



Scientific Programme

Overall Programme

Tutorials

Final Session Programme

Technical Commission I: Sensors, Platforms and Imagery

Technical Commission II: Systems for Data Processing, Analysis and Representation

Technical Commission III: Theory and Algorithms

Technical Commission IV: Spatial Information Systems and Digital Mapping

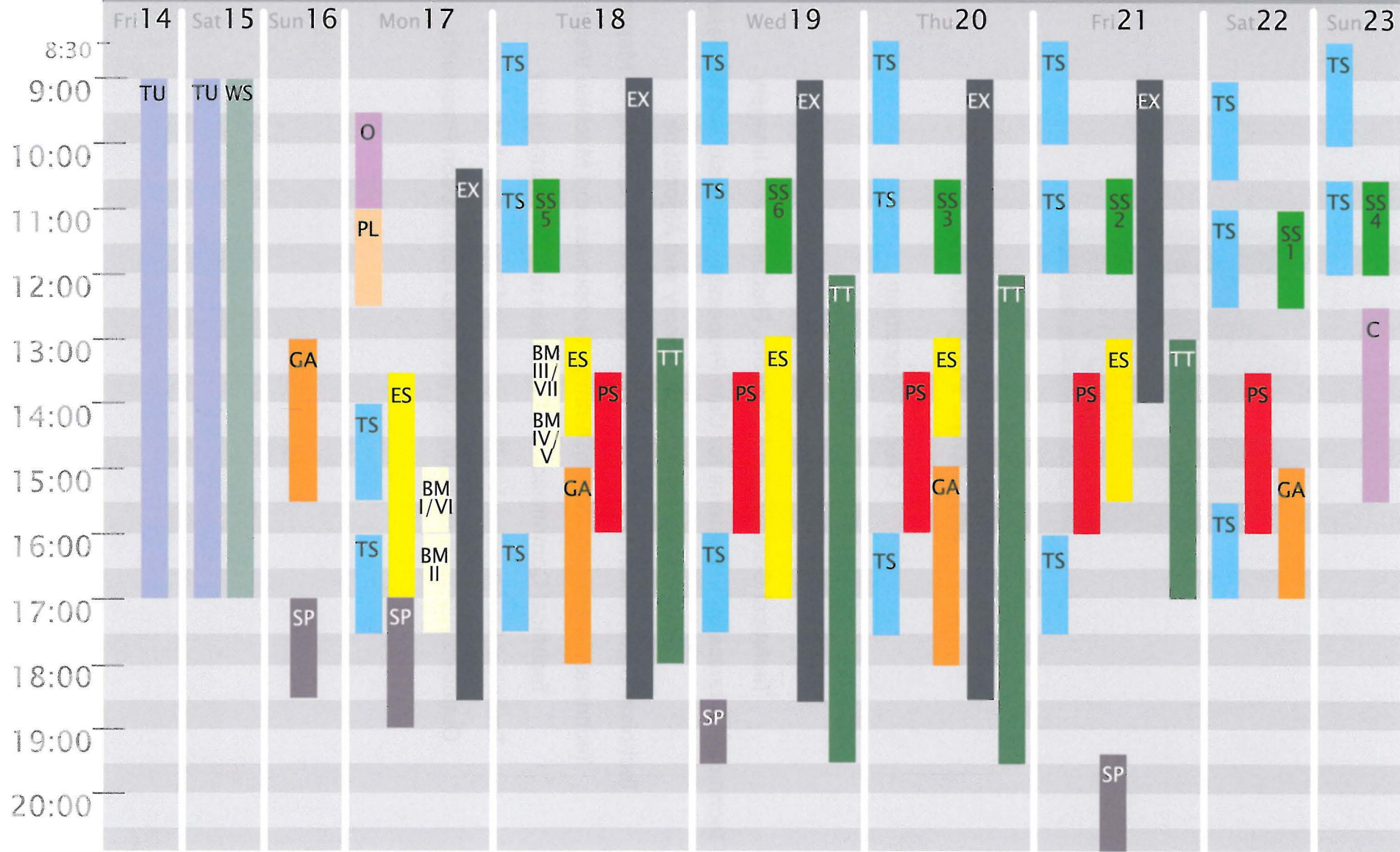
Technical Commission V: Close-range Techniques and Machine Vision

Technical Commission VI: Education and Communication

Technical Commission VII: Resources and Environment Monitoring

Outlook 2000-2004 of Incoming Technical Commission Presidents

Overall Programme



Monday

version 14-06-2000

IC-03 High resolution sensor data
Room A

TC-IV-02 Extra terrestrial mapping
Room B

TC-V-01 Vision metrology and VR/VE-generation
Room L

TC-VI-01 International co-operation and technology transfer
Room C/D

IC-25 Cloud mapping
Room B

TC-VI-03 Educational developments
Room C/D

TC-V-02 Automation in vision
Room L

TC-VII-04 High resolution satellite image data
Room A

Tuesday

IC-01 Advances in SAR developments
Room B

IC-20 Distance learning
Room C/D

TC-II-04 Integration of sensors on airborne and other platforms
Room L

TC-III-5a Object recognition using multi-sensor and multi-spectral data
FORUM

IC-18a Global databases and change monitoring
Room A

IC-02 Developments in SAR applications
Room B

IC-19 Interoperability and WEB-based approaches
Room C/D

TC-III-5b Laser altimetry
FORUM

TC-IV-06 Mapping potential of high resolution images
Room A

SS-5 Availability of spatial data
Room L

TP-III-01 Building reconstruction and low level processing
Room A

TP-IV-01 3D GIS and DEM generation
Room B

TP-IV-03 Information systems design
Room C/D

TP-V-05 Image sequence analysis and medical applications
Room L

TP-VII-01 Global monitoring
Room M

TP-VII-11 Disaster mitigation
Room N

IC-10 Real time systems
Room C/D

IC-17 Dynamic spatial modelling
Room B

IC-18b Global databases and change monitoring
Room A

TC-V-03 Integration of photogrammetry and CAD/CAM
Room L

Wednesday

IC-06a Data fusion and integration
FORUM

TC-II-03 Automation in digital systems for photogrammetry and RS
Room A

TC-IV-03a Spatio-temporal databases
Room B

TC-V-06 Motion capture, animation and 3D medical image processing
Room L

TC-VI-02 Internet activities
Room C/D

IC-06b Data fusion and integration
FORUM

IC-14 Data quality
Room C/D

TC-III-01 Computer vision for all
Room A

TC-VII-03 Sustainable renewable resource management
Room B

SS-6 Spatial data and terabyte technology
Room L

ISO-TC211
Room M
14.30-17.30

NSEOG: Geo-information in the network society
Room O 13.30-17.30

TP-II-01 Real time mapping and techniques for application of images
Room A

TP-III-02 Road/object recognition
Room B

TP-IV-02 DEM generation and orthoimages
Room C/D

TP-V-01 Close range imaging systems and vision metrology
Room M

TP-VI International co-operation, technology transfer and educational developments
Room L

TP-VII-03 Sustainable resources management - forest and agriculture
Room N

IC-16 Urban 3D modelling
Room B

IC-21 Hyperspectral sensing and applications
Room C/D

TC-II-02 Image transfer standards
Room L

TC-IV-03b Spatio-temporal databases
Room A

Thursday

IC-07a Integration of image analysis and GIS: general
FORUM

TC-III-2a Surface reconstruction
Room A

TC-V-04 Image sequence analysis
Room L

TC-VII-01 Local, regional and global monitoring
Room B

TC-II-01 Panel discussion
Systems for new data products
Room C/D

IC-07b Integration of image analysis and GIS: case-specific
FORUM

IC-11a Sensor orientation
Room B

TC-IV-01 Advanced geoinformation concepts for all
Room A

UNESCO/CIPA
Room C/D

SS-3 Remote sensing and global change
Room L

OGC
Room L

TP-I Sensor and SAR application development
Room A

TP-IV-04 Concepts for spatial databases, hierarchical approaches and interoperability
Room B

TP-V-02 Vision metrology and integration with CAD
Room M

TP-VII-02 Image analysis and application development
Room C/D

TP-VII-08 Monitoring of urban areas
Room L

TP-VII-05 Sustainable resource management - hydrology
Room N

IC-24a Disaster monitoring
Room B

TC-I-02 Perspectives of platforms and sensors for geoinformation needs
Room C/D

TC-III-2b Surface reconstruction
Room A

TC-V-05 Visualisation and virtual reality
Room L

Friday

CATCON

Room M

IC-11b Sensor orientation
FORUM

IC-09 CEOS WGISS
Room C/D

TC-IV-05a Spatial database interpretation
Room B

TC-V-07 CAD-based architectural and archeological photogrammetry
Room L

TC-VII-02 From raw data to user-defined quantitative products
Room A

CATCON

Room M

IC-13a Object recognition and image understanding
FORUM

IC-15a DTM generation and ortho-images I
Room A

TC-IV-05b Generalisation of spatial data
Room B

LH-Systems
Room C/D

SS-2 Geoinformation for sustainable development
Room L

CATCON

Room M

Special session:
70th birthday *Gottfried Konecny*
Room L

TP-II-02 Digital photogrammetry
Room L

TP-III-03 DEM and image matching
Room B

TP-IV-05 Data acquisition for spatial databases and global databases.
Room C/D

TP-V-03 Architectural & archeological photogrammetry & visualisation
Room A

TP-VII-06 Sustainable resource management - general 1
Room O

TP-VII-09 Image interpretation and analysis 1
Room N

CATCON

Room M

IC-13b Object recognition and image understanding
Room B

IC-15b DTM generation and ortho-images II
Room A

IC-22 Global RS and GIS and the Kyoto protocol
Room L

TC-VII-08 Environmental resource management and geotechnical applications
Room C/D

