

THE INTERNATIONAL ARCHIVES OF THE PHOTOGRAMMETRY, REMOTE SENSING AND SPATIAL INFORMATION SCIENCES
ARCHIVES INTERNATIONALES DES SCIENCES DE LA PHOTOGRAMMÉTRIE, DE LA TÉLÉDÉTECTION ET DE L'INFORMATION SPATIALE
INTERNATIONALES ARCHIV FÜR PHOTOGRAMMETRIE, FERNERKUNDUNG UND RAUMBEZOGENE INFORMATIONSWISSENSCHAFTEN

VOLUME
VOLUME
BAND

XXXVIII

PART
TOME
TEIL

7A

ISPRS Technical Commission VII Symposium
100 Years ISPRS
Advancing Remote Sensing Science



1910 - 2010
CENTENARY CELEBRATION VIENNA



Vienna, Austria
July 5 – 7, 2010

Papers accepted on the basis of peer-reviewed full manuscripts

Editors

W. Wagner, B. Székely

Organised by

ISPRS Technical Commission VII

Thematic Processing, Modeling and Analysis of Remotely Sensed Data

Supported by

Leica Geosystems, Vexcel Imaging, Stadt Wien, ESRI, RIEGL LMS, TU Wien

This compilation © 2010 by the International Society for Photogrammetry and Remote Sensing. Reproduction of this volume or any parts thereof (excluding short quotations for the use in the preparation of reviews and technical and scientific papers) may be made only after obtaining the specific approval of the publisher. The papers appearing in this volume reflect the authors' opinions. Their inclusion in this publication does not necessarily constitute endorsement by the editors or by the publisher. Authors retain all rights to individual papers.

Credits

Technical Editing: Alexandra von Beringe, Peter Doringner, Sebastian Flöry, Josef Jansa, Clemens Nothegger, Norbert Pfeifer, Andreas Roncat

using L^AT_EX's confproc class (by V. Verfaillle)

Cover Illustration: Gregor Franzen

Printed by: Buchdruckerei Ernst Becvar Ges.mbH, Vienna, Austria

Published by

Institute of Photogrammetry and Remote Sensing, Vienna University of Technology

on behalf of

ISPRS Technical Commission VII *Thematic Processing, Modeling and Analysis of Remotely Sensed Data*

Cooperating ISPRS Working Groups

- WG VII/1 *Physical Modelling and Signatures in Remote Sensing*
- WG VII/2 *SAR Interferometry*
- WG VII/3 *Information Extraction from Hyperspectral Data*
- WG VII/4 *Methods for Land Cover Classification*
- WG VII/5 *Methods for Change Detection and Process Modelling*
- WG VII/6 *Remote Sensing Data Fusion*
- WG VII/7 *Theory and Experiments in Radar and Lidar*
- ICWG III/VII *Pattern Recognition in Remote Sensing*

