account the specific circumstances of the country concerned.

The main outcomes of the second workshop show that the level of sophistication of each 3D cadastre will in the end be based on the user’s needs, land market requirements, legal framework, and technical possibilities, but a good framework will ease the communication and implementation of 3D cadastre. Semantics and the lack of a common definition for a 3D cadastre proved to be indeed a major impediment to make summarisations. A good idea would also be to provide more time, as the time allocated for the working sessions was not enough to discuss all the agenda points.

The recommendations of the workshop sessions also clearly point out the importance of:

- Having an interoperate approach regarding data accessibility and sharing;
- User’s requirement analysis;
- Definition of 3D cadastre parcel and the need for a kind of dictionary to explain the clear and unambiguous meaning of terms;
- An inventory of successful cases and encountered problems to provide support;
- To present the benefices of having 3D cadastre implemented for various stakeholders.

Data Specifications

Ulf Sandgren

The development of specifications for spatial data faces several challenges. For a long time we have been developing cartographic models, which have made it possible to describe the real and complex world appropriately for specific purposes. However, this means that the structure of data, scale and layout of a map normally only fits a limited number of cases. Nowadays, the demands for interoperability between different data themes, different organisations, and different levels of detail make it even more demanding to work out data specifications that support the use of spatial data for many different purposes.

Inspire

Several experts from EuroSDR member organisations are deeply involved in the development of INSPIRE Implementing Rules. In the last two years, nineteen Thematic Working Groups have been developing specifications for Annex II and III data themes. These were distributed for review and testing in June 2011. When the consultation ended in October the Commission had received 6,192 comments from 160 different organisations. This clearly shows the heavy commitments in INSPIRE.

In order to help concerned organisations to understand the transformation process, availability of software tools, and to facilitate the sharing of the experiences from testing activities, a dedicated INSPIRE Testing Forum has been set up. EuroSDR has been directly involved in the development of testing methods. This work is partly based on a joint commission IV and V initiative on the performance testing of GI services and outcome from work within the Persisting Test Beds (PTB).

Generalisation

Based on results from the generalisation project, which was led by Jantien Stoter of ITC, a tutorial arranged by EuroSDR took place during the ICC Conference in Paris in July 2011. The project included an investigation and comparison of applications and methods that support the generalisation of geodata. The project report gives a clear picture of the current status concerning the possibilities the use of automatic methods generates for filtration and the generalisation of spatial data.

Multiple representations

An important field for research and development is the multiple representations of spatial data. Already a couple of years ago EuroSDR initiated a project proposal on Multiple Information Representation and Consistent Logical Environment (MIRACLE) for FP7. The project was intended to meet the challenges of semantically integrating extremely large and growing

volumes of heterogeneous multi/vario-scale GI by providing data models, architectures and software for both data providers and end-users. The goal of MIRACLE was to enable users to seamlessly integrate GI across scales and countries without being limited by technical constraints. Unfortunately, the project proposal was ranked too low on the priority list to allow it to be funded within the limits of the budgetary resources available. A number of EuroSDR members followed up the project idea in a new project proposal called “Aware Web Entities – Enabling the Internet of Places” (abbreviation: AWE) which was delivered in December 2010 within the ICT PPP call series 2. Unfortunately, this proposal was also ranked too low during the evaluation process.

Quality assurance of data supply

Based on a EuroSDR workshop on production partnership management an ISO standardisation initiative on quality assurance of data supply was initiated in 2008. Antti Jakobsson of EuroGeographics’ head office has been the chairman of the working group and Ray Patrucco of Ordnance Survey GB is the editor. The work is due to be finalised with the publication of a Technical Specification – ISO/TS 19158.

Web mapping

A workshop on web mapping was arranged in Lund, Sweden, on 5-6 May 2011. More than 30 experts from European mapping agencies, universities, research institutes, and private enterprises participated. A summary of the outcome from the workshop was presented during the INSPIRE Conference in Edinburgh in June 2011 and during the ICA Conference in Paris in July 2011. Preparations for a new workshop have started. The idea is that this workshop should be directly focused on setting up a research agenda related to web mapping.

