



## **ISPRS Technical Commission III Photogrammetric Computer Vision and Image Analysis 2008-2012**

2009 Annual report

### **Technical Commission Officers:**

- President: Nicolas Paparoditis
- Vice-President: Marc Pierrot-Deseilligny
- Secretary: Clément Mallet

### **1. General status:** (N. Paparoditis, M. Pierrot-Deseilligny, and C. Mallet)

The goal of Commission III is to develop mathematical, image processing and computer vision methods and tools to fully automate 3D data collection from satellite, aerial, street level or close-range remote sensing data (mainly optical and Lidar). The key topics which are addressed by this commission are:

- Sensor pose estimation
- Surface reconstruction
- Pattern recognition
- Image indexation and image retrieval
- Interpretation of images of complex scenes
- 3D reconstruction
- Image sequence analysis

This commission is in the continuity of the previous Commission III organizations with some slight changes: two previous working groups on “Automatic Interpretation for City Modelling” and “object extraction for Road Modelling” have been fused in one working group called “Complex Scene Analysis and 3D reconstruction”. A dedicated “pattern recognition in Remote Sensing” inter-commission working group has been created, this field being particularly active and innovative in the last few years. Another working group on “Image Analysis for Image Indexation and Retrieval” has also been created, this field being a particularly hot topic, for the processing of, and the navigation within, huge data sets and image archives acquired from satellite, aerial and street-level platforms.

All working groups of Commission III will address the topics of benchmarking, performance evaluation, and self diagnosis of algorithms. Indeed, these subjects are a good way to promote our field and also a way to bring together researchers of different fields.

More information are available on the TC III website: <http://www.commission3.isprs.org/>

## **2. Accomplishments of Commission during the current year** (N. Paparoditis, M. Pierrot-Deseilligny, and C. Mallet)

- TC website

The [website of TC III](#) is now fully operational and gathers any relevant information coming from each WG.

- Laserscanning & CMRT workshops

The TC officers have been heavily involved in the organization of the joint ISPRS workshops Laserscanning and CMRT that have been held in Paris (France) between September 1 and 4. They were both in the local organization committee, and members of the program committees or reviewers. Marc Pierrot-Deseilligny was co-chair of the Laserscanning event and Nicolas Paparoditis co-chair of the CMRT workshop.

The joint organization of these two workshops has gathered close to 300 participants from 25 different countries representing universities, research institutions, government and private industry. 90 people have attended both workshops, enhancing the success of a joint organization and the relevance of a common framework for bundle workshops.

The two workshops were single-track and organised in 17 oral sessions gathering 53 papers and 3 interactive sessions with 43 posters. There were no parallel sessions allowing people to attend each oral presentation. The schedules were also tailored for significant poster presentations leaving room for many intensive discussions and detailed explanations. Therefore, it provided an excellent opportunity to exchange latest research ideas of the two partly overlapping and partly different communities since both theoretical and thematic researchers were present.

More details about each workshop are given below.

- Laserscanning 2009 (Frédéric Bretar and Clément Mallet)

Few months after the XXIst ISPRS symposium took place in Beijing, China, in July 2008, the new board of the WG officers was built. From January 2009, we decided to organize Laserscanning 2009 in Paris, France with the help of the Société Française de Photogrammétrie et de Télédétection (French Society for Photogrammetry and Remote Sensing), and the Institut Géographique National (French National Mapping Agency). The event was the sixth in a series, following the events that have been held in La Jolla, USA in 1999 to Espoo, Finland, in 2007. Laserscanning workshops are dedicated to the processing and the analysis of point clouds and waveforms acquired and generated from active airborne and terrestrial sensors. Based on lidar data as well as data from other sensors, scientists have built an operational framework to extract spatial information, but also are facing challenging tasks to enhance current point cloud processes. Laserscanning 2009 has focused on new data,

methodologies, algorithms, and applications related to the processing of point clouds as well as sensor improvements and new sensor-driven calibration techniques.

The event was firstly a major scientific experience where 62 papers have been accepted to be published in the IAPRSSIS. Among them, 30 have been presented in one of the 7 oral sessions (Urban, Classification, Pattern Recognition, Forestry, Physical Modelling, Full-Waveform, and Geometrical Modelling).