ISPRS Headquarters 2008-2012

c/o CHEN JUN, ISPRS Secretary General

National Geomatics Centre of China

No. 1 Baishengcun, Zizhuyuan

Beijing 100048, PR CHINA

Tel: +86 10 6842 4072

Fax: +86 10 6842 4101

Email: chenjun@nsdi.gov.cn; chenjun_isprs@263.net

ISPRS WEB Homepage: <http://www.isprs.org>

Available from

GITC bv

P.O.Box 112

8530 AC Lemmer

The Netherlands

Tel: +31 (0) 514 56 18 54

Fax: +31 (0) 514 56 38 98

E-mail: mailbox@gitc.nl

Website: www.gitc.nl

Table of Contents

Preface	viii
Symposium Committee	x
Reviewers	xi
Papers	
The effect of biomass and scanning angle on the laser pulse transmittance <i>Eero Ahokas, Juha Hyypä, H. Kaartinen, Antero Kukko, Sanna Kaasalainen, and Anssi Krooks</i>	1
Analysis of spatial and temporal evolution of the NDVI on vegetated and degraded areas in the central Spanish Pyrenees <i>Luis Carlos Alatorre, and S. Beguería</i>	7
Estimating sub-pixel to regional winter crop areas using neural nets <i>Clement Atzberger, and Felix Reibold</i>	13
Integration of contextual information for the transfer of beliefs in an information sources fusion system-application to detection and classification of trees crowns <i>Zouhour Ben Dhiab, A. Hamouda, and J. Desachy</i>	19
Comparison of Error Propagation in Block Orientation: An Analytical Approach <i>Jackson Cothren, and Burkhard Schaffrin</i>	25
A review on image segmentation techniques with remote sensing perspective <i>Vivek Dey, Y. Zhang, and M. Zhong</i>	31
Assessment system of GIS-objects using multi-temporal imagery for near-realtime disaster management <i>Daniel Frey, and Matthias Butenuth</i>	43
The potential of a space altimeter when measuring significant wave height <i>Boris Y. Grishechkin, and A.I. Baskakov</i>	49
Classification of settlement areas in remote sensing imagery using conditional random fields <i>Thorsten Hoberg, and Franz Rottensteiner</i>	53
Estimation of timber assortments using low-density ALS data <i>Markus Holopainen, Mikko Vastaranta, Jussi Rasinmäki, Jouni Kalliovirta, Antti Mäkinen, Reija Haapanen, Timo Melkas, Xiaowei Yu, Juha Hyypä, and Hannu Hyypä</i>	59
Towards Fully Automatic Photogrammetric Reconstruction Using Digital Images Taken From UAVs <i>Arnold Irschara, Viktor Kaufmann, Manfred Klopschitz, Horst Bischof, and Franz Leberl</i>	65
Exterior orientation of line-array CCD images based on quaternion spherical linear interpolation <i>Gangwu Jiang, Ting Jiang, Hui Gong, and Xin Wang</i>	71
Theoretical frameworks of remote sensing systems based on compressive sensing <i>Jiying Liu, Jubo Zhu, Fengxia Yan, and Zenghui Zhang</i>	77

Comparison of terrestrial laser scanner and synthetic aperture radar data in the study of forest defoliation <i>Sanna Kaasalainen, Juha Hyypää, Mika Karjalainen, Anssi Krooks, Päivi Lyytikäinen-Saarenmaa, Markus Holopainen, and Anttoni Jaakkola</i>	82
True Orthophoto Creation Through Fusion of LiDAR Derived Digital Surface Model and Aerial Photos <i>Akira Kato, L.M. Moskal, P. Schiess, Donna Calhoun, and Mark E. Swanson</i>	88
Mapping of built-up area density from satellite images using morphological granulometries <i>Akila Kemmouche, R. Khedam, and C. Mering</i>	94
Analysis of BRDF characteristics of forest stands with a digital aerial frame camera <i>Tatjana Koukal, and Werner Schneider</i>	100
Land cover identification using polarimetric SAR images <i>Assia Kourgli, M. Ouarzeddine, Y. Oukil, and A. Belhadj-Aissa</i>	106
Analysis of spatiotemporal difference of NDVI in an arid coal mining region using remote sensing <i>Shaogang Lei, and Zhengfu Bian</i>	112
A framework of polarimetric SAR filter based on independency of intensity and polarimetric information <i>Pingxiang Li, Shaoping Deng, Jixian Zhang, Guoman Huang, and Zheng Zhao</i>	117
Evaluation of spectral and texture features for object-based vegetation species classification using support vector machines <i>Zhengrong Li, Ross Hayward, Jinglan Zhang, Hang Jin, and Rodney Walker</i>	122
Empirical comparison of machine learning algorithms for image texture classification with application to vegetation management in power line corridors <i>Zhengrong Li, Yuee Liu, Ross Hayward, and Rodney Walker</i>	128
Assessment of the multiple endmember spectral mixture analysis (mesma) model applied to the HYPERION/EO-1 hyperspectral data of the coastal plain of Rio Grande do Sul, Brazil <i>Rodrigo M. Linn, Silvia Beatriz Alves Rolim, and Lênio Soares Galvão</i>	134
Urban Road Tracking by Fusion of SVDD and Region Adjacency Graphs from VHR imagery <i>Zhengjun Liu, Xiangguo Lin, Jixian Zhang, and Pengxian Pu</i>	139
Validation of the radiometric processing chain of the Leica ADS40 airborne photogrammetric sensor <i>Lauri Markelin, Eija Honkavaara, Ulrich Beisl, and Ilkka Korpela</i>	145
Describing buildings by 3-dimensional details found in aerial photography <i>Philipp Meixner, and Franz Leberl</i>	151
Terrain echo probability assignment based on full-waveform airborne laser scanning observables <i>Werner Muecke, Christian Briese, and Markus Hollaus</i>	157
Airborne Doppler navigation system application for measurement of the water surface backscattering signature <i>Alexey Nekrasov</i>	163
Aerial photo building classification by stacking appearance and elevation measurements <i>Thuy Thi Nguyen, Stefan Kluckner, Horst Bischof, and Franz Leberl</i>	169
Multitemporal RADARSAT-2 polarimetric SAR data for urban land-cover mapping <i>Xin Niu, and Yifang Ban</i>	175