Saturday

IC-23a Sustainable resource management
Room B

TC-III-04a Automatic road extraction
FORUM

TC-V-10 World cultural heritage and information systems
Room L

OEEPE Session
Room A

TC-III-04b Automatic building extraction
FORUM

TC-V-12 Image sequence analysis
Room B

TC-VII-07 Radar processing for renewable resource monitoring
Room A

SS-1 Unispace III Revisited
Room L

TP-III-04 Image orientation and laser altimetry
Room A

TP-IV-06 Data quality and uncertainty
Room B

TP-V-04 Site modelling and cultural heritage recording
Room C/D

TP-VII-07 Sustainable resource management - general 2
Room M

TP-VII-10 Image interpretation and analysis 2
Room N

TP-VII-04 Non-renewable resources
Room O

IC-04 Sensor calibration
Room B

IC-08b CEOS WGISS
Room L

IC-23b Sustainable resource management
Room C/D

TC-VII-05 New development in automated image interpretation and analysis
Room A

Sunday

LEGEND

<p>IC-08a Integrated Global Observing System and other integrated systems <i>Room A</i></p> <p>IC-12a Feature extraction <i>FORUM</i></p> <p>TC-I-1 Space systems for disaster management <i>Room B</i></p> <p>TC-V-11 Performance of close-range imaging systems <i>Room L</i></p>
<p>IC-12b Feature extraction <i>FORUM</i></p> <p>IC-24b Risk assessment <i>Room A</i></p> <p>TC-V-08 Site recording and modelling <i>Room B</i></p>
<p>SS-4 Education and the profession <i>Room L</i></p>

<p>Technical Commission and Inter-Commission sessions</p> <p>Oral presentations</p> <p>Block 1a 9.00 - 10.30</p>	<p>CATCON</p> <p>8.30 - 17.30</p>	<p>Technical Commission and Inter-Commission sessions</p> <p>Oral presentations</p> <p>Block 1 8.30 - 10.00</p>
<p>OEERF Session Block 1a 9.00 - 10.30</p>		

<p>Technical Commission and Inter-Commission sessions</p> <p>Oral presentations</p> <p>Block 2a 11.00 - 12.30</p> <p>Special Sessions Block 2a 11.00 - 12.30</p>	<p>CATCON</p> <p>8.30 - 17.30</p>	<p>Technical Commission and Inter-Commission sessions</p> <p>Oral presentations</p> <p>Block 2 10.30 - 12.00</p> <p>Special Sessions Block 2 10.30 - 12.00</p>
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<p>Technical Commission and Inter-Commission sessions</p> <p>Oral presentations Block 3a 14.00 - 15.30</p>	<p>CATCON</p> <p>8.30 - 17.30</p>	<p>Oral presentations Block 3c 14.30 - 16.00 or 17.30</p> <p>Oral presentations Block 3-4 13.30 - 17.30</p> <p>Technical Commission and Inter-Commission sessions</p> <p>Poster presentations Block 3b 13.30 - 16.00</p>
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<p>Technical Commission and Inter-Commission sessions</p> <p>Oral presentations</p> <p>Block 4a 16.00 - 17.30</p>	<p>CATCON</p> <p>8.30 - 17.30</p>	<p>Technical Commission and Inter-Commission sessions</p> <p>Oral presentations</p> <p>Block 4b 16.00 - 17.30</p>
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Tutorials

On the occasion of the XIXth ISPRS Congress several tutorials were organised to inform the participants on the latest developments in their field. A total of fifteen tutorials were offered in the announcement of the congress. Due to the initially low numbers of registered participants the organising committee decided to cancel nine tutorials. The six tutorials that were held took place either in the congress centre RAI in Amsterdam or at the ITC in Enschede. They covered a broad variety of subjects, as one can see from the tutorial descriptions below.

TU1 - Introduction to SAR data

Convenor: D. Corr
 Location: RAI Amsterdam
 Date: July 15th, morning
 Lecturer: D. Corr
 Number of participants: 18

This tutorial provided an introduction to Synthetic Aperture Radar for anyone who needs to use SAR data or wished for a basic introduction to the topic. The tutorial addressed the question: What is SAR? It described the processes behind image formation and the characteristics of the image. The SAR processor was described and the characteristics of the output products, including such phenomena as speckle and layover. Issues of calibration were addressed. The tutorial also looked at a range of techniques which use SAR for particular applications, these included classification, interferometric SAR, Stereo SAR and Multi-polarimetric SAR. Current and future SAR systems were described.

TU2 - Overview, evaluation and testing of digital photogrammetric stations

Convenor: E. Baltsavias
 Location: RAI Amsterdam
 Date: July 15th, whole day
 Lecturers: E. Baltsavias,
 T. Kersten,
 Ms. M. Torre,
 L. Blank

Number of participants: 41

The tutorial first provided an overview of existing commercial digital photogrammetric systems, their technical characteristics and their functionality. Thereby, only 'universal' systems (incl. scanners) were treated, i.e. dedicated close-range or satellite remote sensing were excluded, while the focus was on systems using aerial imagery in production environments. Secondly, criteria and methods of evaluating such systems, using real examples, were presented. Thirdly, benchmark tests and comparisons of various commercial systems were presented. Finally, the performance of the systems was critically analysed and compared to the requirements for various photogrammetric applications, with emphasis on film scanning, aerial triangulation, DTM generation, orthoimage generation and mosaicking, and feature extraction. The tutorial did not only cover theoretical aspects but also included practical experience gained at a major photogrammetric company (Swissphoto), as well as significant tests performed within ISPRS and OEEPE.

In addition, close co-operation with the manufacturers to include the latest up-to-date information was aimed for. It was the aim that the tutorial, among other benefits, would provide attendees with sufficient background knowledge to (a) follow better the paper presentations during the Congress, and (b) make better use of the exhibition.

TU3 - Visual dissemination of geo-data via the World Wide Web

Convenor: M.-J. Kraak
 Location: ITC Enschede
 Date: July 14th, whole day
 Lecturers: M.-J. Kraak,
 B.J. Köbben,
 W. Feringa,
 R.M. Hootsmans

Number of participants: 12

The World Wide Web (WWW) has rapidly become a widespread means for the publication of geo-data. The WWW has earned this popularity since it is virtually platform-independent, it can reach many users at minimal costs and it is easy to update. Even more, the WWW meets the increasing demand for customised geo-data products. Visually disseminating spatial data on the WWW evokes special needs for map design, whilst bringing up new capabilities and pitfalls for interactive map applications. The tutorial addressed and discussed these new developments, passed on the knowledge on the state-of-the-art of publishing geo-data on the WWW and touched upon the capabilities and limitations of web maps through some practical exercises.

TU5 - An introduction to virtualised reality systems

Convenor: P. Boulanger
 Location: ITC Enschede
 Date: July 15th, afternoon
 Lecturers: P. Boulanger
 Number of participants: 9

Virtual reality systems (VR) are increasingly being used for industrial, medical and educational training applications, to name a few. In many of these applications, the truthful representation of the environment and the accurate manipulation and navigation in the virtualised world are crucial. These systems, called Virtualised Reality Systems, are similar to standard VR systems with the difference that the digital simulation model is created and updated from sensor data. In this tutorial, various new systems were described which integrate technologies in the field of virtual reality, real-time imaging, internet communication, sensor fusion and 3-D sensing to represent in real-time a complete digital simulation of unstructured sites. In this tutorial, various systems developed to date were described from the point of view of real-time hardware and software. It was also explained how the various monitoring sensors attached to a site can be integrated in a coherent and intuitive representation capable of giving to an operator a higher level of awareness of an environment or a process.

TU12 - Multi-source data fusion in photogrammetry and remote sensing

Convenor: C. Pohl
 Location: ITC Enschede
 Date: July 14th, whole day
 Lecturers: C. Pohl,
 E. Baltasvias,
 M. Hahn

Number of participants: 16

This tutorial provided an introduction to multi-source data fusion. It dealt with fusion of sensor data and other knowledge sources (databases, model knowledge, rules etc.), fusion of multi-sensor data at different processing levels. It covered both airborne and spaceborne sensor data. After introducing definitions, an overview of multi-source data fusion was given. This included possible applications, data types involved, different fusion levels and processing techniques, problems and requirements. The tutorial then continued in two major blocks:

Fusion of image data and GIS/map databases and fusion of multiple cues, including topics like fusion/homogenisation of GIS/map databases.

Data, especially image fusion, using mainly data from spaceborne sensors.

Both blocks provided an overview on data, fusion techniques, processing chains and knowledge requirements, followed by illustrative examples. Special emphasis was placed on examples and case studies using satellite data (SPOT, Landsat, ERS-1/2, JERS-1, IRS-1C) and airborne sensors (colour and NIR film cameras, stereo and multi-spectral line CCDs, laser scanner). Examples of extraction, reconstruction and classification of objects were presented, with applications in topographic mapping and map updating, change detection, generation of 3-D city models, land use monitoring and natural disaster management. The presentation included selected elements out of a multimedia tutorial on data fusion developed by ITC.

TU15 - Image analysis techniques for aerial image interpretation

Convenor: W. Eckstein
 Location: RAI Amsterdam
 Date: July 15th, afternoon
 Lectureres: W. Eckstein,
 C. Steger

Number of participants: 19

First, the advantage of multiple input data (e.g., colour, infrared, DEM) and the information that can be derived from these sources was discussed. Besides sensor data, 'synthetic' input images were generated (e.g., using texture filters) to support the segmentation process. Depending on the class of the object, the extraction must be selected: compact artificial objects may be segmented using primitives like areas, lines or points. Linear objects, like roads, are similar but the borders are curves and their size is not limited. Arbitrary areas like meadows, forests or fields have an arbitrary border and are mainly defined by their specific texture. Objects like trees or cars have to be treated in a very specific manner. Finally, different base algorithms for segmentation were discussed: pixel classification is very simple but lacks the use of context. The extraction of primitives (edges, lines, area, points) may be used as a basis for a wide class of objects. Texture analysis can be used for a rough segmentation of the image. Specialised operations are useful for the extraction of objects like single trees or to support the interpretation process.

In the second part, different examples of image interpretation were given. These comprised road, forest, and building extraction. Here the use of features, knowledge, models and control structures was discussed.

Tutorial	Participants	Duration (days)
TU1	18	0,5
TU2	41	1,0
TU3	12	1,0
TU5	9	0,5
TU12	16	1,0
TU15	19	0,5
Total	115	

Final Session Programme

IC-03

Session: High resolution sensor data
Room: Room A
Date: 17th July
Time: 14:00 - 15:30
Chair: Moriyama, Takashi, Japan

Characteristics of space imaging's one-meter resolution satellite imagery products

IC-03-01

*Gerlach, F.