The invited talk "A lidar odyssey in Earth observation" given by Pierre Flamant from the LMD laboratory from Ecole Polytechnique was an exotic keynote and a relevant link between the ISPRS lidargrammetry community and the atmospheric lidar community. Laserscanning workshops are known to gather people around the lidar technology but this is mainly true for geospatial and terrestrial topographic as well as bathymetric applications. Pierre Flamant detailed the researches that have been and are carried out in the atmospheric lidar community. Such lidar systems can operated from satellites, airplanes, and ground stations for many applications such as the retrieval of tropospheric clouds & aerosols, the determination of the atmosphere components (CO<sub>2</sub> etc.), or 3D wind turbulence. Since distinct interactions processes are involved for these topics, Pierre Flamant also presented several historical systems and gave us a comprehensive physical overview about lidar pulse scattering. Such "out-of-scope" talk raised many questions and was enthusiastically welcomed. The presentation is downloadable on [Laserscanning website](#).

It is also a human experience which has gathered more than 160 attendees from 25 countries. The continuous increasing interest of the lidar technology and its applications is clearly shown by the international audience of this event. We will keep on working this way. The duality of science and industry was again demonstrated by the success of the industrial session with four speakers.

In the same time, the website of the WG is a success. More than 20 people became member of the WG. Our mailing list includes 160 names, mostly from the attendance of the Laserscanning workshop.

- CMRT 2009 (Uwe Stilla, Chris Mc Glone, Stefan Hinz, Matthias Butenuth)

The workshop took place in Paris from Thursday 3rd September to Friday 4th September 2009. It was held in conjunction with the ISPRS workshop "Laserscanning 2009" which took place at the same venue on September 1 and 2. Both workshops were hosted by the Laboratoire Matis of the French Institut Géographique National (IGN) and by the Société Française de Photogrammétrie et de Télédétection (SFPT). The pricing policy of the local organizers encouraged participants to attend both events. There were 115 participants to CMRT09, with 75 attending also the Laserscanning 2009 workshop. CMRT09 was organized by the ISPRS Working Groups III/4, "Complex Scene Analysis and 3D Reconstruction", and III/5, "Image Sequence Analysis". In their call for papers, the conference chairs, Nicolas Papanoditis (IGN/MATIS, St. Mandé), Uwe Stilla (TU Munich) and Franz Rottensteiner (University of Hannover), had invited prospected authors to submit scientific papers on topics related to the terms of reference of the two Working Groups. Altogether 60 full papers were submitted by authors coming from 20 different countries. Following the standards set by previous workshops of ISPRS Commission III, these papers had to undergo a rigorous double-blind peer review. Each paper was reviewed at least by two members of the Scientific Committee. This reviewing process resulted in the acceptance of 38 contributions by authors coming from 14 countries, which corresponds to a rejection rate of 37%. As a consequence, the scientific quality of the workshop was very high. The accepted papers were published in the International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences (IAPRS), Volume 38, Part 3/W4. They were available at the conference both as

hardcopies and on CD-ROM. The proceedings can be also available via the conference website. There was a single track of 6 oral sessions with altogether 22 presentations. Each presenter had 25 minutes. This time frame was used for in-depth presentations and for intense discussions. In addition, there was a well-attended poster session with 16 contributions in the afternoon of September 3. The main topic of the workshop was the automated extraction of topographic objects from remotely sensed data. The presentations were dedicated to new developments both in data processing, where methods from Computer Vision are adopted by the Photogrammetric community, and in sensor technology.

The workshop started with a keynote by Josiane Zerubia from INRIA Sophia Antipolis Méditerranée. In her excellent presentation she showed applications of Marked Point Processes for automated object extraction from high-resolution image data.