Fusion of optical and radar remote sensing data: Munich city example <i>Gintautas Palubinskas, and Peter Reinartz</i>	181
Tidal wetland monitoring using polarimetric synthetic aperture radar <i>Sang-Eun Park, D. Kim, H.-S. Lee, W. M. Moon, and Wolfgang Wagner</i>	187
Automatic detection of buried channel deposits from dense laser altimetry data <i>Boudewijn M.J. Pospel, Roderik C. Lindenbergh, and Joep E.A. Storms</i>	192
Land use and land cover classification using RADARSAT-2 polarimetric SAR imagery <i>Zhixin Qi, Anthony Gar-On Yeh, Xia Li, and Zheng Lin</i>	198
Four reduced-reference metrics for measuring hyperspectral images after spatial resolution enhancement <i>Shen-En Qian, and Guangyi Chen</i>	204
A comparative case of study of image sharpening <i>Victor F. Rodríguez Galiano, E. Pardo-Igúzquiza, M. Chica-Olmo, M.J. García-Soldado, J.P. Rigol-Sánchez, and M. Chica-Rivas</i>	209
Mapping key hydrological variables using remotely sensed images integrated in a distributed water balance model <i>Nilda Sánchez, J. Martínez-Fernández, Alfonso Calera, Enrique Torres, and C. Pérez-Gutiérrez</i>	215
Detection of 25-year land-cover change in a critical watershed in southern philippines using LANDSAT MSS and ETM+ images: importance in watershed rehabilitation <i>Jojene R. Santillan, Meriam M. Makinano, and Enrico C. Paringit</i>	219
Remote Sensing and GIS in Inflow Estimation: The Magat Reservoir, Philippines Experience <i>Czar Jakiri S. Sarmiento, Ryan James V. Ayson, Rhodora M. Gonzalez, and Peter Paul M. Castro</i>	227
A supervised spectral substratum classifier to classify images with fuzzy memberships <i>Zongyao Sha, and Yichun Xie</i>	233
Image Texture Preservation in Speckle Noise Suppression <i>Ali Shamsoddini, and John C. Trinder</i>	239
Texture analysis to improve supervised classification in IKONOS imagery <i>Anna Nora Tassetti, E.S. Malinverni, and Michael Hahn</i>	245
The registration of 3-D model and 2-D image using point and line features <i>Tee-Ann Teo, and Liang-Chien Chen</i>	251
Estimation of aerosol and air quality fields with PM MAPPER – an optical multispectral data processing package <i>Thi Nhat Thanh Nguyen, S. Mantovani, and M. Bottoni</i>	257
Change visualization through a texture-based analysis approach for disaster applications <i>Daniel Tomowski, Sascha Klonus, Manfred Ehlers, Ulrich Michel, and Peter Reinartz</i>	263
Remote Sensing, Geographic Information Systems and Shannon’s Entropy: Measuring Urban Sprawl in a Mountainous Environment <i>Loureal Camille O. Verzosa, and Rhodora M. Gonzalez</i>	269
Automated Extraction of Plantations from IKONOS Satellite Imagery Using a Level Set Based Segmentation Method <i>Karsten Vogt, Björn Scheuermann, Christian Becker, Torsten Büschenfeld, Bodo Rosenhahn, and Jörn Ostermann</i> ..	275