Preparations for the On-Orbit Geometric Calibration of the OrbView 3 and 4 Satellites

IC-03-02

*Mulawa, David

Straight Lines in Linear Array Scanner Imagery

IC-03-03

*Habib, Ayman; Kelley, Devin; Asmamaw, Andinet

Rigorous Photogrammetric Processing of High Resolution Satellite Imagery

IC-03-04

*Stallmann, Dirk; Fritsch, Dieter

Design principles of the LH Systems ADS40 airborne digital sensor

IC-03-05

*Sandau, Rainer; Braunecker, Bernhard; Driescher, Hans; Eckardt, Andreas; Hilbert, Stefan; Hutton, Joe; Kirchhofer, Werner; Lithopoulos, Erik; Reulke, Ralf; Wicki, Stefan

Key Technology Development for the Advanced Land Observing Satellite (ALOS)

IC-03-06

*Hamazaki, Takashi; Osawa, Yuji

TC IV-02

Session: Extra terrestrial mapping
Room: Room B
Date: 17th July
Time: 14:00 - 15:30
Chair: Muller, Jan-Peter, United Kingdom

Recent planetary topographic mapping at the USGS, Flagstaff: Moon, Mars, Venus, and beyond

TC IV-02-01

*Kirk, R.L.; Howington-Krous, E.; Rosiek, M.

Automated MOLA track registration in MOC and Viking Images and it's application for the establishment of new 3-D control points on Mars

TC IV-02-02

*Kim, Jung Rack; Muller, Jan-Peter; Morley, Jeremy

Controlled topographic image mosaics from combination of Viking orbiter images and Mars orbiter laser altimeter data

TC IV-02-03

*Hauber, Ernst; Oberst, J.; Zeitler, W.; Kuschel, M.; Wählich, M.; Jaumann, R.

Photogrammetric Point Determination Using Digital Galileo SSI Images from Asteroid Ida

TC IV-02-04

*Zeitler, Wolfgang; Ohlhof, Timm; Ebner, Heinrich

Large Scale Mars Mapping and Rover Localization Using Descent and Rover Imagery

TC IV-02-05

*Li, Rongxing; Ma, Fei; Xu, Fengliang; Matthies, Larry; Olson, Clark; Xiong, Yalin

TC V-01

Session: Vision metrology and VR/VE generation
Room: Room L
Date: 17th July
Time: 14:00 - 15:30
Chair: Chikatsu, Hirofumi, Japan

A Practical Approach to Creating Precise and Detailed 3D Models from Single and Multiple Views

TC V-01-01

*El-Hakim, Sabry

Photogrammetry and CAD/CAM in culture and industry - an ever changing paradigm

TC V-01-02

*Patias, P.; Peipe, J.

Semi-Automated Edge Segment Specification for an Interactive Modelling System of Robot Environments

TC V-01-03

*Even, Philippe; Malavaud, Anne

An object space technique independent of lens distortion for forensic videogrammetry

TC V-01-04

*Fryer, J.G.

Quantitative measurement of teamwork in ball games using dominant region

TC V-01-05

*Taki, T.; Hasegawa, J.

TC VI-01

Session: International co-operation and technology transfer
Room: Room C/D
Date: 17th July
Time: 14:00 - 15:30
Chair: Mussio, Luigo, Italy

Remarks on networking and technology transfer in Africa

TC VI-01-01

*Bujakiewicz, Aleksandra

Polish-Belgian co-operation. Development of an educational software for digital photogrammetry

TC VI-01-02

*Ewiak, I.; Billen, R.; Cornelis, B.; Kaczynski, R.; Donnay, J.-P.; Schumacker, B.

International standardization and management of GIS-activities

TC VI-01-03

*Knoop, Hans

Production flowcharting for mapping organisations: a guide for both lecturers and production managers

TC VI-01-04

*van der Steen, J.F.M.

IC-25

Session: Cloud mapping

Room: Room B

Date: 17th July

Time: 16:00 - 17:30

Chair: Grün, Armin, Switzerland

Automated cloud-top height, amount and winds in the EU-CLOUDMAP Project

IC-25-01

*Muller, Jan-Peter; Dundas, Rowan; Fischer, Juergen; Schueller, Lothar; Preusker, Rene; Roozkrans, Hans; de Valk, Paul; Grün, Armin; Seitz, Gabriella; Poli, Danniella; Mannstein, Herman; Meyer, Richard; Hetzheim, Hartwig; Drescher, Armin

Cloud-top height estimation from satellite stereopairs for weather forecasting and climate change analysis

IC-25-02

*Poli, Daniela; Seiz, Gabriela; Baltasvias, Manos

Cloud mapping using ground-based imagers

IC-25-03

*Seiz, Gabriela; Baltasvias, Manos

Fusion of stochastic properties by fuzzy integrals and applications on detection within images

IC-25-04

*Hetzheim, Hartwig

The new photogrammetric method for cloud remote studies

IC-25-05

*Petrosyan, Arakel; Pavlov, S.

TC VI-03

Session: Educational developments

Room: Room C/D

Date: 17th July

Time: 16:00 - 17:30

Chair: Sausen, Tania Maria, Brazil

A systematic approach in remote sensing/GIS education and training in Malaysia

TC VI-03-01

*Kanniah, K.D.; Hashim, M.

Toward the restructuring of photogrammetry curriculum in the Cameroon education system

TC VI-03-02

*Happi Mangoua, F.

GORS and its activities in Syria

TC VI-03-03

*Ibrahim, H.

Modernising and strengthening the educational programme of the federal school of surveying in Nigeria

TC VI-03-04

Bouloucos, T.; *Kufoniyi, O.

New paradigm, new approaches: restructuring geospatial information education and training in a traditional research university setting.

TC VI-03-05

*Lillesand, Thomas; Olsen, Timothy; Gage, James; McE-naney, Patrick

TC V-02

Session: Automation in vision

Room: Room L

Date: 17th July

Time: 16:00 - 17:30

Chair: Fraser, Clive, Australia

Data processing and calibration of a cross-pattern stripe projector

TC V-02-01

*Guehring, Jens; Brenner, Claus; Boehm, Jan; Fritsch, Dieter

Evaluation of the Accuracy of a Laser Scanner-Based Roll Mapping System

TC V-02-02

*Radovanovic, Robert; Teskey, William Francis; Al-Hanbali, Nedal N.

Exploiting the multiview geometry for automatic surfaces reconstruction using feature-based matching in Multimedia Photogrammetry

TC V-02-03

*Wolff, Kirsten; Förstner, Wolfgang

A new approach to online 3D measurement

TC V-02-04

*Schneider, C.-T.; Bösemann, W.

Design of Coded Targets and Automated Measurement Procedures in Industrial Vision Metrology

TC V-02-05

*Imoto, Harutaka; Hattori, Susumu; Akimoto, Keiichi; Fraser, Clive; Ono, Tetsu

TC VII-04

Session: High resolution satellite image data

Room: Room A

Date: 17th July

Time: 16:00 - 17:30
Chair: Forster, Bruce, Australia

Application of photogrammetry in freshwater ecology: analysing the morphology of a high alpine flood-plain

TC VII-04-01

*Zah, Rainer; Niederost, Markus; Uehlinger, Urs

Studying Earth Change with NASA's Scientific Data Buy Program

TC VII-04-02

*Raine, Julie

Analysis and evaluation of nature space potential in peri-urban spaces using remote sensing data and GIS

TC VII-04-03

*Banzhaf, Ellen; Netzband, Maik

Environmental legislation compliance maps at national level: The Greek forest law case

TC VII-04-04

*Rokos, D.; Karathanassi, V.; Levantis, E.

Producing a State-Wide High-Resolution Satellite Data Mosaic and Using the Data in Planning Processes

TC VII-04-05

*Meinel, Gotthard; Lippold, Regin; Hennersdorf, Jorg

IC-01

Session: Advances in SAR developments
Room: Room B
Date: 18th July
Time: 08:30 - 10:00
Chair: Miller, John, Canada

Wiener Based Interferometric Signature Reconstruction

IC-01-01

*Honikel, Marc

Automatic Registration for Repeat-track InSAR Data Processing

IC-01-02

*Liao, Mingsheng; Zhang, L.; Zhang, Z.; Zhang, J.

Segmentation of Interferometric SAR Data for building detection

IC-01-03

*Thoennessen, Ulrich; Soergel, Uwe; Gross, Hermann; Stilla, Uwe

A SAR speckle filtering algorithm: uniform area smoothing and edge sharpening

IC-01-04

*Dong, Y.; Milne, A.K.; Forster, B.C.

The PHARUS system; an overview and recent developments

IC-01-05

*van Rossum, W.; Otten, M.; Smith, A.; Groot, J.

IC-20

Session: Distance learning
Room: Room C/D
Date: 18th July
Time: 08:30 - 10:00
Chair: Cho, Kohei, JAPAN
Co-Chair: Höhle, Joachim, Denmark

Teaching architectural photogrammetry on the Web with arpenteur

IC-20-0

*Grussenmeyer, P.; Drap, P.

The use of CAT/CAL programs for image processing and remote sensing in distance learning

IC-20-02

*Höhle, Joachim

Wageningen Advanced Learning Space in Geo-Information Science

IC-20-04

Vonder, O.W.; *Hartog, R.J.M.; Clevers, J.G.P.W.; van Lammeren, R.J.A.

TC II-04

Session: Integration of sensors on airborne and other platforms
Room: Room L
Date: 18th July
Time: 08:30 - 10:00
Chair: Schade, Holger, Switzerland
Co-Chair: Toth, Charles, United States

Capturing Road Network Data Using Mobile Mapping Technology

TC II-04-01

*He, Guangping; Orvets, Greg

NEXUS: Positioning Methods in Urban Regions for Spatially Aware Applications

TC II-04-02

*Klinec, Darko; Volz, Steffen

Geo-referencing CASI Imagery Using Direct Measurement of Position and Attitude

TC II-04-04

*Shukla, Rakesh; Smith, Martin J.

Mathematical Modelling, Computer Simulation and Control of a Stabilised Platform of an Airborne Sensor

TC II-04-05

*Heimes, Franz-Josef; Bäumker, M.; Hahn, H.; Brechtken, Rainer

TC III-05a

Session: Object recognition using multi-sensor and multi-spectral data
Room: Forum room
Date: 18th July

Time: 08:30 - 10:00
Chair: Csatho, Beata, United States

Effect of wavelet compression on the automatic classification of urban environments using high resolution multi-spectral imagery and laser scanning data

TC III-05a-01

*Kiema, John Bosco Kyalo; Bähr, Hans-Peter

Agricultural field extraction from aerial images using a Region Competition Algorithm

TC III-05a-02

*Torre, Margarita; Radeva, P.