The first technical session, chaired by Markus Gerke, dealt with the automatic extraction of roads from data acquired by various sensors. It included one contribution on the semi-automatic recognition of road markings from Video data. The other presentations were dedicated to the extraction of roads and to the modeling of street surfaces using laser scanner data and aerial imagery. The second oral session which was the first of two sessions on building extraction was chaired by Franz Rottensteiner. It consisted of presentations on automated building extraction from aerial imagery and laserscanner data. There were papers on primary data acquisition, on the decomposition of 2D ground plans for 3D building reconstruction, and on methods for map updating. Nicolas Champion (IGN) presented the results of the EuroSDR test on change detection for automated updating of cadastral maps. On Friday morning, Uwe Stilla was the chair of the oral session on SAR. There was a focus on TerraSAR-X data and on the theoretical foundations of the TanDEM-X mission, with contributions on image improvement and change detection, building height estimation by SAR interferometry, building extraction by fusion of optical and SAR paper and, finally, SAR simulations for ray tracing based on 3D models. The SAR session was followed by the oral session on Traffic and Navigation, chaired by Matthias Butenuth. There were two contributions on the recognition of vehicles and the estimation of velocities from aerial images and one paper on the on-line analysis and registration of oblique-view lidar data for navigation purposes. The session on Street Scenes was chaired by Stefan Hinz. The three presentations of this session were closely related to the field of computer vision. The topics were positioning in urban scenes using images retrieved from a data base by means of matching procedures, text recognition and the recognition of road signs in terrestrial scenes. The last oral session of CMRT09, chaired by Caroline Baillard, was the second session on buildings, with a focus on terrestrial scenes and façades. There was one contribution on the combined segmentation of images and point clouds generated by image matching. The remainder of the presentations dealt with the improved generation of façade texture for building models, with the segmentation of façade parts, and with façade reconstruction from mobile Lidar mapping. The local organization of the workshop was excellent, and so was the catering. The conference fee included Lunch at the conference venue, which will be remembered by all the workshop participants for its high culinary standard. The same thing can be said about the social event on Thursday evening:

The participants could enjoy French Haute Cuisine on a boat trip on the Seine while watching the wonderful sights of Paris by night.

- PCV 2010

The mid-term symposium “Photogrammetric Computer Vision and Image Analysis” will take place in Paris, France, from 1-3 September 2010 at the same location as for Laserscanning

and CMRT workshops. The 2010 Symposium will have special sessions to cover all of the ISPRS Technical Commission III Working Groups as well as the Intercommission Working Group. The [website of PCV](#) has been established and is open. A first call for papers has been made both using the ISPRS mailing list and in the French Image and Vision community. The website has received almost 400 visits between November 15 and December 15, coming from 53 countries.

Important dates:

- March 1, 2010: Full-paper submission deadline for peer-review process
- April 1, 2010: Abstract submission deadline for non peer-review
- May 1, 2010: Acceptance notification
- May 31, 2010: Camera-ready paper
- August 31, 2010: Tutorial day
- September 1-3, 2010: Conference

Papers for peer-reviewed proceedings (Part A):

The authors shall submit a full paper (6 pages). Each paper will be reviewed by two to three peers of the Program Committee. The best papers (50% acceptance) will be selected for the proceedings part A.

Papers for non peer-reviewed proceedings (Part B):

Authors shall submit only an abstract (1 page - 1000 words) for the selection process. These abstracts will then be reviewed by the Scientific Committee. Accepted papers on the basis of the abstract will be selected for interactive presentations (poster sessions). As for part A, authors will be requested to provide a full paper for integration in the proceedings Part B .

Tutorials and demos:

In addition to the main technical program, the conference will include a tutorial day on August 31, 2010 and Demonstrations.

### **3. Working Group Activities during the current year**

**a. WG III/1 (Helmut Mayer):** Pose estimation and surface reconstruction from image and/or range data

1. State of Science and Technology

The WG aims to promote within ISPRS more or less fully automatic methods for calibration and orientation without requiring markers, and for surface reconstruction. Current state-of-the-art methods are well known and to be tested with respect to general applicability, reliability, and performance. Thereby, a further refinement and robustification of the methods is to be fostered. The WG will therefore provide various synthetic and real test data sets for image calibration/orientation as well as surface reconstruction tasks. It will invite researchers to evaluate their algorithms against known ground truth data with respect to general applicability and robustness.

Consequently, the WG cooperates with other organizations such as the International Association for Pattern Recognition (ICPR conferences), the Institute of Electrical and

Electrical Engineers (IEEE) as well as the organizing committees of the major computer vision conferences (ICCV, ECCV, ACCV).

## 2. Activities of the WG in 2009

- Opening of the WG [website](#).
- Integration of the results submitted by new teams for the camera calibration and multi-view stereo benchmark for high resolution imagery on [Christoph Strecha's web site](#) (WG co-chair). Six sets of images with internal and external camera parameters are provided. Up to ten teams have submitted the results of their algorithms to Christoph Strecha, and even more teams work with such datasets. In 2009, algorithms presented in ACCV, CVPR, 3DIM or CVWW conferences and workshops have been benchmarked.

