

Annual Report on the Activities of Working Group III/4 “Complex Scene Analysis and 3D Reconstruction” in 2009

Franz Rottensteiner and Gunho Sohn

30 November 2009

1. State of Science and Technology of Working Group Topics

- 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 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 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 / m²) 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 PIA11 conference in Munich (Germany). It will also support the Laserscanning 2011 workshop in Calgary (Canada).