Fusion of Optical Imagery and SAR/INSAR Data for Object Extraction

TC III-05a-03

*Hellwich, Olaf; Gunzl, Manfred; Wiedemann, Christian

Comparison of object-oriented classification techniques and standard image analysis for the use of change detection between SPOT multispectral satellite images and aerial photos

TC III-05a-04

*Willhauck, G.; Schneider, T.; de Kok, R.; Ammer, U.

Land use classification of remote sensing image with GIS data based on spatial mining techniques

TC III-05a-05

*Di, Kaichang Li, Deyi; Li, Deren

IC-18a

Session: Global databases and change monitoring
Room: Room A
Date: 18th July
Time: 08:30 - 10:00
Chair: Hastings, David, United States

Analysis of the factor which gives influence to AVHRR NDVI data

IC-18a-01

*Park, J.G.; Tateishi, R.

The Study of Global Land Suitability Evaluation: A Case of Potential Productivity Estimation for Wheat

IC-18a-02

*Tan, Guoxin; Shibasaki, Ryosuke; Rajan, K.S.

Sustainability Analysis for Human Population in Relation to Global Deforestation using Remote Sensing and GIS

IC-18a-03

*Pahari, Krishna; Murai, S.; Yasuoka, Y.

Fusion of data sources in an effort to study global climate change for the great lakes of North Eurasia

IC-18a-04

*Semovski, Sergei V.; Mogilev, Nikolay Yu; Loupian, Evgeny A; Mazurov, Alexey M.

A case study of INPA's Bio-DB and an approach to provide an Open Analytical Database Environment

IC-18a-05

*Campos dos Santos, J. L.; de By, R.A.; Magalhaes, C.

IC-02

Session: Developments in SAR applications
Room: Room B
Date: 18th July
Time: 10:30 - 12:00
Chair: Jacobsen, Karsten, Germany

Topographical map generation in high mountainous areas by means of InSAR data

IC-02-01

*Damoiseaux, Thomas

Near-Real Time Oil Slick Monitoring Demonstrator for the Mediterranean

IC-02-02

*Lichtenegger, Juerg; Calabresi, Gianna; Petrocchi, Andrea

Map production in Venezuela using airborne INSAR

IC-02-03

*Arbiol, Roman; González, Gloria

Mapping by airborne synthetic aperture radar (SAR)

IC-02-05

*Skriver, Henning; Schou, Jesper; Dierking, Wolfgang

IC-19

Session: Interoperability and WEBbased approaches
Room: Room C/D
Date: 18th July
Time: 10:30 - 12:00
Chair: Bishr, Yaser, Germany

Schema transformation for semantic geodata translation

IC-19-01

*Lee, Y.C.; Xu, Z.; Chen, Y.Q.

Research on distributed GIS based on mobile agent

IC-19-02

*Chen, M.; Guan, J.; Huang, X.

Hypermap - based distributed spatial data model

IC-19-03

Lin, Hui; *Han, Haiyang; Gong, Jianya

Updating a census Web atlas in a geospatial data infrastructure using agents and metadata

IC-19-04

*Kraak, Menno-Jan; Emmer, Noline; Mac Gillavry, Edward

The Synergy of GIS with Other Systems

IC-19-05

*Stefanakis, Emmanuel

TC III-05b

Session: Laser altimetry
 Room: Forum room
 Date: 18th July
 Time: 10:30 - 12:00
 Chair: Csatho, Beata, United States

Least-Squares Matching with Airborne Laserscanning Data in a TIN Structure

TC III-05b-01

*Maas, Hans-Gerd

Adjustment of Laser Scanner Data for Correction of Orientation Errors

TC III-05b-02

*Burman, Helén

Automatic breakline detection from airborne laser range data

TC III-05b-03

*Brügelmann, Regine

Estimation of planimetric accuracy of laser scanning data. Proposal of a method exploiting ramps

TC III-05b-04

*Casella, Vittorio; Spalla, Anna

On the adjustment of overlapping strips of laser altimeter height data

TC III-05b-05

De Min, Erik; Brügelmann, Regine; *Crombaghs, Marc

TC IV-06

Session: Mapping potential of high resolution images
 Room: Room A
 Date: 18th July
 Time: 10:30 - 12:00
 Chair: Konecny, Gottfried, Germany

The "Topographic Image Map Fossa di Vulcano 1:5,000" - A Digital Mapping Approach based on "High Resolution Stereo Camera - Airborne Imagery"

TC IV-06-01

Gwinner, Klaus; Lehmann, Hartmut; *Albertz, Jorg

Applications of Very High Resolution Digital Airborne Scanner Data

TC IV-06-02

*Moeller, Matthias

Generation and Update of VMap Data Using Satellite and Airborne Imagery

TC IV-06-03

*Ohlhof, Timm; Emge, Thomas; Reinhardt, Wolfgang; Leukert, Kristin; Heipke, Christian; Pakzad, Kian

The extraction of GIS features from high resolution imagery using advanced methods based on additional contextual information - first experiences

TC IV-06-04

*Hofmann, Peter; Reinhardt, Wolfgang

Differential approach for map revision from new multi-resolution satellite imagery and existing topographic data

TC IV-06-05

*Armenakis, Costas

SS-05

Session: Availability of spatial data. Status and policies

Room: Room L

Date: 18th July

Time: 10:30 - 12:00

Convenor: Fritz, Lawrence W., United States

Panel discussion with the following speakers:

- Dr. Ferris Webster, ICSU Chairman of World Data Centres (WDC), ICSU/CODATA Chairman, Group on Data and Information
- Herbert Satterlee III, President of CEO, EarthWatch, Inc.
- Gérard Brachet, Director of Centre National d'Etudes Spatiales (CNES)
- Aki. A. Yamaura, General Manager, Mitsubishi Corporation
- Prof. U. R. Rao, Member, Space Commission of India
- Dr. Bas Kok, Director of Netherlands Council for Geographic Information (RAVI)

TP III-01

Session: Building reconstruction and low level processing

Room: Room A

Date: 18th July

Time: 13:30 - 16:00

Chair: Mayer, Helmut, Germany

The human factors influence on process of pattern recognition (theory question)

TP III-01-01

*Prisniakov, V.; Prisniakova, L.

Integrated approach-based Automatic Building Extraction

TP III-01-02

*Zhao, Bofang; Trinder, John

A linear conflation approach for the integration of photogrammetric information and GIS data

TP III-01-03

*Filin, Sagi; Doytsher, Yerahmiel

A new Approach to Edge-preserving Smoothing for Edge Extraction and Image Segmentation

TP III-01-04

*Garnica, Carsten; Boochs, Frank; Twardochlib, Marek

Interactive Roof Patch Reconstruction Based on 3-D Linear Segments

TP III-01-05

*Chio, Shih-Hong; Wang, Shue-Chia; Wrobel, Bernhard

Model independant object extraction from digital surface models

TP III-01-06

*Gamba, Paolo; Casella, Vittorio

Automatic extraction of objects and their integration into an information system

TP III-01-07

*Celikoyan, Timur Murat; Altan, M. Orhan

Extraction of man-made buildings in multispectral stereoscopic images

TP III-01-08

*Chen, Liang-Chien; Hsu, W.C.

Construction of Urban Scene Model by Image Sequence Analysis Using Digital Map

TP III-01-09

*Uehara, Masafumi; Shiosaki, Takeshi; Zen, Heitou

Introduction of 3D information in urban GIS: a conceptual view

TP III-01-10

*Billen, Roland

Urban 3-D models for planning of mobile telephony systems

TP III-01-11

*Villa, Benedetto; Coppola, Francesco; Lo Brutto, Mauro; Midulla, Patrizia

Automated update of buildings in digital maps

TP III-01-12

*Niederöst, Markus

3D-object detection method based on the stereo image transformation to the common observation point

TP III-01-14

*Lisitsyn, V.M.; Tikhonova, S.V.

Three dimensional reconstruction and visualization of regular houses and their texture from image pair

TP III-01-15

*Zhang, Zuxun; Zhang, Jianqing; Zhu, Yinghao; Zhang, Yu

Semi-automatic building extraction based on least squares matching with geometrical constraints in object space

TP III-01-16

*Zhang, Zuxun; Zhang, Jianqing; Xie, Lingseng

Toward Automatic updating of the Israeli national GIS- PAHE 3

TP III-01-17

*Peled, Ammatzia; Haj-Yehia, Basheer

Automatic Building Recognition From Digital Aerial Images

TP III-01-18

*Saadat Seresht, Mohammad

The Decision of the Optimal Parameters in Markov Random Fields of Images by Genetic Algorithm

TP III-01-19

*Zheng, Zaobao; Zheng, Hong

Russian concept of digital processing of satellite images

TP IV-01-01

*Tchekaline, V.F.; Fomtchenko, M.M.

A novel error detection technique for automatically generated digital elevation models

TP IV-01-02

*Gooch, Michael; Chandler, Jim

An Experimental Result on the Refinement of DEMs using iteratively generated ortho-image from SPOT stereopairs

TP IV-01-03

*Lee, Yong-Woong; Yeu, Bock-Mo; Koh, Jin-Woo; Cho, Bong-Whan

An experiment in cartography production and updating using satellite images

TP IV-01-04

Fiani, Margherita; *Vatore, Felicia

DTM generation from Russian TK-350 space imagery in the PC-based photogrammetric system Z-Space

TP IV-01-05

*Sibiryakov, Alexander

Digital 3D-Data Acquisition with the High Resolution Stereo Camera-Airborne (HRSC-A)

TP IV-01-06

*Scholten, Frank

Evaluation and Integration of Urban Height Information into a Database for Radio Planning Purposes

TP IV-01-07

*Siebe, Eckhard; Kaufmann, Katrin

Planning and production of 1,300 digital orthophoto maps of the region affected by the earthquake in Turkey

TP IV-01-08

*Akdenyz, Erdogan

Investigation of the accuracy of digital elevation models (DEMs) used in producing orthophoto maps in the Marmara earthquake area

TP IV-01-09

*Ozbalmumcu, Mahmut

The advantages of High density airborne laser measurement

TP IV-01-10

*Akiyama, Y.