## 3. Planned activities of the WG in 2010

- The WG will take an active part in the reviewing process for the Commission III Symposium "Photogrammetric Computer Vision and Image Analysis (PCV 2010)" in Paris, France, September 1-3.
- The WG will be involved in the PIA11 conference in Munich (Germany).

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## **b. WG III/2 (Frédéric Bretar): Point Cloud Processing**

### 1. State of Science and Technology

The ISPRS Working group III/2 aims to promote the development of new methodologies, algorithms and applications related to the processing of point clouds acquired by airborne or satellite lidar system, terrestrial laser scanners as well as from other sensors. To this purpose, the WG organizes workshops to exchange the latest developments on processing point clouds. Furthermore the WG provides (links to) publicly available datasets and organizes international comparative tests on the performance of algorithms for processing point clouds for various applications. Finally, the WG will continue to work closely with WG V/3 and WG III/4 and will establish links with WG VII/7 and WG I/2.

## 2. Activities of the WG in 2009

- Full organization of the ISPRS Workshop [Laserscanning 2009](#), Paris, France, September 1-2, 2009.
- WG officers were members of the Program Committee for Laserscanning.
- Publication of the printed and electronic proceedings of the workshops in the International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences (vol. XXXVII - part 3/W8). Editors: F. Bretar (WG chair), G. Vosselman (WG co-chair), and M. Pierrot-Deseilligny (TC III vice-president).
- Opening of the WG website. Datasets are available (those of the ISPRS test on extracting DEMs from point clouds that aimed to compare existing automatic filtering algorithms) as well as an opening source software ([FullAnalyze](#)). This is a software for handling, processing and visualizing topographic lidar data (both point clouds and lidar waveforms).

- Recruitment of members (15 active members / 7 passive members)

### 3. Planned activities of the WG in 2010

- Organizing a session at the TC III symposium PCV 2010 in September 2010, in Paris (France).
- Propose new airborne laser scanning datasets for the community.
- Co-organizing the ISPRS Workshop Laserscanning 2011 in Calgary (Canada).

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### **c. WG III/3 (Mathieu Cord, Olivier Tournaire): Image Analysis for Indexation and Image retrieval**

#### 1. State of Science and Technology

Information retrieval from image databases has been the subject of intense interest over the past few years as the size of such collections has grown, but the proportion of this work devoted to satellite, aerial and street-view images, as opposed to generic image and multimedia databases for example, is quite small. Satellite and aerial image indexing presents several specificities. First, remote sensing databases are operated by specialists from widely varying fields. The needs of the user are thus precise and complex, yet very different from one application to another. Second, the nature of satellite, aerial and street-view images is very different from those in generic databases. Textural and spectral measures are very important for remote sensing image understanding, but are seldom used in generic databases. Other elements, such as buildings, bridges, human activity, and so on, are better characterized by their inter-relations than by their individual characteristics. Third, the high-resolution imagery that will form the databases of tomorrow varies considerably in resolution. Methods to compensate for this variability are therefore essential, but again do not form part of existing information retrieval techniques. Another very important component of the satellite, aerial, and street-view image database processing is the huge amount of data. For retrieval purpose, this scalability aspect has to be carefully considered. For generic image databases, several indexing schemes have been designed to face this problem, but it is still a scientific lock with a lot of opened questions. Learning categories and semantic concepts from these data is also a very challenging problem. Recent advances have been done to fill the gap between the low-level features extracted from the data and the high-level semantic concepts that the final user attempts to manipulate. In particular, statistical learning framework allows to efficiently work on high dimensional data, complex categories or concepts and with on-line learning. Based on the above considerations, the objective of this working group is to promote works related to the use of low-level (textural and spectral) and high-level (structural) primitives for information retrieval from remote sensing databases containing images of widely varying resolutions, within a semantic learning framework based on working image retrieval systems.

#### Terms of Reference:

- Information mining in large satellite, aerial, and street view image archives;
- Satellite, aerial and street-view image indexing and retrieval;

- Machine learning and context aware image understanding;
- Image semantics and knowledge representation;
- Integration of heterogeneous features : textural, spectral and geometrical attributes;
- Integration of low and high level features (points, segments, regions, graphs, etc.);
- Integration of 3D information and spatial relations between the features;
- Multi-resolution image indexing;
- Image retrieval for localisation and pose estimation;
- Managing huge heterogeneous data sets.