Retrieval of biophysical vegetation products from RapidEye imagery <i>Francesco Vuolo, Clement Atzberger, Katja Richter, Guido D'Urso, and Jadunandan Dash</i>	281
Pansharpening – Relating Quantitative Quality Measures to Impact on Results of Subsequent Processing Steps <i>Uwe Weidner</i>	287
Mapping deformation of man-made linear features using dinsar technique <i>Hongan Wu, Yonghong Zhang, Jixian Zhang, and Xiaoyong Chen</i>	293
Structural high-resolution satellite image indexing <i>Gui-Song Xia, Wen Yang, Julie Delon, Yann Gousseau, Hong Sun, and Henri Maître</i>	298
Multistage algorithm for lossless compression of multispectral remote sensing images <i>Alexander Zamyatin</i>	304
Monitoring impervious surface sprawl using tasseled cap transformation of LANDSAT data <i>Qian Zhang, and Yifang Ban</i>	310
Precise Processing of SPOT-5 HRS and IRS-P5 Stereo Imagery – For the Project of West China Topographic Mapping at 1:50,000 Scale <i>Li Zhang, and Jixian Zhang</i>	316
Fusion of ascending and descending polarimetric SAR data for color orthophoto generation <i>Jixian Zhang, Jujie Wei, Guoman Huang, and Yonghong Zhang</i>	323
Author Index	329
Keyword Index	331

Preface

These are the proceedings of the ISPRS Technical Commission VII Symposium that was held on July 5–7, 2010, at the Vienna University of Technology, Austria. The proceedings consist of two parts: Part A collects all papers that were accepted on the basis of peer-reviewed full manuscripts; Part B contains papers which have been selected based on a review of the submitted abstracts.

The topic of the symposium was “100 Years ISPRS – Advancing Remote Sensing Science” to celebrate the foundation of the International Society for Photogrammetry (ISP) on July 4, 1910, on the initiative by Prof. Eduard Doležal. The Society changed its name to the International Society for Photogrammetry and Remote Sensing (ISPRS) in 1980, reflecting the increasing integration of the two disciplines. In our modern digital age, photogrammetry and remote sensing have virtually grown together, having as their common scope the extraction of reliable information from non-contact imaging and other sensor systems about the Earth and its environment through recording, measuring, analysing and representation.

Given the particular occasion the themes of the symposium extended beyond the traditional realms of Commission VII (“Thematic Processing, Modelling and Analysis of Remotely Sensed Data”) by inviting contributions from the other ISPRS Commissions as well. Contributions that provided a comprehensive overview of the major research areas in remote sensing, highlighting past achievements and identifying challenges for the future, were particularly welcome. The conference topics were

- Multi-spectral and hyperspectral remote sensing
- Microwave remote sensing
- Lidar and laser scanning
- Geometric modelling
- Physical modelling and signatures
- Change detection and process modelling
- Land cover classification
- Image processing and pattern recognition
- Data fusion and data assimilation
- Earth observation programmes
- Remote sensing applications
- Operational remote sensing applications

We would like to take this opportunity here to sincerely thank the reviewers of both the full-papers and the abstracts for their valuable time and expertise! Each paper within Part A was reviewed by at least two reviewers and revised according to their comments. Only 60% of the submitted full papers finally made it through this review process. Also each abstract was reviewed by two peers, most of them by even three or more peers. Without question, the reviewer’s effort was not in vain as it has helped to raise the quality of the papers and has allowed us to put together a high-quality technical programme.

Nevertheless, we also would like to add some self-criticism here. Within ISPRS the importance of a proper review process is broadly recognised. Also, more and more ISPRS colleagues rightfully request that all papers published in the *International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences* (such as those contained in the current volume) shall be covered by prominent indexing and abstracting databases. Yet, there is no standard ISPRS reviewing system, nor is there a professional editorial support and indexing service. Consequently, every organiser of an ISPRS workshop, symposium or congress needs to reinvent the wheel by building up his/her own system for reviewing and handling the scientific contributions and for producing the proceedings. Having never organised an event with more

than hundred people, the learning curve has been particularly steep for us. As a result, mistakes were unavoidable and we would like to apologise with the authors and reviewers for any inconvenience that they may have experienced. We are confident that together we will be able to solve this challenge for future scientific meetings to the benefit of our discipline.

Finally, we want to highlight the very positive fact that we have received many excellent papers from scientists from developing regions. This suggests to us that ISPRS has been quite successful in stimulating the exchange of scientists from around the world and diverse cultural background. This will become the ever more important as climate change, continued population growth and shrinking natural resources have all become truly global problems that require, as one small part of the solution, global observation capabilities to better understand of how we have to act locally.