PostGIS

There is an increasing use of the open source PostGIS database technology by mapping agencies and other data providers. This has led to an initiative to set up a project aimed to achieve a better understanding of the benefits and problems related to the implementation of this technology. A more detailed planning of the work will be based on the outcome of a workshop on the exchange of experiences in March 2012.

Communication

Members of the Commission have been involved in a great number of conferences, seminars, and workshops where issues within the work program of the commission have been presented and discussed.

Ulf Sandgren
Chairman
Commission IV



Network Services

Lars Bernard

In 2011, I had the honor of becoming the new Chair of commission V “Network Services” and this is my first contribution to the annual report. First, it is my great pleasure to start this report by acknowledging the commitment and enthusiasm of the previous chair, Prof. Mike Jackson. The joint activities initiated by him helped a lot in advancing the cooperation between EuroSDR and AGILE, the Association of Geographic Information Laboratories for Europe (<http://www.agile-online.org/>) and in continuing research on geospatial information services. And as Mike became the new Chair of the AGILE council, the path is perfectly paved for further fruitful cooperation.

As in previous years, there has been a joint EuroSDR & AGILE workshop on “Testing Geospatial Web Services & Persistent Testbed” prior to the AGILE 2011 Conference (18th April 2011 in Utrecht). The workshop was successfully organised by Stephan Schmid (University of the Bundeswehr, Munich), Johannes Brauner (Technische Universität Dresden), and Bastian Schäffer (52°North GmbH, Münster). Various presentations and discussions addressed topics such as the performance of Web Coverage Service implementations, distributed geoprocessing, service testing, usability testing, and service level agreements for geospatial information services, service based geospatial data transformations, testing of INSPIRE Annex Data Specifications and INSPIRE Network Services, and also cloud computing for INSPIRE implementations. The well-attended workshop was used for lively discussions about the aspects outlined above and for personal networking. It was decided to continue the series of workshops, which started in 2007, with a workshop at AGILE 2012 in Avignon, France (April 24th 2012). A more detailed report and the presentations can be found under <http://sdi-testbed.eu/>.

What could be clearly seen at this workshop is that the INSPIRE roadmap, i.e. urging the member states to have a first initial set of INSPIRE Network Services available in 2011, also dominated a number of current discussions around geospatial information services. The further on-going implementations of the INSPIRE Discovery, View and Download Services as well as the drafting of the INSPIRE Implementing Rule on INSPIRE Spatial Data Services will guarantee continuous interest in defining and realising INSPIRE Services. Commission V will continue to support these developments and provide a platform for communication and the exchange of knowledge to discuss all

the issues that go along with these developments. Your input, your ideas, and your wishes for activities related to these topics are very welcome.

Also in 2011, the continuation of the Persistent Test-Bed Initiative (PTB), as a common sandbox-like environment for testing and further developing network services for geospatial information has been one of the main areas of focus. Following the 2010 experiments and developments on federated authentication and access to geospatial data using Shibboleth, it is now planned to initiate a related next PTB project phase (PTB Phase 3). The idea here is to join research institutions and mapping agencies in commonly exploring organisational and technical frameworks to allow scientists an as open as possible access to geospatial data. The recent decisions of some member states to provide cost-free access to topographic data indicate that these developments possibly need to concentrate less on e-payment and other related mechanisms and more on the effective means to assure that the IPRs of data providers are protected, and also to prevent providers from any accountability or even unwanted warranty claims that could be related to the served geospatial data. Like many other largely volunteer-driven activities these days, the PTB also suffers from general budget cuts, preventing the PTB’s main protagonists from dedicating as much work as they would like to further promote the PTB. Here we hope that some on-going EU proposals will provide us with the required means for the planned activities.

In 2012, Jeremy Morley (Centre for Geospatial Science, University of Nottingham) and Peter Mooney (National University of Ireland, Maynooth) will coordinate a joint EuroSDR and AGILE project on research into the use of crowd sourcing in a national mapping context. Small funded projects will also be carried out through university student internships. As with the aforementioned PTB Phase 3, the intention is that the projects will pair a national mapping or cadastre agency with an academic partner. A workshop at the University of Nottingham (19th and 20th January 2012) serves as a kick-off of this project, which is expected to provide interesting results and insights into the hot topic of crowd sourcing for geospatial data (see also report of Commission III).