## 2. Activities of the WG in 2009

- Opening of the [WG website](#).
- WG officers were members of the Program Committees both of Laserscanning and CMRT workshops.
- WG officers worked on building a database of natural images and Ground Truth (GT) available for the scientific community. It is about hundred of complex views from streets. The Ground should contain many different patterns and/or objects. The first type of identified pattern is around textual objects present in the scenes. At the moment, a first version of the GT is ready but still need to be improved.

## 3. Planned activities of the WG in 2010

- Co-organize workshop or special event, reviewing of papers and organizing sessions at the TC III symposium PCV 2010 in September 2010, in Paris (France).
- Propose a tutorial on “Indexation for large street view dataset image processing” at the TC III Symposium PCV 2010 in 31 August 2010 in Paris (France).
- Release a dataset of annotated texts in street view images. The dataset contains more than 100 images acquired by Stereopolis (the mobile mapping system of the MATIS laboratory of IGN, France) in which texts have been manually delineated. This dataset could be used for benchmarking text detection and recognition algorithms.
  - Finalization of the textual GT of the street scene database,
  - Adding new features to the database.
  - Make the database available for the community on the website.
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- Make the database available for the community on the website.

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## **d. WG III/4 (Franz Rottensteiner and Gunho Sohn): Complex scene Analysis and 3D reconstruction**

### 1. State of Science and Technology

- The availability of digitally recorded aerial images has made possible the acquisition of multiple-overlap imagery at hardly any extra cost. As a consequence, and due to the adaptation of dense matching techniques from Computer Vision, the quality of Digital Surface Models (DSMs) from stereo matching in urban areas has increased. In 2009 there

were quite a few papers dealing with dense matching or with using the DSMs thus obtained for object extraction.

- The adaptation of methodology from Computer Vision and Pattern Recognition continued:
  - The dense matching techniques for DSMs in urban areas already mentioned
  - Sampling methods such as Marked Point Processes or reversible jump Markov Chain Monte Carlo methods have been increasingly used for object extraction. There was a remarkable keynote by Josiane Zerubia (INRIA – Sophia Antipolis, ARIANA team) on Marked Point Processes at the CMRT09 workshop.
  - Techniques from statistical pattern recognition such as boosting and random forests have been adapted for object extraction from terrestrial or airborne data.
  - Image retrieval from large data bases based on SIFT or related features were used for georeferencing.
- In City Modeling, the reconstruction, texturing, and interpretation of façade images has found much interest. Half of the papers dealing with building extraction at the CMRT09 workshop dealt with such topics. Some of them were based on mobile mapping devices having both cameras and laser scanners on board. Research obviously turns into the direction of increasing the LoD of City Models to LoD 3 according to the CityGML standard. In addition to 3D buildings, research to extract other features comprising city models including road signs, billboards, roundabouts and pedestrian roads was of interest at the CMRT09 workshop.
- There were reports on large-scale generation of building models based on subdivisions of ground plans and reconstruction of roofs based on DSM either from laser or from image matching (e.g. the cities of Berlin and Cologne).
- The topic of “complex scenes” was only addressed by work on specific tasks in complex environments. There was hardly any work on complex scene models involving multiple object classes and context. We also observe a lack of research on other topics listed in the WG’s terms of reference. These include:
  - 1) Interpreting and modeling of complex scene with support of existing GIS and CAD models
  - 2) Contextual reasoning and analysis methods of complex scene
  - 3) Trade-off study between geometry and radiometry/texture for visualization
  - 4) Studies on productivity, efficiency, quality analysis / quality control, specifically on a large scale and in complex scenes.

## 2. Activities of the WG in 2009

- Recruitment of members (23 active members / 3 passive members)
- WG Officials were members of the Program Committee for the Workshop CityScapes, i.e. the Academic Track of the GeoWeb 2009 conference in Vancouver, Canada, July 27-31, 2009.
- WG Officials were members of the Program Committee for the ISPRS Workshop Laserscanning 2009, Paris, France, September 1-2, 2009.

- The main activity of WG III/4 was the organization of the reviewing and paper selection process for the ISPRS Workshop on “Object Extraction for 3D City Models, Road Databases and Traffic Monitoring” (CMRT09) in Paris, France, 3-4 September 2009, in collaboration with Working Group III/5 and IGN. The workshop attracted 60 full paper submissions. As a result of a double-blind review process, thirty-eight (63%) of these papers, with authors from 14 countries, were accepted (22 oral presentations / 16 posters). The proceedings appeared on CD and in print, as Volume XXXVIII – 3/W4 of the International Archives of the Photogrammetry, Remote Sensing, and Spatial Information Sciences. The workshop was well-attended with 115 registrants.
- Franz Rottensteiner attended the meeting of the German Association for Photogrammetry and Remote Sensing (DGPF) on the DGPF Camera Test in Stuttgart, Germany, on October 5-6. He got the DGPF’s permission to use the data of the DGPF camera test for the purposes of ISPRS WG III/4 (see below).

