

THE 4TH INTERNATIONAL SYMPOSIUM - REMOTE SENSING OF URBAN AREAS: OUTCOMES AND FUTURE DIRECTIONS

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1. Introduction

The 4th International Symposium Remote Sensing of Urban Areas was held from June 27-29, 2003 in Regensburg, Germany. The conference built upon earlier meetings held in Regensburg (1997 and 2001), and in Istanbul, Turkey (2002). A total of 130 participants came from over 30 countries around the globe. Rapid advances in image acquisition and analysis techniques related to the remote sensing of urban areas necessitate frequent forums for the exchange of ideas among researchers and industry professionals. A total of 36 oral papers and 14 poster presentations made up the conference program, which was supported by the International Society for Photogrammetry and Remote Sensing (ISPRS) under the auspices of working group ISPRS-WG VII/4-Human Settlement and Impact Analysis, the European Association of Remote Sensing Laboratories, and the German Society for Photogrammetry, Remote Sensing and Geoinformation.

4th International Symposium REMOTE SENSING OF URBAN AREAS June 27-29, 2003, Regensburg, Germany

The Symposium was held on the campus of the University of Regensburg and directed by Dr. Carsten Jürgens (University of Regensburg) and co-directed by Dr. Derya Maktav (Istanbul Technical University). The international scien-

tific committee consisted of members from Australia, Canada, the Czech Republic, Denmark, Germany, Hungary, Italy, Luxembourg, Switzerland, Turkey, the United Kingdom, and the United States.

2. Opening Session and Symposium Themes

The symposium was opened with introductions by a number of distinguished guests including officials from the University of Regensburg (Dr. Otto Wolfbeis-Vice-Rector and Dr. Jürgen Schmude-Dean of the Faculty of Philosophy). They were followed by Hans Schaidinger (Mayor of Regensburg), Dr. Klaus Komp (President, German Society for Photogrammetry, Remote Sensing and Geoinformation), Dr. Eberhard Parlow (President, European Association of Remote Sensing Laboratories), Dr. John Trinder (President, International Society for Photogrammetry and Remote Sensing-ISPRS), and Dr. Gabor Remetey-Flopp (Chair, ISPRS-WG VII/4-Human Settlement and Impact Analysis). The session finished with remarks from Dr. Derya Maktav and Dr. Carsten Jürgens.

The symposium addressed the following session topics:

- Ecological Aspects / Landscape Metrics
- Urban Information and Decision Support Systems
- Change Detection Analysis
- Road Extraction Techniques / Traffic Applications
- Radar and Thermal Applications
- Special Applications
- Extraction of Height and Density
- Monitoring Urban Land Cover Dynamics and Urban Growth

- Vulnerability of Urban Areas to Natural Hazards
- New Information Extraction Strategies [Jürgens 2003].

Ecological Aspects / Landscape Metrics

This session consisted of four presentations including the themes of energy infrastructure, sealed surface determination, urban growth, and the uses of astronaut photography. An international theme was evident, with applications including the Urban Environmental Monitoring (UEM) Project underway at Arizona State University, which looks at urban spatial variation in 100 global cities using Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) data. Other data sources used by the presenters included IKONOS, Landsat, and aerial photography.

Urban Information and Decision Support Systems

Presentations in this session dealt with issues related to 3D city visualization, Internet-based GIS data query and visualization, integrated GIS and remote sensing decision support systems for city planning, and utilizing the 'Address-Point' database for improved image pattern recognition. The principal theme was related to improving information access by employing new methods and data sources that have recently become available. The rate of land use change was also a focus in this session.

Change Detection Analysis

The main issues addressed in this session were the use of object-oriented or object-specific approaches for change detection as well as the measurement of land use change. A wide variety of data sources were used including Landsat Multispectral Scanner (MSS), Thematic Mapper (TM), and Enhanced Thematic Mapper (ETM+), Quickbird, and aerial photography. Very diverse areas were subject to analysis including Austria, Germany, and Mongolia.

Road Extraction Techniques / Traffic Applications

This session concentrated on road and traffic applications. Thermal infrared camera images and IKONOS data were used in these studies with applications focussing on road network planning, traffic flow regulation, and updating road network information in developing countries. The need for up-to-date urban databases is apparent in both the developed and developing world.

Radar and Thermal Applications

The themes of the two papers presented in this session were radar data speckle reduction/edge detection in urban environments and using the Moderate Resolution Imaging Spectroradiometer (MODIS) thermal data for the assessment of urban heat islands. As new low-cost types of data such as MODIS become available, the applications for them will continue to increase.

Special Applications

One paper was presented in this session related to the advantages of using digital cadastre data, digital photogrammetric data, digital aerial photographs, as well as excavation reports and drawings for more precise mapping of archaeological sites in Rome.

Extraction of Height and Density

This session highlighted the use of some 'old' technology (balloons) in combination with new digital technology (digital cameras) for the examination of cultural heritage structures. In addition, applications of Light Detection and Ranging (LIDAR) data were addressed relating to the production of Digital Elevation Model (DEM) data and 'true-orthophotos'. A further paper was presented on the production of DEM from aerial data. Height is becoming an important requirement for geographic data and platforms such as LIDAR are providing valuable information in this area.

Monitoring Urban Land Cover Dynamics and Urban Growth

The monitoring of land use change dynamics is a growing concern in many countries. Applications were presented in this session related to urban area growth in Canada, the Czech Republic, Italy, and Slovenia. Datasets analyzed included Landsat (MSS, TM and ETM+), Quickbird, and aerial photography. The use of pan-sharpened data, the inclusion of image texture, and Normalized Difference Vegetation Index (NDVI) analysis were highlighted for urban classification applications.

