ISPRS Working Group III/5 – Image Sequence Analysis

Annual Report 2011

1. State of Science and Technology of Working Group Topics

Goals:
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 framerate
- 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. Accomplishments of Working Group during the current year

- 2011, 11.-13. April
  IEEE/ISPRS Joint Urban Remote Sensing Event (JURSE 2011)
  Munich, Germany
  http://www.jurse2011.tum.de/
  Co-organization the conference by
    - Announcement
    - Web pages
    - Management of the review process
    - Editing of proceedings
    - Publication of proceedings
    - Local organization

- 2011, 13.-15. April
  Earth Observation of Global Changes (EOGC 2011)
  Munich, Germany
  http://www.eogc2011.tum.de/
  Co-organization of the conference by
    - Announcement

    - Web pages
    - Management of the conference tool
    - Local co-organization

- 2011, 05.-07. October
  Photogrammetric Image Analysis (PIA11)
  Munich, Germany
  http://www.pia11.bv.tum.de/
  Co-organization of the conference by
    - Announcement
    - Web pages
    - Management of the review process
    - Editing of proceedings
    - Publication of proceedings
    - Local organization

3. Working Group News

Planned activities

- 2012, 08 -10 February
  WG III/5 is co-organizer of
  EuroCOW 2012: The Calibration and Orientation Workshop in Castelldefels, Spain
  http://www.ideg.es/page.php?id=1094

- 2012, July
  Organization of a Summer school at TUM in Munich, Germany

- 2012, 25 August – 1 September
  Organize sessions at the **ISPRS Congress** in Melbourne, Australia
  http://www.isprs2012-melbourne.org/

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JURSE 2011

JURSE 2011, the IEEE GRSS and ISPRS **J**oint **U**rban **R**emote **S**ensing **E**vent was a double-track conference which was held in Munich, Germany, from April 11-13, 2011.

The idea to organize an international workshop on urban remote sensing, jointly sponsored by IEEE GRSS (Institute of Electrical and Electronic Engineers, Geoscience and Remote Sensing Society) and ISPRS (International Society for Photogrammetry and Remote Sensing) was put in practice for the first time by the GRSS/ISPRS Joint workshop on 'Remote sensing and data fusion over urban areas' (URBAN) held in Rome (2001). Editions of URBAN followed in Berlin (2003) and Tempe (2005). In parallel to these activities a series of workshops named ‘Remote sensing of urban and suburban areas' (URS) were organized in Regensburg (1997, 2001, 2003), Istanbul (2002), and Tempe (2005). After the common workshop in Tempe (2005) the 4th GRSS/ISPRS Joint Workshop on 'Remote sensing and data fusion over urban areas (URBAN)' and the 6th International Symposium on 'Remote sensing of urban areas' (URS) were jointly held in Paris (2007). The meeting was named 'Joint Urban Remote Sensing Event' (JURSE). The last JURSE was held in Shanghai in 2009.

JURSE 2011 was organized by the conference chairs and the local organizing committee of the Department of Photogrammetry and Remote Sensing, Technische Universitaet Muenchen. The conference addressed researchers and practitioners from universities, research institutes, industry, mapping agencies, governmental organizations, and private companies. It discussed recent developments and trends on remote sensing for urban monitoring. The range of topics covers methodological work as well as application oriented case studies and is reflected by the terms of URBAN and URS:

- ❒ New data & sensors for urban area remote sensing
- ❒ Structure detection and characterization in urban areas
- ❒ Algorithms and techniques for remotely sensed data interpretation in urban areas
- ❒ Algorithms and techniques for urban area applications

- ❒ Urban climatology, geology, and geohazards
- ❒ Remote sensing applications to social science
- ❒ Remote sensing applications to urban planning and conservation
- ❒ Urban development and growth pattern
- ❒ Urban/periurban ecology

In order to support young researchers in the field of urban remote sensing, a student paper competition was embedded in JURSE 2011, being a wonderful occasion for young scientists to expose their work in this unique venue and be recognized for their value. Submitted student papers were evaluated and the best ones selected. The students of these papers were able to present their work in dedicated student prize sessions. In addition they received free registration for the conference as well as free hotel rooms close to the conference site. The three best papers were rewarded.