### 3. Planned activities of the WG in 2010

- Preparation of a test data set for object reconstruction based on the DGPF Camera Test data set. As the data volume is relatively large, several test areas will have to be selected. For each test area there will be ALS data (about 4 points / m<sup>2</sup>) and aerial images with 8 cm GSD and least four-fold overlap. Once the test sites have been identified and the data have been documented, the test data set can be made accessible via the ISPRS home page. It is the plan of the WG to have the data ready in mid-2010. The WG committee has not determined yet under which scientific envelope, in terms of scientific theme, experimental frameworks and publications of the designed test results, the test datasets will be distributed to the ISPRS researchers. However, a solid plan of the test bed to use the DGPF data sets will be ready in mid-2010 when the data set is publically available.
- The WG will take an active part in the reviewing process for the Commission III Symposium “Photogrammetric Computer Vision and Image Analysis (PCV 2010)” in Paris, France, September 1-3.
- Outlook on 2011: The WG will co-organize the Photogrammetric Image Analysis (PIA11) conference in Munich (Germany). It will also support the Laserscanning 2011 workshop in Calgary (Canada).

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#### **e. WG III/5 (Uwe Stilla, Chris Mc Glone, Stefan Hinz, Matthias Butenuth): Image Sequence Analysis**

##### 1. State of Science and Technology

Image sequence analysis is playing an important role in many fields of close-range photogrammetry, computer vision, machine vision and robot vision for many years. With the development of modern, flexible digital sensors, automatic methods for analyzing and evaluating image sequences are also entering the fields of aerial photogrammetry and remote sensing. Examples of the application of image sequence analysis in photogrammetry and remote sensing are 2D/3D object tracking, ego-motion determination, detection and characterization of dynamic processes, deformation measurements, monocular or stereoscopic

mapping of the environment of a UAV or an autonomous robot, mobile mapping, biomedical motion analysis, and many others. However, recent research has shown that a pure transition of methods mainly designed for the analysis of (close-range) video streams to the aforementioned applications is not possible due to different camera characteristics, varying frame rates, other platforms and, in general, very challenging environments. Further theoretical and experimental developments accompanied by thorough validations are thus necessary to better exploit the huge information content of image sequences.

Terms of Reference:

- Studying camera and camera network calibration from image sequences including cameras with non-standard geometry and variable frame rate
- Studying ego-motion determination for navigation, georeferencing and object reconstruction
- Studying detection, reconstruction, classification and tracking of single and multiple objects in image sequences
- Studying event reconstruction from image sequences as well as single and multiple video streams
- Investigating the quality assessment of calibration, orientation and object detection using image sequences
- Benchmarking of calibration, orientation and object detection techniques using image sequences

## 2. Activities of the WG in 2009

- [IEEE / ISPRS Joint Urban Remote Sensing Event 2009](#), 20-22 May 2009, Shanghai, China. Organization of session on “Urban Mapping”
- [ISPRS Hannover Workshop 2009](#), 2-5 June 2009, Hannover, Germany. Co-organize a session on “Object detection and characterization using passive and active sensors”:
- [CMRT09](#) “Object Extraction for 3D City Models, Road Databases and Traffic Monitoring - Concepts, Algorithms and Evaluation”, 3-4 September 2009, Paris, France.

## Performed tests, distributed datasets:

We plan to provide datasets on our homepage to perform tests. The datasets will contain image sequences, reference data and additional meta data. Current data sets are:

- <http://vision.middlebury.edu/flow/> We highly encourage you to use this database if you are planning to test your optical flow algorithms.
- [http://www.mi.auckland.ac.nz/index.php?option=com\\_content&view=article&id=44&Itemid=67](http://www.mi.auckland.ac.nz/index.php?option=com_content&view=article&id=44&Itemid=67) This web site of the .enpeda.. (Environmental Perception and Driver Assistance) project offers sets of geometrically rectified stereo image sequences for the purpose of comparative performance evaluation of stereo vision, optic flow, motion analysis, or further techniques in computer vision.