Lars Bernard
Chairman
Commission V



Workshops 2011

Geographic Data Archiving (Second workshop)
Munich, 14th to 15th March 2011

JURSE 2011

Munich, 11th to 13th April 2011

http://www.pf.bv.tum.de/jurse2011/jurse2011_spo.html

Workshop on Test-Bed Research: Testing Geospatial Web Services/Persistent Test-Bed (PTB)
Utrecht, 18th April 2011

Web Cartography

Sweden, 5th to 6th May 2011

<http://www.nateko.lu.se/euroedr>

ISPRS Workshop 2011—High Resolution Earth Imaging for Geospatial Information
Hannover, 14th to 17th June 2011

<http://www.ipi.uni-hannover.de/ipi-workshop.html>

Laser Scanning Spatial Data Infrastructure ESP Exploratory Workshop—PESC—LESC
Heidelberg, 8th to 11th September 2011

<http://www.nateko.lu.se/euroedr>

UAV-g 2011—Unmanned Aerial Vehicles in Geomatics

Zurich, 14th to 16th September 2011

http://www.geometh.ethz.ch/uav_g/index

PIA11—Photogrammetric Image Analysis

Munich, 5th to 7th October 2011

<http://www.pf.bv.tum.de/isprs/pia11/>

Second International Workshop on 3D Cadastres

Delft, 16th to 18th November 2011

<http://3dcadastres2011.nl/>

Financial overview

Financial Overview 2011	
Income	
Membership EuroSDR	94,000
Education Service	8.000
Total	€102.000
Expenditure	
Research Activities	19.499
Education Service	13.283
Executive Team	5.489
Secretariat	55.400
Fees & Charges	6.943
Total	€100.614
Income Surplus	€1.386

118th Meetings in Vienna, Austria

The 118th meeting of the EuroSDR Board of Delegates took place from 18th to 20th May 2011 in Vienna. It was hosted by BEV Federal Office of Metrology and Surveying and coordinated by the prime delegate for Austria, Mr. Michael Franzen.



The three days of meetings opened on Wednesday, 18th May with a series of presentations showcasing spatial data research, development and production in Austria. The following topics were presented:

- **LISA – Land Information System Austria: Concept for National Data Infrastructure contribution to GMES in the area of land monitoring** - Gebhard Banko, Deputy Head of Unit Biodiversity & Nature Conservation Environment Agency Austria
- **INSPIRE – Realisation aspects in Austria** Markus Jobst, Member of INSPIRE Team at BEV Federal Office of Metrology and Surveying
- **Potential Applications based on high resolution 3D-City-Models** - Peter Belada, Head of Municipal Department 41 Urban Surveyors, Vienna City Administration
- **Microsoft Photogrammetry – a Technology Update** - Michael Gruber, Chief Scientist Photogrammetry Vexcel Imaging/Microsoft
- **Cost-effective Airborne Data Acquisition System for Near-Real-Time Application Scenarios** - Hannes Raggam, Head of Geometric Image Processing Group Joanneum Research, Graz
- **High Performance Laser Scanners for Terrestrial, Mobile and Airborne Applications** Nikolaus Studnicka, Business Development Manager, International Sales, RIEGL Laser Measurement Systems GmbH
- **Radiometric Calibration of Laserscanning Measurements: Adding a new Dimension** Wolfgang Wagner, Professor, Chair of ISPRS Technical Commission VII, Institute of Photogrammetry and Remote Sensing, Vienna University of Technology

Those interested in accessing pdf versions of these presentations should contact the EuroSDR Secretariat.

On Thursday and Friday (19th and 20th May) the main scientific part of the meetings included a mixture of reports on current EuroSDR research activities, invited keynote presentations and focused on breakout discussions. Presentations included:

Research and Production Activities in the Czech Republic by *Dr Marketa Potuckova, Department of Applied Geoinformatics and Cartography, Charles University, Prague*

In a wide-ranging presentation, Dr Potuckova gave a detailed account of spatial data related activities in the Czech Republic. Topics covered included: Activities of the Czech Office for Surveying, Mapping and Cadastre; Private industry; Education in Geomatics in the Czech Republic; and Examples of research activities at universities.