For further improvement of the scientific quality a full paper review was introduced for JURSE 2011 in Munich. Prospective authors were invited to submit full papers of a maximum length of 4 pages. We received 147 papers from 34 countries for peer review. Most papers were reviewed at least by three members of the program committee; papers for the student competition were reviewed by four peers. In total, 411 reviews were carried out by 44 reviewers.

Finally, 115 papers coming from 28 countries were included in the program which corresponds to an acceptation rate of 78%. From 27 papers submitted following the call for students 10 papers were considered for the oral student competition at the conference.

During the two-and-a-half days of the event there were one plenary session with 2 presentations, 9 sessions with altogether 45 oral presentations, 3 special sessions with 15 oral presentations, and 2 student paper sessions with 10 oral presentations. Additionally, in one poster session 47 posters were presented.

All presented papers were published via IEEE Xplore (http://ieeexplore.ieee.org).

PIA11

Automated extraction of objects from remotely sensed data is an important topic of research in Photogrammetry, Computer Vision, Remote Sensing, and Geoinformation Science. PIA11 addressed researchers and practitioners from universities, research institutes, industry, government organizations, and private companies. The range of topics covered by the conference is reflected by the terms of reference of the cooperating working groups of the International Society for Photogrammetry and Remote Sensing (ISRPS):

- Lidar, SAR and Optical Sensors (WG I/2)
- Pose Estimation and Surface Reconstruction (WG III/1)
- Complex Scene Analysis and 3D Reconstruction (WG III/4)
- Image Sequence Analysis (WG III/5)

After the successful series of ISPRS conferences on Photogrammetric Image Analysis in Munich in 1999, 2003, and 2007, in 2011 PIA11 again discussed recent developments, the potential of various data sources, and future trends in automated object extraction with respect to both sensors and processing techniques, focusing on methodological research. It was held at Technische Universitaet Muenchen (TUM) in Munich, Germany, 5-7 October 2011.

Prospective authors were invited to submit full papers of a maximum length of six A4 pages. We received 54 full papers coming from 18 countries for review. The submitted papers were subject to a rigorous double blind peer review process. Forty-two papers were reviewed by three members of the program committee, whereas the rest (12 papers) was reviewed by two members of that committee. In total we received 150 reviews from 29 reviewers. Altogether 30 papers were accepted based on the reviews, which corresponds to a rejection rate of 44%. From those 25 papers were published in printed form within the book series 'Lecture Notes in Computer Science' (LNCS) of Springer-Verlag and 5 papers are contained in this volume of the International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences. All contributions are listed in Part 1. Additionally, authors who intended to present application-oriented work particularly suitable for interactive presentation were invited to submit extended abstracts. Part 2 of this volume contains 23 of these papers.

Altogether, PIA11 featured 7 oral sessions, 2 poster sessions, and 2 invited talks, namely "Convex optimization methods for Computer Vision" (Daniel Cremers) and "Exploiting redundancy for reliable aerial Computer Vision" (Horst Bischof).

Finally, the editors wish to thank all contributing authors and the members of the Program Committee. In addition, we would like to express our thanks to the Local Organizing Committee, without whom this event could not have taken place. Ludwig Hoegner did a great job managing of the conference tool. The final editing of all incoming manuscripts and the preparation of the proceedings by Michael Schmitt are gratefully acknowledged. Konrad Eder and Dorota Iwaszczuk did a great job organizing the social events and accomodation, Florian Burkert in caring for the technical equipment, and Sebastian Tuttas in supervising the local organizing committee assistants. We would also like to thank Christine Elmauer, Carsten Goetz, and Gabriele Aumann for their support to make PIA11 a successful event.