Vulnerability of Urban Areas to Natural Hazards

Urban morphology and its relation to earthquake vulnerability was the focus of the first paper in this session. The composition of census tracts as measured through a spectral mixture analysis of Landsat TM imagery was highlighted. The second paper used IKONOS imagery and a high resolution DEM to compare a computed flood line with terrestrial measurements. This innovative approach resulted in the computation of a new flood plain.

New Information Extraction Strategies

Four papers were presented in the final conference session. The issues addressed included the use of image texture, object-oriented classification, automated procedures for large-area mapping, and the application of high-resolution and multi-sensor data in urban landscape mod-

elling. Some of the items reported included an increase in classification accuracy using object-oriented methods versus maximum likelihood procedures, and the use of neural networks for sub-pixel mapping.

3. State of the Science

Remote sensing is continuously evolving and new applications and techniques are being developed at a rapid rate. The papers that were presented at this symposium represented a wide range of topics that can be considered under the main theme of urban remote sensing. The use of aerial photography continues to play a major role in change-detection applications. The potential for using astronaut digital photography (which has recently become available) in urban growth analyses and as sources of ancillary data should be further developed where feasible. Newer high-resolution data sources such as IKONOS and Quickbird are increasingly being utilized for urban studies. LIDAR and other aerial platforms are providing additional sources of high-resolution data that have applications in areas such as DEM generation, building height determination, and road network detection.

Improved data fusion techniques such as pansharpening [Zhang 2002] are creating new valuable information sources from long-running programs such as Landsat. The lower costs associated with satellite data are making the acquisition and use of these data possible for a much wider audience. From the oral and poster presentations at this symposium, it appears that the main satellite sensors used for urban analyses are: Landsat, ASTER, MODIS, ERS, JERS, SPOT, IKONOS, and Quickbird. Other sensors that certainly have application include IRS, Radarsat, and AVHRR, plus additional sensors that will be launched in the short and long term.

4. Future Directions

The era of civilian satellite remote sensing began with the launch of Landsat 1 in 1972 [Lauer et al. 1997]. Landsat 5 continues to be operational however Landsat 7 has been adversely affected by a failure of its Scan Line Corrector-SLC [NASA 2003]. This problem results in an unaffected data swath that is approximately 22 km wide in the centre of each orbital path. Areas outside of this region will contain artefacts caused by the failure of the SLC. Nonetheless, due to the low cost and wide availability of Landsat imagery, this program will unquestionably continue to provide data for a wide range of urban remote sensing studies. High-resolution satellite and aerial platform digital data will increasingly be utilized in detailed analyses of urban areas. However, the role of aerial photography must not be forgotten as this provides a valuable information source especially for historical urban change studies.

The 5th International Symposium Remote Sensing of Urban Areas symposium is scheduled for Tempe, Arizona in 2005. There will most certainly be a wide range of developments and issues to discuss at this meeting.

5. Symposium Sponsors

Sponsors included: the Deutsche Gesellschaft für Photogrammetrie und Fernerkundung (DGPF); the European Association of Remote Sensing Laboratories (EARSeL); the International Society for Photogrammetry and Remote Sensing (ISPRS); Vexcel Imaging Austria, Graz; Geosystems GmbH, Germering; Toposys GmbH, Ravensburg; GIN Kompetenzzentrum für Geoinformatik, Vechta; Taylor & Francis Books Ltd., London; Kluwer Academic Publishers, Dordrecht; Informatica per il Territorio Srl, Roma; ImageSat Israel, Tel Aviv; and GGS Geotechnik, Geoinformatik, Service Kemper & Partner GbR, Speyer.

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REPORT OF THE CIG CERTIFICATION COMMITTEE

The Certification Committee was approved by the CIG Executive Committee on June 4, 2002. The members of the Certification Committee are:

Dr. Gerald Lachapelle, Professor, University of Calgary, Calgary
 Mr. Paul Mrstik, Vice President, Mosaic Mapping Systems Inc., Ottawa
 Ms. Carolyn J. Goodfellow, Scientist, CCRS, Ottawa
 Dr. David J. Coleman, Professor, University of New Brunswick, Fredericton
 Dr. George J.M. Zarzycki, (retired and consultant), Chairman of the Committee, Kanata

A total of six applications were received, four were approved and two are "in the pipe line" under review. Of the six, one is in photogrammetry, one in geodesy and four in GIS/LIS. One of those certified is a professor from Spain. It would appear that we are attracting members from outside the traditional surveying and mapping community. The number of applicants is small, but this is not surprising, considering that the Certification Program was not advertised (outside of one notice in *Geomatica*).

We have received several inquiries about certification in cartography. Unfortunately, the cartographic community has not yet come up with certification criteria. I have contacted Dr. Peter Keller regarding this matter.

I discussed with the new Executive Director of CIG, Mr. Richard Nasmith, possible strategies to make the Certification Program more widely known, and we agreed that it should be advertised in *Geomatica* and in the publication of ESRI Canada, *Arc North News*. I am confident that CIG would gain at least a hundred new members and would play a leading role in certification of geomatics professionals in Canada.

As far as the financial side of this program is concerned, the six applications brought in \$900 plus membership fees. Expenses to date are negligible, some \$20 for postage.

I would like to thank all members of the Certification Committee for their dedication and hard work.

I hope that the CIG Council will support the Certification Program.

DR.GEORGE J.M. ZARZYCKI