Challenges of the Implementation of European and International Spatial Data Infrastructures by *Prof Dr Dietmar Grünreich, Bundesamt für Kartographie und Geodäsie*

Prof Grünreich is a strong supporter of EuroSDR, in particular in relation to the official EuroSDR publications, and he delivered a stimulating and very informative presentation.

From SDI 1.0 to SDI 2.0 by *Prof Dr Lars Bernard, Technical University of Dresden*

Prof Bernard began by defining Spatial Data Infrastructure as “the technologies, policies, and people necessary to promote sharing of geospatial data throughout all levels of government, the private and non-profit sectors, and the academic community”.

The topics discussed in detail during breakout sessions included 1) Challenges of the Implementation of European and International Spatial Data Infrastructures and 2) issues relevant to the better engagement of EuroSDR with industry. We were very grateful to Mr. Peter Woodsford and Mr. John McNally who joined us to offer the industry view. A number of useful suggestions have emerged and the EuroSDR Executive Team will bring proposals to the delegates to build on this initiative.

A significant highlight of the three day meeting was the unanimous election of Prof. Dr. Joep Crompvoets as Secretary-General of EuroSDR for a four year period from October 2012. Dr. Crompvoets is an associate professor at the Public Management Institute at KU Leuven. The editors wish him success during his term of office.

Inter-Commission Working Group on Standards

Wolfgang Kresse

The Intercommission Working Group on Standards is the bridge between EuroSDR and standardisation organisations that focus on photogrammetry, remote sensing, and GIS. These organisations include the ISO with its Technical Committees (TCs) 211 “Geographic information / Geomatics”, 172 “Optics and photonics”, and 42 “Photography”, as well as the Open Geospatial Consortium (OGC). The main activities regard imagery standards and their implementation.

The ISO-imagery standards are bundled in the Working Group 6 of the ISO/TC 211 and comprise standards for sensor calibration (ISO/TS 19159-x), for the georeference of geospatial imagery and sensors (ISO/TS 19130-x), and for geospatial metadata, including imagery (ISO/TS 19139-x) (TS = Technical Specification). In 2011 the ISO/TS 19159 was split in two, or potentially more, parts. Part 1 covers the calibration of optical sensors and, after major advancement in 2011, is likely to be completed next year. Part 2 will cover LIDAR-sensors, RADAR and SONAR (hydrography)

are planned to become parts 3 and 4. After the completion of the ISO/TS 19130 for the georeference of frame and line cameras, the ISO/TS 19130-2 rounds up the suite including LIDAR and RADAR, and will be completed soon as well. The ISO/TS 19139-2 defines an xml-interface for the imagery metadata.

The outcome of the ISO and the OGC work may be distinguished in both abstract and implementation standards, respectively. In 2011, the OGC indicated an interest in developing the implementation level specifications for the above mentioned initiative and almost completed the ISO standards and specifications. A joint activity is scheduled during the ISPRS-congress in August 2012.

The author of this report is also a passive member of the ISO/TCs 172 and 42, and thus receives regular notifications of their activities. The membership could be changed into an active status if necessary.

Inter-Commission Working Group on Education Services

Anders Östman

Four distance e-learning courses were offered again in 2011 as part of EuroSDR's EduServ series, which is now approaching its tenth year.

EduServ serves two aims, namely to provide training that is of interest to EuroSDR members and, through training actions, to disseminate the results of EuroSDR research activities.