Evaluation of landslide volume using photogrammetric techniques

TP IV-01-11

*Fiani, Margherita; Barbarella, Maurizio; Fazio, Carmine

A Data-Independent Method for Quantitative Accuracy Assessment of Morphological Parameters Extracted from Grid-based DTM

TP IV-01-12

*Zhou, Qiming

TP IV-01

Session: 3D GIS and DEM generation
Room: Room B
Date: 18th July
Time: 13:30 - 16:00
Chair: Fritsch, Dieter, Germany

Automatic extraction of 3D model coordinates using digital stereo-images

TP IV-01-13

*Papapanagiotu, Evangelos; Hatzopoulos, John N.

TP IV-03

Session: Information systems design

Room: Room C/D

Date: 18th July

Time: 13:30 - 16:00

Chair: Winter, Stephan

Jubilee 2000 project: the experience of building DB25 at the I.G.M.I., the Italian land mapping agency

TP IV-03-01

*Arrighi, A.

ATKIS data base revision and generation of digital topographic base maps

TP IV-03-02

*Müller, W.; Seyfert, E.

Network Scenario for Countrywide Natural Resources Information Management and Dissemination

TP IV-03-03

*Matieda, I. C.; Shah, Pushpalata B.

A Design of Three-Dimensional Data Model and its Data Structure in Geological Exploration Engineering

TP IV-03-04

*Cheng, Penggen; Gong, Jianya

ARCHEOGIS: an interoperable model for archaeological data

TP IV-03-05

*Brovelli, Maria Antonia; Maurino, Andrea

Performance issues in design and implementation of GIS-term

TP IV-03-06

*Veszeka, Zsolt; Wiesel, Joachim

Management of Spatial Data in Multidisciplinary Projects

TP IV-03-07

*B.P.J. van den Bergh, Dick; de Vries, A.

The expression of road networks for Vehicle Navigation

TP IV-03-08

*Lei, Ting; Li, Deren; Gong, Jianya

Planning and application of the real estate information system

TP IV-03-09

*Gumusay, Mustafa Umit

Intelligent imagery system: a proposed approach

TP IV-03-10

*Abdelrahim, Mohamed

The Effective Construction of Map Database using a Data Modelling

TP IV-03-11

*Kang, Joon-Mook; Hee-Cheon, Yun; Hyung-Seok, Lee

Urban cadastral database modelling

TP IV-03-12

*Chacon, L.; Hernández, D.

Cartographic data bank at scale 1:200,000 of the Republic of Côte d'Ivoire (BDGéo200)

TP IV-03-13

*Diomandé, Y.; Bahintchie, E.

Accessibility of the digital atlas of Krakow Province (Poland) as GIS data through intranet and internet

TP IV-03-14

*Pyka, Krystian; Hejmanowska, Beata

A Methodology for Architectural Modelling of Spatial Information Production Processes in the context of Business Process Re-engineering

TP IV-03-15

Morales, Javier; *Radwan, Mostafa; Sani, Rosilah

Updating of a geographic database: an application and design of a geographic information system

TP IV-03-16

*Maras, Hadi Hakan; Altan, M.Orhan

TP V-05

Session: Image sequence analysis and medical applications

Room: Room L

Date: 18th July

Time: 13:30 - 16:00

Chair: Maas, Hans-Gerd, The Netherlands

A Study of the Digital Image Enhancement of Low Resolution Sensor

TP V-05-01

*Oh, Won-Jin; Fryer, John; McIntosh, Kerry

A comparative study of Gradient-Based Approaches for optical flow estimation

TP V-05-02

*Fuse, T.; Shimizu, E.; Tsutsumi, Morito

Image Passenger Detection and Localization Inside Vehicles

TP V-05-03

*Faber, Petko

Simulation of postoperative 3D facial morphology using physics-based head model

TP V-05-04

*Aoki, Yoshimitsu; Hashimoto, Shuji; Terajima, Masahiko; Nakashima, Akihiko

Computer Aided Diagnosis for Pneumoconiosis Radiographs using Neural Network

TP V-05-05

*Kondo, Hiroshi; Zhang, Lifeng; Koda, T.

Soft Tissue Analysis and Cast Measurement in Orthodontics using Digital Photogrammetry

TP V-05-06

*Schewe, Heinrich; Ifert, Falk

Global Statistical Description of Temporal Features

TP V-05-07

*Shutler, Jamie; Nixon, Mark S.; Harris, Chris J.

Towards a Marker-less Human Gait Analysis System

TP V-05-08

*Sharman, Karl; Nixon, M.; Carter, J.

Photogrammetric wound measurement with a three-camera vision system

TP V-05-09

*Boersma, Saskia M.; van den Heuvel, Frank A.; Cohen, Adam F.; Scholtens, Rick E.M.

Videometric measurement system for surface determination in medical applications

TP V-05-10

*Mélykúti, Balázs; Jansa, J.; Öhreneder, C.

Topography of surface and spinal deformity

TP V-05-11

*Zawieska, Dorota

NDVI measurements of neotropical savanna physiognomies: a gradient of biomass, structure and phenology changes

TP V-05-12

*Mesquita Jr, Humberto

Dynamic Modelling and Georegistration of Airborne Video Sequences

TP V-05-13

*Theiss, Henry J.; Lee, C.; Mikhail, E.M.; Vriesenga, M.R.

The Assessment of Magnetic Imagery for Computer Assisted Spinal Surgery

TP V-05-14

*Tate, Peter; Chapman, M.A.

A Method of Modelling Deformation of an Object Employing Surrounding Video Cameras

TP V-05-15

*Tan, J.K.; Ishikawa, S.

On the creation of panoramic images from image sequences

TP V-05-16

*Pöntinen, Petteri

Kinematic analysis of lips movement in swallowing amongst dental wearers by two infrared CCD cameras

TP V-05-17

*Minakuchi, S.; Hirano, Y.; Takaoka, S.; Furuya, J.; Miyashita, K.; Uematsu, H.

Integration of successive range image for robot vision

TP V-05-18

*Hirose, M.; Miyasaka, T.; Kuroda, K.; Araki, K.

Radiometric Restoration and Segmentation of Color Images

TP V-05-19

*Asmamaw, Andinet; Lee, Young-Ran; Habib, Ayman

Bio-dynamic analysis of walking using gyro sensor system

TP V-05-20

*Tsuruoka, Masako; Shibasaki, Ryosuke; Yasuoka, Yoshifumi; Murai, Shunji; Minagucil, Shunsuke; Tsuruoka, Yuriko

Production and application of a new kind of stereoscopic animation

TP V-05-21

*Mori, N.

Study on traffic flow measurement based on low altitude remote sensing

TP V-05-22

*Mushiake, N.; Setojima, M.; Tanaka, M.

Algorithms for a structural model of biped locomotion in the configuration space

TP V-05-23

*Finat, Javier

Symbolic models for postures recognition of a three fingered artificial hand

TP V-05-24

*Gonzalo-Tasis, Margarita; Pellon, Rafael; Sanchez, David; Finat, Javier

Close range photogrammetry system for medicine and railways

TP V-05-25

*Mikrut, S.; Tokarczyk, R.

High speed 3-D measurement system using intensity ratio

TP V-05-26

*Miyasaka, T.; Kuroda, K.; Hirose, M.; Araki, K.

An automatic process for the extraction of the 3D model of the human back surface for scoliosis treatment

TP V-05-27

*Sechidis, Lazaros; Patias, Petros; Tsioukas, Vassilios

TP VII-01

Session: Global monitoring

Room: Room M

Date: 18th July

Time: 13:30 - 16:00

Chair: Imhoff, Mark, United States

The use of remote sensing and GIS to detect salt crust in the Iranian deserts

TP VII-01-01

*Alavi Panah, S.

Using HRV SPOT data for study of environments evolution in the Sulina site from the Danube delta

TP VII-01-02

*Ionescu, I.; Noaje, I.

Change detection on natural vegetation cover in the territory of I.R. of Iran caused by pollution resulting from the Kuwaiti oil well fires during the Persian Gulf war

TP VII-01-03

*Jalali, N.; Aminipouri, B.; Fatehi, A.

Application of remote sensing and GIS to development subjects

TP VII-01-04

*Patmios, E.; Lasaridou, M.

Data Integration for Pan European Land Cover Monitoring

TP VII-01-05

*van Katwijk, Victor; Boersma, W.; Múcher, C.A.; Steinnocher, K.T.; Champeaux, J.L.; Wester, K.; Griguolo, S.; Heunks, C.

WFI/CBERS imagery simulation for understanding water pathways from Amazon River to the floodplain

TP VII-01-06

*Novo, Evlyn; Shimabukuro, Yosio; Costa, Maycira

Information, integration, internet and interface: a solution for coastal zone management

TP VII-01-07

*Green, D.R.; King, S.D.

Woody vegetation damage assessment using Landsat imagery and GIS

TP VII-01-08

Ibrahim Mohammed, Gar Elnabi; *Abdalla Fadl Elmula, Isam Eldin

RAMSES system

TP VII-01-09

*Henaff, Y.; Pinel, B.; Caspar, C.; Fusco, L.; Forte, M.

Fuel Model Mapping and Fire Simulation Modelling

TP VII-01-10

*Tueller, Paul; Krauter, Karl; Hill, Kevin; Cheng, Tzutai; Noonan, Erin

Changes at multiple spatial scales

TP VII-01-11

*de Carvalho, Luis; Fonseca, Leila; Murtagh, Fionn; Clevers, Jan

Geomorphology of the Blue Nile by remote sensing

TP VII-01-12

*Osman, A.R.

Seasonal Change of NDVI Calculated by JERS Data with Higher Spatial Resolution

TP VII-01-13

*Osaki, Keiji

Enhancing Coarse Resolution Population Data with Night-time Earth Images for Global Urban Land Cover Assessment

TP VII-01-14

*Lawrence, W.; Imhoff, M.; Rusin, R.; Stutzer, D.; Aschwanen, C.

Topographical classification in the prediction of disaster zone in forest fire using DTM

TP VII-11-01

*Koizumi, Toshio

Landslide investigations in Southern Kyrgyzstan based on a digital elevation model derived from stereoscopic MOMs-2P data

TP VII-11-02

*Roessner, S.; Wetzel, H-U.; Kaufmann, H.; Kornus, W.; Lehner, M.; Reinartz, P.; Mueller, R.