Vienna, June 2010

Wolfgang Wagner

Balázs Székely

Symposium Committee

Organising Committee

Wolfgang Wagner, Vienna University of Technology, Austria (Chairman)
Balázs Székely, Vienna University of Technology, Austria (Scientific Coordinator)

Wouter Dorigo, Vienna University of Technology, Austria
Michael Franzen, Bundesamt für Eich- und Vermessungswesen, Austria
Juha Hyypä, Finnish Geodetic Institute, Finland
Josef Jansa, Vienna University of Technology, Austria
Norbert Pfeifer, Vienna University of Technology, Austria
Werner Schneider, University of Natural Resources and Applied Life Sciences, Austria
Klaus Steinnocher, Austrian Institute of Technology, Austria

Scientific Committee

Richard Bamler, DLR, Germany
Arnold Dekker, CSIRO, Australia
Diego Fernandez, ESA
Wolfgang Förstner, Bonn University, Germany
Garik Gutman, NASA, USA
Michael Schaepman, Universität Zürich, Switzerland
Johannes Schmetz, EUMETSAT
Uwe Sörgel, Leibniz Universität Hannover, Germany
Niko Verhoest, Ghent University, Belgium
Jixian Zhang, Chinese Academy of Surveying and Mapping, China
Yun Zhang, University of New Brunswick, Canada
Qiming Zhou, Hong Kong Baptist University, China

Reviewers

We gratefully acknowledge the support of the following colleagues who generously helped us in the review of the full-papers and abstracts:

Luis Carlos Alatorre
Paul Aplin
Roman Arbiol
Costas Armenakis
Clement Atzberger
Christoph Aubrecht
Manos Baltasvias
Richard Bamler
Georg Bareth
Zoltan Bartalis
Annett Bartsch
Enton Bedini
Eyal Ben-Dor
Santosh P. Bhandari
Horst Bischof
Christian Briese
Manfred Buchroithner
Ana Cabral
Liang-Chien Chen
Jan Clevers
Rene Colditz
Jackson Cothren
Jean-Francois Crétaux
Michele Crosetto
Wouter Dorigo
Peter Dorninger
Ian Dowman
Diego Fernandez
Michael Franzen
Steffen Fritz
Garik Gutman
Stefan Hasenauer
Christian Heipke
Manuela Hirschmugl
Thorsten Hoberg
Bernhard Höfle
Markus Hollaus
Pai-Hui Hsu
Tangao Hu
Juha Hyypä
Arnold Irschara

Josef Jansa
Sanna Kaasalainen
Helmut Kager
Wilfried Karel
Akira Kato
Viktor Kaufmann
Akila Kemmouche
Richard Kidd
Géza Király
Mathias Kneubühler
Ilkka Korpela
Tatjana Koukal
Nelley Kovalevskaya
Olaf Kranz
Claudia Künzer
Peijun Li
Bo-Cheng Lin
Roderik Lindenbergh
Zhengjun Liu
Zhong Lu
Aliaksei Makarau
Clément Mallet
Gottfried Mandlbürger
Lauri Markelin
Helmut Mayer
Ian McCallum
Thomas Melzer
Gábor Molnár
Werner Mücke
Sonoyo Mukai
Vahid Naeimi
Alexey Nekrasov
Wenige Ni-Meister
Johannes Otepka
Gintautas Palubinskas
Nicolas Paparoditis
Charles Paradzayi
Sang-Eun Park
Carsten Pathe
Norbert Pfeifer
Camillo Ressler

Victor F. Rodríguez-Galiano
Petri N. Rönholm
Dominik Rosenbaum
Franz Rottensteiner
Nilda Sánchez
Michael Schaeppman
Johannes Schmetz
Thomas Schneider
Alexander Schunert
Gabriela Seiz
Jie Shan
George Sithole
Julian Smit
Ben Somers
Uwe Sörgel
Klaus Steinnocher
Uwe Stilla
Haigang Sui
Anna Nora Tasseti
Tee-Ann Teo
Thi Nhat Thanh Nguyen
Gábor Timár
John Trinder
Jaan-Rong Tsay
Niko Verhoest
Loureal Camille Verzosa
Karsten Vogt
Francesco Vuolo
Wolfgang Wagner
Peter Waldhäusl
Miao Wang
Björn Waske
Aloysius Wehr
Uwe Weidner
Gui-Song Xia
Mitsunori Yoshimura
Yu Zeng
Jixian Zhang
Li Zhang
Yun Zhang
Qiming Zhou