EduServ 2011 was hosted by IGN France and ENSG (Ecole Nationale des Sciences Géographiques), under the leadership of Mr. Pascal Barbier. An introductory seminar was held from 8th to 9th March 2011. In total, 23 participants followed the courses through distance e-learning from their workplaces or homes. Each course required about thirty hours study over period of two weeks. During this time, participants enjoyed direct access to the course tutors for feedback and instruction. Of the participants, 61% were employees of national mapping agencies and 22% came from universities. The courses were:

Assessment of the quality of Digital Terrain Models, with instructors Prof. Dr. Joachim Höhle (Aalborg

University) and Dr Marketa Potuckova (Charles University in Prague);

The INSPIRE Directive and its Implementing Rules. How to understand and apply them? This course was hosted by KU Leuven with course leaders Mr. Danny Vandenbroucke, Dr Joep Crompvoets and Prof. Dr. Jos van Orshoven;

Terrestrial Reference Frames: application to the realisation of the European Reference System (ETRS89), with instructor Dr. Zuher Altamimi (IGN France / LAREG);

3D data in Urban Environments, with instructors Nicolas Papanoditis, Marc Pierrot-Deseilligny, Bruno Vallet, Mathieu Brédif (IGN/MATIS), Juha Hyypä (Finnish Geodetic Institute) and Nicolas Bellaiche (IGN/SD).

These last two courses - Terrestrial Reference Frames and 3D data in Urban Environments will be offered again in 2012 as part of EduServ10, to be hosted by the Dublin Institute of Technology, Ireland.

119th Meetings in Udine, Italy

A highlight of the EuroSDR Board of Delegates meetings in Udine, Italy was the transition of the EuroSDR Secretariat from the Dublin Institute of Technology to the Public Management Institute of KU Leuven in Belgium. The handover took place during the three-day meeting from 26th to 28th October 2011 in the magnificent buildings of the International Centre for Mechanical Sciences (CISM), Udine.

Our hosts, Prof. Fabio Crosilla of the University of Udine and Ms. Alessandra Benvenuti of Insiel, Italy ensured that the meeting was both enjoyable and very productive.

The meetings opened with a seminar on the 26th of October showcasing activities in Italy in our field of interest. These included:

- **State of the art of the Geomatic research in Italy** - *F. Sansò, Politecnico di Milano, Italy (presented Prof Fabio Crosilla)*
- **The Italian national cadastral information system** - *A. Angelini, Agenzia del Territorio - Central Directorate for Cadastre and Cartography, Rome*
- **The role of the regional administrations for the development of the national Geo spatial infrastructure** - *U. Trivelloni, Regione del Veneto and CISIS, Segreteria Regionale per le Infrastrutture, U.P. SIT e cartografia, Venice*
- **Implementation of the INSPIRE directive in Italy: state of the art and future perspectives** - *G. Corrarello, Ministero dell'Ambiente, Rome*
- **Solutions and services for geospatial data management and territorial government** - *A. Benvenuti on behalf of F. Sbrojavacca, Director insiel, Trieste*
- **Spatial data production at BLOM-CGR SpA** - *A. Cavazzini, BLOM – CGR, Parma*
- **Remote sensing data production at Helica Srl** - *C. Peloso, Helica Srl, Amaro, Udine*
- **Geomatic research activities at the University of Udine** - *A. Beinat, F. Crosilla, D. Visintini, CARTESIO, the Interdepartmental Centre for Cartography and GIS of the University of Udine.*

Those interested in accessing pdf versions of these presentations should contact the EuroSDR Secretariat.

The three-day meeting was interspersed with a number of very interesting tours, including a visit to the magnificent Castello di Udine, a historical building in Udine built on a hill in the historical center of the city where a celebratory dinner was enjoyed by the

EuroSDR delegates and guests. A number of presentations were made for the outgoing Secretariat, Kevin Mooney and Oonagh Birchall. A presentation was also made for Prof. Risto Kuittinen, recently retired from the Finnish Geodetic Institute, to mark his extensive and unstinting support for EuroSDR activities throughout his long involvement in the organisation.

Invited presentations at the meetings included:

A New Way of Working: Integrating Remote Sensing Capture and Field Survey by *Neil Ackroyd, Director of Data Collection and Management at Ordnance Survey Great Britain.*

Mr Ackroyd began by giving an overview of Ordnance Survey Great Britain, an organisation of 270 staff distributed nationally throughout 11 Government Office Regions and 75 photogrammetric staff based at Southampton.