Research of seismic damage for network of gas pipes based on GIS

TP VII-11-03

*Yu, J.; Bian, F.; Li, P.

A feasibility study of extraction method for densely crowded areas with wooden buildings in the KOBE government: considering evaluation of urban fire hazard

TP VII-11-04

*Katayama, R.; Shoji, M.

The role of digital orthophotos in the management of environmental disasters

TP VII-11-05

*Banchini, G.; Gentili, G.; Lombardo, G.; Surace, L.

Coastal meandering currents and estuarine fronts detected by JERS-1 SAR images

TP VII-11-06

*Marone, Eduardo; Noernberg, Mauricio Almeida

A comparison between optical and radar satellite images in detecting burnt tropical forest in South Sumatra, Indonesia

TP VII-11-07

*Hussin, Yousif; Sunuprpto, Heri

Use of a Landsat-TM time-series for monitoring erosion features in areas of gold exploration, region of Serra Tepequém, Roraima State, Brazilian Amazon

TP VII-11-08

*Almeida-Filho, Raimundo; Melo, Edileuza C.; Shimabukuro, Yosio E.

Validation of satellite and rain-gauge data for parameterising a soil erosion model for sub-Saharan Africa

TP VII-11-09

*Symeonakis, Elias; Bonifacio, Rogerio; Drake, Nick

Burn Scar Mapping and Fire Damage Assessment using ERS-2 SAR Images in East Kalimantan, Indonesia

TP VII-11-10

*Ruecker, Gernot; Siegert, Florian

Temporal analysis of urban growth at erosion risk areas using remote sensing and geoprocessing techniques

TP VII-11-11

*Valério Filho, Mário; Serafim, Carlos Roberto; Dias, Luiz Alberto Vieira

TP VII-11

Session: Disaster mitigation
Room: Room N
Date: 18th July
Time: 13:30 - 16:00
Chair: Singhroy, Vernon, Canada

Morphological slope failure detection using multisensor data merged by wavelet transformation

TP VII-11-12

*Tsuji, Yuji

L'évaluation des catastrophes naturelles en milieu urbain par télédétection, photogrammétrie et technologies GIS

TP VII-11-13

*Zavoianu, Fl.; Turdeanu, L.; Dinulescu, L.

Multitemporal LANDSAT TM data for monitoring the effects of forest fires and vegetation recovery processes in Mediterranean areas

TP VII-11-14

*Patrono, A.; Baptista, A.; Ebeltjes, J.

Geographic investigation system for the fight against sleeping sickness in Côte d'Ivoire

TP VII-11-15

*Baudouhat, M.-J.; Baiintchie, E.; Diomande, Y.; Hussard, A.; Hervouët, J.-P.; Vessier, M.

Study of the flood hazard in the Castelfranco Emilia area (Modena Province, Northern Italy)

TP VII-11-16

Castaldini, Dorian; *Bertens, Jurjen; Giusti, Cecilia; Gonzalez Diez, Alberto; Marchetti, Mauro; Barbieri, Massimo; Bonachea, Jaime

Practical applications of digital mapping technology

TP VII-11-17

*Oyama, Y.; Fukushima, N.; Shishido, M.

A trial of environmental damage account after the NAHODKA oil-spill, 1997 using geoinformation

TP VII-11-18

*Kim, Sang-Woo; Goto, Shintaro; Matui, Kouji; Shikada, Masaaki; Shikida, Asami; Sawano, Nobuhiro

Geoinformation for erosion monitoring and mapping using multi-temporal aerial photographs, simple instruments, and numerical data processing

TP VII-11-19

*Efiong-Fuller, E.O.

Spilled oil trajectory assessment by using TOPEX/POSEIDON

TP VII-11-20

*Kozai, Katsutoshi

SnowView and FlowView - Geographical presentation and analysis of information in both time and space domain

TP VII-11-21

*Sollie, Arnt; Norheim, David; Schødt-Osmo, Ole

Progress of the CEOS disaster management support project

TP VII-11-22

*Wood, H.

Integrated data-sets for land-use planning, natural hazards and impact assessment in Guipuzcoa, Basque Country, Spain

TP VII-11-23

*González-Díez, Alberto; Giusti, Cecilia; Remondo, Juan; de la Pedraja, Almudena; Díaz de Terán, José Ramón; González-Lastra, Juan; Aramburu, José Maria

A methodological approach for the evaluation of impact on the intrinsic quality of sites of geomorphological interest (SGI), using GIS techniques.

TP VII-11-24

*Giusti, Cecilia; González-Díez, Alberto

Application of multivariate statistics to study stream sediment data from the vicinity of Lead-Zinc occurrences at Gabal El-Rusas Area, Eastern Desert, Egypt

TP VII-11-25

*Morsy, M.A.

Flood hazard assessment and monitoring using geographic information and remotely sensed data

TP VII-11-26

*Stancalie, Gheorghe; Alecu, Corina; Catana, Simona

IC-10

Session: Real time systems

Room: Room C/D

Date: 18th July

Time: 16:00 - 17:30

Chair: Li, Ron, United States

Automatic Recognition of Civil Infrastructure Objects in Mobile Mapping Imagery using a Markov random field model

IC-10-01

*Tu, Zhuowen; Li, Rongxing

The Development of a Backpack Mobile Mapping System

IC-10-02

*Ellum, Cameron; El-Sheimy, Naser

The development of airborne three line scanner with high accuracy INS and GPS for analysing car velocity distribution

IC-10-03

*Murai, Shunji; Matsumoto, Y.

Research on Match of GPS Signal and Road Information for mobile navigation system

IC-10-04

*Wang, Mi; Guo, Bingxuan; Li, Deren; Gong, Jianya

IC-17

Session: Dynamic spatial modelling

Room: Room B

Date: 18th July

Time: 16:00 - 17:30

Chair: Chen, Jun, China

Automated change detection in GIS databases based on classification of multispectral data

IC-17-01

*Walter, Volker

Change detection in urban area based on stereo image pairs of different duration

IC-17-02

*Zhang, Jianqing; Zhang, Zuxun; Fan, Hong; Fang, Zheng; Liu, Zifang

Practical Experience with Spatio-temporal GIS in Geophysical Research

IC-17-03

*Knudsen, Thomas

Improving the landcover classification using domain knowledge

IC-17-04

*Largouet, Christine; Cordier, Marie-Odile

Invasive and Noxious Weeds Detection using a Multispectral Digital Aerial Photography System

IC-17-05

*Johnson, Dale

IC-18b

Session: Global databases and change monitoring

Room: Room A

Date: 18th July

Time: 16:00 - 17:30

Chair: Hastings, David, United States

USLE C factor determined by multi-temporal AVHRR/NOAA-14 Data

IC-18b-01

*Cavalli, Antonio Carlos; Garcia, Gilberto Jose; Zullo Junior, Jurandir; Lombardi Neto, Francisco

Harmonic analysis of time-series AVHRR NDVI data for characterizing US Great Plains land use/land cover

IC-18b-02

*Jakubauskas, Mark; Legates, D.R.

A comparison of different techniques, applied to the UK, to map socio-economic parameters: implications for modelling the human dimensions of global change

IC-18b-03

*Doll, Christopher; Muller, Jan-Peter

Establishment of a 1-km pan-European land cover database for environmental monitoring

IC-18b-04

*Mucher, Caspar Alexander; Steinnocher, Klaus; Champagneux, Jean-Louis; Griguolo, Silvio; Wester, Kjell; Heunks, Camiel; van Katwijk, Victor

Development of global 10m resolution DEM using Optical and Microwave Sensors, a Challenge for ALOS (Advanced Land Observation Satellite)

IC-18b-05

*Shibasaki, Ryosuke; Igarashi, Tamotsu; Wakabayashi, Hiroyuki; Shimada, Masanobu

TC V-03

Session: Integration of photogrammetry and CAD/CAM

Room: Room L

Date: 18th July

Time: 16:00 - 17:30

Chair: Peipe, Jürgen, Germany

Trends in CAD-based photogrammetric measurement

TC V-03-01

*van den Heuvel, Frank

Automated Extraction of Features from CAD Models for 3D Object Recognition

TC V-03-02

*Boehm, Jan; Guehring, Jens; Brenner, Claus; Fritsch, Dieter

An object-oriented stereo system for 3D-measurement

TC V-03-03

*Neifer, Markus; Boochs, Frank; Gehrhoff, Anja

Photogrammetric measurement techniques for quality control in sheet metal forming

TC V-03-04

*Bösemann, W.; Godding, R.; Hütte, H.

Photogrammetric Measurement of Linear Objects with CCD Cameras - Super-elastic Wires in Orthodontics as an Example

TC V-03-05

*Suthau, Tim; Hemmleb, Matthias; Zuran, Dietmar; Jost - Brinkmann, Paul- Georg

IC-06a

Session: Data fusion and integration

Room: Forum room

Date: 19th July

Time: 08:30 - 10:00

Chair: McKeown, Dave, United States

A Plane-Sweep Strategy for the 3D reconstruction of buildings from multiple images

IC-06a-01

*Baillard, C.; Zisserman, A.

Generation of 3D-City Models and their Utilisation in Image Sequences

IC-06a-02

*Stilla, Uwe; Soergel, Uwe; Jaeger, Klaus

Automatic registration of images to maps - the ARCHANGEL and ARMIES systems

IC-06a-03

*Vohra, V.; Dowman, I.J.

A new approach to automatic feature-based registration of SAR and SPOT images

IC-06a-04

*Dare, Paul; Dowman, Ian

Multi-sensor image fusion by inverse sub-band coding

IC-06a-05

*Ghassemian, H.

TC II-03

Session: Automation in digital systems for photogrammetry and RS

Room: Room A

Date: 19th July
Time: 08:30 - 10:00
Chair: Heipke, Christian, Germany

Digital systems for automated cartographic feature extraction

TC II-03-01

*Gülch, E.

Photogrammetric software for the LH Systems ADS40 airborne digital sensor

TC II-03-02

*Tempelmann, Udo; Borner, Anko; Chaplin, Bruce; Hinsken, Ludger; Mykhalevych, Borys; Miller, Scott; Recke, Utz; Reulke, Ralf; Uebbing, Robert

Digital Modular Camera: System Concept and Data processing workflow

TC II-03-03

*Doerstel, Christoph

Automatic triangulation and rectification of images from airborne and spaceborne sensors

TC II-03-04

*Wang, Younian; Yang, Xinghe; Stojic, Mladen

Towards automated map updating: is it feasible with new digital data-acquisition and processing techniques?