## 3. Planned activities of the WG in 2010

- 2010, 10-12 February. Co-organizing workshop [Eurocow 2010](#)
- 2010, 1-3 September. Reviews and co-organizing of [Commission III Symposium](#) in Paris (France).

- 2011, September. Organize a conference on Photogrammetric Image Analysis ([PIA11](#)) in conjunction with the other working groups of Commission III, follow up of the PIA07 conference in 2007 to be held in Munich (Germany).
- 2012, 25 August – 1 September. Organize sessions at the ISPRS congress in Melbourne (Australia).

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## **f. ICWG III/VII (Wolfgang Förstner) - Pattern Recognition for Remote Sensing**

### 1. State of Science and Technology

The goals of the working group is to:

- coordinate the research in the development of pattern recognition methods for remote sensing applications;
  - bring together researchers for photogrammetry, remote sensing, pattern recognition and machine learning;
  - discuss the used methods;
  - evaluate the methods based on common benchmarks.

Fortunately the WG is closely linked to the Technical Committee 7 on ‘Remote sensing and Mapping’ of the International Association for Pattern Recognition ([www.iapr-tc7.org/start](http://www.iapr-tc7.org/start)).

Terms of Reference:

- Statistical and non-statistical methods,
- Pixel-based and object-based methods,
- Graphical models (random fields, Bayesian nets) and stochastic grammars,
- Scale space methods,
- Data fusion,
- Quality and uncertainty,
- Benchmarking.

### 2. Activities of the WG in 2009

- Opening of the WG [website](#);
- Recruitment of members (78 members);
- The workshop "Performance Evaluation of Pattern Recognition in Remote Sensing" ([PEPRRS'09](#)) was planned to be held in Jena, Germany, on 08th September 2009 in conjunction with the DAGM Symposium 2009, but the workshop was finally cancelled.
- [eTRIMS Image Database](#): The database is provided by the University of Bonn (Germany). It contains annotated RGB-images of building facades. Ground truth is provided to serve as a basis for evaluation and comparison of supervised learning approaches to image interpretation. eTRIMS is a collection of annotated images of real world street scenes. Name stems from supporting EU Project eTRIMS - eTraining for Interpreting Images of Man-Made Scenes (2006 – 2009). Typical objects in these images are variable in shape and appearance, in the number of its parts and appear in a variety of configurations. The domain of man-made scenes is thus well suited for

evaluation and comparison of a variety of interpretation approaches, including those that employ structure models. The provided pixelwise ground truth assigns each image pixel both with a class label and an object label and offers thus ground truth annotation both on the level of pixels and regions. While it is believed that such ground truth is of general interest in supervised learning, such data may be of further relevance in emerging real world applications involving automation of man-made scene interpretation. The database is comprised of two datasets, the 4-Class eTRIMS Dataset with 4 annotated object classes and the 8-Class eTRIMS Dataset with 8 annotated object classes. For more details, please read the [Technical Report](#) of the IGG of the University of Bonn (Germany).

### 3. Planned activities of the WG in 2010

- WG meeting at the occasion of the mid-term symposium in Paris, France (PCV 2010).

## 4. Other Relevant Information (N. Paparoditis, M. Pierrot-Deseilligny, and C. Mallet)

Summary of the activities of the six WG of TC III for 2009:

WG	III/1	III/2	III/3	III/4	III/5	ICWG III/VII
<b>Active members</b>	4	15	6	23	19	78
<b>Passive members</b>	0	7	1	3	-	-
<b>Benchmark</b>	x			x (in 2010)		
<b>Datasets</b>	x	x (2004-2008+ in 2010)	X (in 2010)	x (in 2010)		x
<b>Software</b>		x				
<b>2009 workshop</b>		x		x	x	(x)
<b>Link with other committees or conferences</b>	Computer Vision conferences					IAPR TC7

## 5. Commission Officer Address Updates (N. Paparoditis, M. Pierrot-Deseilligny, and C. Mallet)

Since September 2009, Björn Waske is Assistant Professor in Remote Sensing, Agricultural Faculty in the Department of Photogrammetry of the Institute of Geodesy and Geoinformation

in the University of Bonn (Germany). Before, he was PostDoc in the Department of Electrical and Computer Engineering of the University of Iceland, (Reykjavik, Iceland). Björn Waske is secretary of ICWG III/VII.