Following Mr. Ackroyd's presentation, delegates divided into small discussion groups to discuss the topic **A New Way of Working: Integrating Remote Sensing Capture and Field Survey**. A second discussion group examined the topic **Volunteered Crowd-Sourced information for national GI purposes**.

A second invited presentation — on **Research and Production Activities in Romania** — was delivered by *Ms Margarita Dogaru of the National Agency of Cadaster and Land Registration of Romania*. Ms Dogaru began her presentation by giving a short history of the National Centre for Geodesy, Cartography, Photogrammetry and Remote Sensing followed by a detailed account of spatial data related activities in Romania.

The final keynote presentation, **Cloud Computing** was delivered by *Tobias Binz of the University of Stuttgart* and covered a range of topics relating to this important development for national mapping agencies. The presentation was followed by a round table discussion involving all delegates.

Outcomes of all discussions are being considered for future action by the EuroSDR Executive Team.



48 Years of EuroSDR Publications

1. *Trombetti, C.*: "Activité de la Commission A de l'OEEPE de 1960 à 1964" - *Cunietti, M.*: "Activité de la Commission B de l'OEEPE pendant la période septembre 1960 - janvier 1964" - *Förstner, R.*: "Rapport sur les travaux et les résultats de la Commission C de l'OEEPE (1960-1964)" - *Neumaier, K.*: "Rapport de la Commission E pour Lisbonne" - *Weele, A.J. v.d.*: "Report of Commission F." - Frankfurt a.M. 1964.
2. *Neumaier, K.*: "Essais d'interprétation de >>Bedford<< et de >>Waterbury<<. Rapport communétabli par les Centres de la Commission E de l'OEEPE ayant participé aux tests" - "The Interpretation Tests of >>Bedford<< and >>Waterbury<<. Common Report Established by all Participating Centres of Commission E of OEEPE" - "Essais de restitution >>Bloc Suisse<<. Rapport commun établi par les Centres de la Commission E de l'OEEPE ayant participé aux tests" - "Test >>Schweizer Block<<. Joint Report of all Centres of Commission E of OEEPE" - Frankfurt a.M. 1966.
3. *Cunietti, M.*: "Emploi des blocs de bandes pour la cartographie à grande échelle - Résultats des recherches expérimentales organisées par la Commission B de l'OEEPE au cours de la période 1959-1966" - "Use of Strips Connected to Blocks for Large Scale Mapping - Results of Experimental Research Organized by Commission B of the OEEPE from 1959 through 1966" - Frankfurt a.M. 1968.
4. *Förstner, R.*: "Sur la précision de mesures photogrammétriques de coordonnées en terrain montagneux. Rapport sur les résultats de l'essai de Reichenbach de la Commission C de l'OEEPE" - "The Accuracy of Photogrammetric Co-ordinate Measurements in Mountainous Terrain. Report on the Results of the Reichenbach Test Commission C of the OEEPE" - Frankfurt a.M. 1968.
5. *Trombetti, C.*: "Les recherches expérimentales exécutées sur de longues bandes par la Commission A de l'OEEPE". - Frankfurt a.M. 1972.
6. *Neumaier, K.*: "Essai d'interprétation. Rapports des Centres de la Commission E de l'OEEPE". - Frankfurt a.M. 1972.
7. *Wiser, P.*: "Etude expérimentale de l'aérotiangulation semi-analytique. Rapport sur l'essai >>Gramastetten<<". - Frankfurt a.M. 1972.