TC II-03-05

*Hoffmann, A.; van der Vegt, J.-W.; Lehmann, Frank

TC IV-03a

Session: Spatio-temporal databases
Room: Room B
Date: 19th July
Time: 08:30 - 10:00
Chair: Pluemer, Lutz, Germany

A Study of Data Consistency in Spatial Database System

TC IV-03a-01

*Zhu, Xinyan; Li, Deren; Gong, Jianya

Development of Network-Based GIServices in Support of Online Geocomputing

TC IV-03a-02

*Tao, C. Vincent; Yuan, Shuxin

Querytool: design, implementation and applications

TC IV-03a-03

*van Oosterom, Peter; Maessen, Bart; Quak, Wilko

The Integrated Spatial Databases of GeoStar

TC IV-03a-04

*Zhu, Qing; Li, Deren; Gong, Jianya; Xiong, Hanjiang

Vectorial road data structuring according to a conceptual model

TC IV-03a-05

*Nechniche, H.; Brahimi, K.

TC V-06

Session: Motion capture, animation and 3D medical image processing

Room: Room L
Date: 19th July
Time: 08:30 - 10:00
Chair: Margadant, Felix, Australia

Human shape and motion recovery using animation models

TC V-06-01

Herda, L.; Plänklers, R.; Boulic, R.; *Fua, P

Least Squares Matching Tracking Algorithm for Human Body Modelling

TC V-06-02

Fua, Pascal; *D'Apuzzo, Nicola; Plaenkers, Ralf

An integrated ergoma system for human motion analysis

TC V-06-03

*Yoshida, S.; Chikatsu, H.

On Measuring Trajectory-Invariant Gait Signatures

TC V-06-04

*Carter, John; Nixon, M.

Dynamic analysis of human motion using hybrid video theodolite system

TC V-06-05

*Anai, Tetsuji; Chikatsu, Hirofumi

TC VI-02

Session: Internet activities
Room: Room C/D
Date: 19th July
Time: 08:30 - 10:00
Chair: Chen, Tuan-Chih, China - Taipei

ISPRS on the Internet - Presence and prospects

TC VI-02-01

*Streilein, André

The Design Idea and Feature of Chinese National Geospatial Data Transfer Format

TC VI-02-02

*Wang, Yandong; Gong, Jianya; Huang, Juntao; Xiong, Hanjiang

The Situation and Progress of Internet for ISPRS

TC VI-02-03

*Chen, Tuan-Chih

Interactive Education on the Web - Experiences in Development and Application of a Computer Assisted Training Course for Remote Sensing

TC VI-02-04

*Koenig, Gerhard

The MiraMon Map Reader, a new tool for the distribution and exploration of Geographical Information through Internet or on CD

TC VI-02-05

*Pons, Xavier; Maso, Joan

IC-06b

Session: Data fusion and integration
Room: Forum room
Date: 19th July
Time: 10:30 - 12:00
Chair: McGlone, Ch., United States

Performance Evaluation for Automatic Feature Extraction

IC-06b-01

*McKeown, D.M.; Shufelt, J.; Cochran, S.; Bulwinkle, T.; Harvey, W.; McGlone, Ch.

Spatial Quality Evaluation of Fusion of Different Resolution Images

IC-06b-02

*Li, Jun

Analysis of image segmentation for multisource data in mountain environments

IC-06b-03

*Ruiz, LUIS A.; Fdez Sarria, Alfonso

Multisensor data fusion using multi-resolution analysis (MRA)

IC-06b-04

*Park, J.H.; Tateishi, R.; Wikantika, K.

The spectral-temporal response surface and its use in the multi-sensor, multi-temporal classification of agricultural crops

IC-06b-05

*Vieira, Carlos; Mather, Paul; McCullagh, Michael

IC-14

Session: Data Quality
Room: Room C/D
Date: 19th July
Time: 10:30 - 12:00
Chair: Lee, Y.C., Canada

On the reliability of spatial data obtained by Kriging

IC-14-01

*Schaffrin, B.

A Simulation approach to analyse error in buffer spatial analysis

IC-14-02

*Shi, Wenzhong (John); Cheung, Chui Kwan

Hybrid Modelling and Analysis of Uncertain Data

IC-14-03

*Klein, Ulrike; Glemser, Michael

Quality control and refinement of the co-registration of multi-resolution reflectance and land cover data

IC-14-04

*Parmes, Eija; Vaatainen, S.

A quality model for spatial objects

IC-14-05

*Ragia, L.

TC III-01

Session: Computer vision for all
Room: Room A
Date: 19th July
Time: 10:30 - 12:00
Chair: Eckstein, Wolfgang, Germany

Combined Adjustment of Laser Scanning Data and Digital Photogrammetric Images

TC III-01-01

*Weisensee, Manfred

An Introduction to Relative Orientation using the Trifocal Tensor

TC III-01-02

*Ressl, Camillo

Photogrammetric Invariance

TC III-01-03

Theiss, H.J.; *Mikhail, E.M.; Aly, I.M.; Bethel, J.S.; Lee, C.

New Orientation Procedures

TC III-01-04

*Förstner, Wolfgang

Shape Recovery from Hybrid Feature Points with Factorisation Method

TC III-01-05

*Miyagawa, Isao; Nagai, Shigeru; Sugiyama, Kazuhiro

TC VII-03

Session: Sustainable renewable resource management
Room: Room B
Date: 19th July
Time: 10:30 - 12:00
Chair: Rao, D.P., India

Potential of high resolution airborne videography for rapid assessment and monitoring of vegetation conditions in agricultural landscapes

TC VII-03-01

*Metternicht, G.; Honey, F.; Beeston, G.; Gonzalez, S.

Crop inventory and production forecasting using remote sensing and agrometeorological models: the case of major agricultural commodities in Hamadan Providence, Iran

TC VII-03-02

*Sharifi, M.A.

Spatial tools for laymen, natural resources management by experts

TC VII-03-03

*Van Laake, Patrick

Interannual variability of NDVI and species richness in Kenya

TC VII-03-04

*Oindo, B.O.; Skidmore, A.K.; de By, Rolf

Assessment of primary productivity for food production in major basins of Asia using R.S. and GIS

TC VII-03-05

*Ochi, S.; Shibasaki, R.; Murai, S.

SS-06

Session: Spatial data and terabyte technology, new business opportunities

Room: Room L

Date: 19th July

Time: 10:30 - 12:00

Moderator Murai, Shunji, Japan

A 12 terabyte image server service for the Internet.

SS-06-01

*Robert Sharks GlobeXplorer.com

Generation and quality assessment of global topography using spaceborne altimetry, "ground truth" and GPS

SS-06-02

*J.P. Muller, UCL, Department of Geomatic Engineering

The Virtual Museum - data generations and visualisation

SS-06-03

*Pierre Boulanger, National Research Council of Canada, Institute for Information Technology.

TP II-01

Session: Real time mapping and techniques for application of images

Room: Room A

Date: 19th July

Time: 13:30 - 16:00

Chair: Schade, Holger, Switzerland

Co-Chair Toth, Charles, United States

Continent-wide high accuracy GPS network (C-Hagnet): a backbone for 21st century geoinformation for all

TP II-01-01

*Brown, Ken; Acharya, Bishwa

The Double Interpolation and Double Prediction (DIDP) Approach for InSAR and GPS Integration

TP II-01-02

*Ge, Linlin; Han, Shaowei; Rizos, Chris

Robust GPS kinematic positioning for direct georeferencing

TP II-01-03

*Talaya, Julià

Prototype Development for Vehicle-based Laser Mapping System (VLMS)

TP II-01-04

*Manandhar, Dinesh; Shibasaki, Ryosuke

Image Compression Versus Matching Accuracy

TP II-01-05

*Kiefner, Michael; Hahn, Micheal

Compression and distribution of SNB softcopy orthophotomap database

TP II-01-06

*Abdelrahim, Mohamed; Coleman, David; Castonguay, Rejan; Raymond, David

Precision Mapping of Highway Linear Features

TP II-01-07

*Grejner-Brzezinska, Dorota; Toth, Charles K.

A street map built by a mobile mapping system

TP II-01-08

*Silva, J.F.C.; Camargo, P.O.; Oliveira, R.A.; Guardia, M.C.; Reiss, M.L.L.; Silva, R.A.C.

Digital mapping horizons that deserve the prestige and outcome of the next century

TP II-01-09

*Al-Garni, A.M.

Impacts of the collocation window on the accuracy of altimeter/buoy wind speed comparison - a simulation study

TP II-01-10

*Chen, G

On the Matching Accuracy of Rasterised Scanning Laser Altimeter Data

TP II-01-11

*Behan, Avril

Use of remote sensing imagery for fast generation of military maps and simulator databases

TP II-01-12

*van Persie, Mark; Noorbergen, Hein H.S.; van den Broek, Bert A.C.; Dekker, Rob J.

Automatic measurement of sewer man-holes in large scale aerial images

TP II-01-13

*Pollak, Bernd; Jacobsen, Karsten

A Distributed Catalogue and Data Services System for Remote Sensing Data

TP II-01-14

*Suresh, R.; Di, L.; McDonald, K.

Automatic cartography from aerial images (site of sale, Morocco)

TP II-01-15

*El kharki, Omar

Low Cost Integrated Airborne Multispectral Remote Sensing

TP II-01-16

*Roberts, Arthur

Intégration Télédétection - S.I.G. Reconstitution du Modèle Géométrique et Restitution Interactive des Éléments Planimétriques à l'aide d'un SIG

TP II-01-17

*Djillali, Abdelkader

Software Tn estudio V2.0: integration of digital image processing tools with pattern recognition to support remote sensing studies

TP II-01-18

*Gil, J.L.; Vega, M.B.; Garcia, E.; Sanchez, R.; Jimenez, L.A.; de Zayas, M.; Martinez, M.

Automatic patterning of the middle scale map using GIS data

TP II-01-19

*Goto, N.; Tsuru, K.; Takenouchi, T.

An integrated Spatial Information System for Informal Settlement Upgrading

TP II-01-20

*Abbott, John

Thematic Resolution Assessment Merging Landsat & Spot 10m

TP II-01-21

*Antunes, Alzir Felipe

Development of a Helicopter-based integrated system for avalanche mapping and hazard management

TP II-01-22

*Vallet, J.; Skaloud, J.; Kölbl, O.; Merminod, B.