8. "Proceedings of the OEEPE Symposium on Experimental Research on Accuracy of Aerial Triangulation (Results of Oberschwaben Tests)" *Ackermann, F.*: "On Statistical investigation into the Accuracy of Aerial Triangulation. The Test Project Oberschwaben" - "Recherches statistiques sur la précision de l'aérotiangulation. Le champ d'essai Oberschwaben" - *Belzner, H.*: "The Planning. Establishing and Flying of the Test Field Oberschwaben" - *Stark, E.*: "Testblock Oberschwaben, Programme I. Results of Block Adjustment by Independent Models" - *Ebner, H.*: "Comparison of Different Methods of Block Adjustment" - *Wiser, P.*: "Propositions pour le traitement des erreurs non-accidentelles" - *Camps, F.*: "Résultats obtenus dans le cadre du projet Oberschwaben 2A" - *Cunietti, M.*; *Vanossi, A.*: "Etude statistique expérimentale des erreurs d'enchaînement des photogrammes" - *Kupfer, G.*: "Image Geometry as Obtained from Rheid Test Area Photography" - *Förstner, R.*: "The Signal-Field of Baustetten. A Short Report" - *Visser, J.*; *Leberl, F.*; *Kure, J.*: "OEEPE Oberschwaben Reseau Investigations" - *Bauer, H.*: "Compensation of Systematic Errors by Analytical Block Adjustment with Common Image Deformation Parameters". - Frankfurt a.M. 1973.
9. *Beck, W.*: "The Production of Topographic Maps at 1:10,000 by Photogrammetric Methods. - With statistical evaluations, reproductions, style sheet and sample fragments by Landesvermessungsamt Baden-Württemberg Stuttgart". - Frankfurt a.M. 1976.
10. "Résultats complémentaires de l'essai d'<<Oberriet>> of the Commission C de l'OEEPE - Further Results of the Photogrammetric Tests of <<Oberriet>> of the Commission C of the OEEPE".
Hárry, H.: "Mesure de points de terrain non signalisés dans le champ d'essai d'<<Oberriet>> - Measurements of Non-Signalized Points in the Test Field <<Oberriet>> (Abstract)" - *Stickler, A.*; *Waldhäusl, P.*: "Restitution graphique des points et des lignes non signalisés et leur comparaison avec des résultats de mesures sur le terrain dans le champ d'essai d'<<Oberriet>> - Graphical Plotting of Non-Signalized Points and Lines, and Comparison with Terrestrial Surveys in the Test Field <<Oberriet>>" - *Förstner, R.*: "Résultats complémentaires des transformations de coordonnées de l'essai d'<<Oberriet>> de la Commission C de l'OEEPE - Further Results from Co-ordinate Transformations of the Test <<Oberriet>> of Commission C of the OEEPE" - *Schürer, K.*: "Comparaison des distances d'<<Oberriet>> - Comparison of Distances of <<Oberriet>> (Abstract)". - Frankfurt a.M. 1975.
11. "25 années de l'OEEPE".
Verlaine, R.: "25 années d'activité de l'OEEPE" - "25 Years of OEEPE (Summary)" - *Baarda, W.*: "Mathematical Models". - Frankfurt a.M. 1979.
12. *Spiess, E.*: "Revision of 1:25,000 Topographic Maps by Photogrammetric Methods.". - Frankfurt a.M. 1985.
13. *Timmerman, J.*; *Roos, P.A.*; *Schürer, K.*; *Förstner, R.*: "On the Accuracy of Photogrammetric Measurements of Buildings - Report on the Results of the Test "Dordrecht", Carried out by Commission C of the OEEPE. - Frankfurt a.M. 1982.
14. *Thompson, C.N.*: Test of Digitising Methods. - Frankfurt a.M. 1984.
15. *Jaakkola, M.*; *Brindöpke, W.*; *Kölbl, O.*; *Noukka, P.*: "Optimal Emulsions for Large-Scale Mapping - Test of "Steinwedel" - Commission C of the OEEPE 1981-84. - Frankfurt a.M. 1985.
16. *Waldhäusl, P.*: Results of the Vienna Test of OEEPE Commission C. - *Kölbl, O.*: "Photogrammetric Versus Terrestrial Town Survey". - Frankfurt a.M. 1986.
17. *Commission E of the OEEPE*: Influences of Reproduction Techniques on the Identification of Topographic Details on Orthophotomaps. - Frankfurt a.M. 1986.
18. *Förstner, W.*: Final Report on the Joint Test on Gross Error Detection of OEEPE and ISP WGIII/1. - Frankfurt a.M. 1986.
19. *Dowman, I.J.*: Spacelab Metric Camera Experiment - Test of Image Accuracy - Frankfurt a.M. 1987.
20. *Eichhorn, G.*: Summary of Replies to Questionnaire on Land Information Systems - Commission V - Land Information Systems - Frankfurt a.M. 1988.
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