TP III-02

Session: Road/object recognition

Room: Room B

Date: 19th July

Time: 13:30 - 16:00

Chair: Habib, Ayan, United States

Detection of dominant orthogonal road structures in small scale imagery

TP III-02-01

*Faber, A.; Förstner, Wolfgang

Early Stage Object Recognition using Neural Networks

TP III-02-02

*Bellman, Chris; Shortis, Mark

Effects of different laser scanning modes on the results of building recognition and reconstruction

TP III-02-03

*Steinle, Eberhard; Vögtle, Thomas

Road Network Extraction by Hierarchical Grouping

TP III-02-04

*Wang, Yandong; Trinder, John

Occlusion detection in digital images through Bayesian networks

TP III-02-05

*Brito, Jorge

Junction Extraction from High Resolution Images by Composite Learning

TP III-02-06

*Teoh, C.Y.; Sowmya, A.

Road surface textures classification using opening-based image processing

TP III-02-07

*Paquis, Stephane; Legeay, V.; Konik, H.

An Approach to Semiautomated Road Extraction from Aerial Image Based on Template Matching and Neural Network

TP III-02-08

*Xiangyun, Hu; Zhang, Zuxun; Zhang, Jianqing

Likelihood-Based Image Segmentation and Classification: Concepts and Applications

TP III-02-09

*Abkar, Ali Akbar; Sharifi, M.

Generalized Mathematical Model of Precise Photogrammetry Reconstruction of Objects

TP III-02-10

*Dorozhynskyy, A.; Moskal, N.

Applying Computer Vision Techniques to Topographic Objects

TP III-02-11

*Keyes, Laura; Winstanley, Adam

Automatic compilation of road figure from plotting data

TP III-02-12

*Kosuke, T.; Hidenori, I.; Takashi, Y.

Imagemap simplification using mathematical morphology

TP III-02-13

*Amini, J.; Saradjian, M.R.

Semi-automatic detection and enhancement of linear features to update GIS files

TP III-02-14

*Forghani, Ali

Application of ellipsoidal coordinates in photogrammetric works

TP III-02-15

*Tjufliin, Yuri

A new approach to object recognition in high resolution satellite imagery

TP III-02-16

*Qin, Qiming; Yuan, Yinhuan; Lu, Rongjian

Algorithm for fast detection and identification of characters in grey-level images

TP III-02-17

*Fu, Z.; Bian, F.; Zhou, S.; Hu, Q.

Analysis of image objects from VHR imagery for forest GIS updating in the Bavarian Alps

TP III-02-18

de Kok, Roeland; Buck, A.; *Schneider, T.; Ammer, U.

Reconstructing road and block from DEM in urban area

TP III-02-19

*Horiguchi, Shoichi; Ozawa, Shiro; Nagai, Shigeru; Sugiyama, Kazuhiro

Peculiar features and problems of visual interpretation of digital space images

TP III-02-20

*Knizhnikov, Yuri; Zinchuk, Nikolai

Problems in Geometric Modelling and Perceptual Grouping of Man-Made Objects in Aerial Images

TP III-02-21

*Michaelsen, Eckart; Stilla, Uwe

The Power of the Links

TP III-02-22

*Baehr, Hans-Peter

Natural Fuzzy Network-Supported Generation of Linguistic Knowledge for Understanding of Spatial Decision-Making

TP III-02-23

*Zheng, Ding

TP IV-02

Session: DEM generation and orthoimages

Room: Room C/D

Date: 19th July

Time: 13:30 - 16:00

Chair: Haala, N., Germany

Seamline removing in the generation of orthophoto maps

TP IV-02-01

*Zhu, Shu-long; Yang, Xu-hua

Update of DEM in urban areas using SPOT panchromatic stereo pair

TP IV-02-02

*Takeuchi, S.; Suga, Y.; Oguro, Y.

Precision rectification of KFA-1000 and Spot images using the multiquadric and DLT model over a test area in Iran

TP IV-02-03

*Sadeghian, S.; Amini, J.

Digital mono-differential restitution of airphotos applied to planimetric mapping

TP IV-02-04

*Mitshita, Edson; Kirchner, Flávio

Test results obtained with the LH Systems airborne digital sensor

TP IV-02-05

*Reulke, Ralf; Eckhardt; Scheele; Terzibaschian; Fricker; Neyer; Sandau; Haala

Generation of Digital Orthophoto for Urban Area Using Digital Building Model

TP IV-02-06

*Kim, Eui Myoung; Yeu, Boek-Mo

Production and precision analysis of a digital orthophoto from 1:35,000 scaled airphoto as a GIS coverage

TP IV-02-07

*Kulur, Sitki; Divan, Ozan

Thematic maps by photogrammetric techniques on satellite images

TP IV-02-08

*Malinverni, Eva Savina; Tonelli, Eliana Paola

Integration of countrywide planimetric data and laseraltimetry data to support 3D-visualisation and analyses

TP IV-02-09

*Simonse, Merlijn; Verbree, Edward; van Asperen, Paul; van der Vegt, Jan-Willem

Twin Snakes for Determining Seam Lines in Orthoimage Mosaicking

TP IV-02-10

*Kerschner, Martin

Draped Aerial Photos and 3D GIS on the Internet

TP IV-02-11

*Lee, JunSeok; Kang, In-Joon; Chang, Yong-Ku; Hong, Soon-Heon

Geometric accuracy potential of the Digital Modular Camera

TP IV-02-12

*Tang, Liang; Dörstel, C.; Jacobsen, K.; Heipke, C.; Hinz, A.

Influence of GPS data fixed during the flight for aerial survey and aerial triangulation

TP IV-02-13

*Dorozhynskyy, O.

On field reconnaissance system using RTK-GPS and FM wave

TP IV-02-14

*Nakano, K.; Tsuru, K.; Ohta, A.

Digital orthophoto generation

TP IV-02-15

*Jaurequi, M.; Vilchez, J.; Chacon, L.

Two-Dimensional Kalman Smoothing for Digital Terrain Modelling

TP IV-02-16

Wang, Ping; Trinder, John; Han, Shaowei; *Donnelly, Brian

Digital elevation modelling using ILWIS 2.1 in parts of Purulia District, West Bengal, India

TP IV-02-17

*Nag, S.K.; Gupta, Niladri

High Resolution Digital Surface Models for Environmental Monitoring

TP IV-02-18

*de Laporte, Karin; Ginzler, Christian

Digital Photogrammetry for the new Glacier Inventory of Austria

TP IV-02-19

*Eder, Konrad; Wurlander, Roland; Rentsch, Hermann

MAPS: Providing Quality Imagery into The Next Millennium.

TP IV-02-20

*Jamieson, Allan

TP V-01

Session: Close range imaging systems and vision metrology

Room: Room M

Date: 19th July

Time: 13:30 - 16:00

Chair: Beyer, Horst, Switzerland

Development and application of digital image surveyor DI-1000

TP V-01-01

Otani, H.; Ito, T.; *Kochi, N.; Aoki, H.; Yarnada, M.; Sato, H.; Norma, T.

Accuracy analysis for new close-range photogrammetric systems

TP V-01-02

*Ali, M.E.N.; Eliwa, M.A.; Mohammed, A.A.E.; Abbas, A.M.

Calibration and testing of a terrestrial laser scanner

TP V-01-03

*Lichti, Derek; Stewart, Mike; Tsakiri, Maria; Snow, Tony

Repercussions of using Surface Models of Greater Fidelity in Area-based Matching

TP V-01-04

*Mitchell, Harvey; Mustaffar, Mushairry

A program for automatic inner orientation of digitised non-metric images (35 and 70 mm)

TP V-01-05

*Cruz, Santiago; Cardenal, Javier; Delgado, Jorge

Automatic Orientation of Mobile Mapping System

TP V-01-06

*Yeu, Bock-Mo; Kim, Gi-Hong; Kim, Uk-Nam; Joo, Hans

Approach to accurate photorealistic model generation for complex 3D objects

TP V-01-07

*Knyaz, Vladimir

Assessment of a laser scanning system for deformation measurements

TP V-01-08

*Al-Hanbali, N.N.; El-Hakim, S.; Teskey, W.F.; Radovanovic, R.S.; Chapman, M.A.

Forensic analysis of imprint marks on skin utilising digital photogrammetric techniques

TP V-01-09

*Robertson, G.

Epipolar images for close range applications

TP V-01-10

*Tsioukas, Vassilios; Stylianidis, Efstratios; Patias, Petros

A Mathematical model for correcting the photographic coordinates due to orientation errors (an application in close-range photogrammetry)

TP V-01-11

*Bas, H.G.

The accuracy of using theodolite in close-range measurements

TP V-01-12

*Bas, H.G.

Digital multisensoral video-thermal system for close range metrology applications

TP V-01-13

*Sawicki, Piotr

Automatic System Calibration of Digital Cameras for Close-range Photogrammetry

TP-V-01-14

*Wang, Sendo; Tsjeng, Yi-Hsing

TP VI

Session: International co-operation, technology transfer and educational developments

Room: Room L

Date: 19th July

Time: 13:30 - 16:00

Chair: Lukman Aziz, Teuku, Indonesia

The teaching of remote sensing in South America

TP VI-01

*Sausen, T.M.

On the use of spreadsheets for teaching analytical photogrammetry

TP VI-02

*Cardenal, Javier; Delgado, Jorge; Torres, Manuel

Processing of correlated information

TP VI-03

*Mussio, Luigi; Bellone, Tamara; Giacobbe, Luigi

Classification by a proximity matrix

TP VI-04

*Bellone, Tamara; Giacobbe, Luigi; Mussio, Luigi

Simulation of business processes for the evaluation of cadastral operations

TP VI-05

*Bouloucos, T.; Davanelou, G.; Radwan, M.

Mapping scientist registration and certification requirements in the U.S.A.

TP VI-06

*Chamard, R.

Gaining an insight into the methodology of information science inside digital photogrammetry

TP VI-07

*Zhang, R.

Education on Photogrammetry Remote Sensing GIS. Experiences, criticism, revisions

TP VI-08

*Patmios, E.; Lasaridou, M.

Destination: 21st century

TP VI-09

*Eslami Rad, Ali; Sarpoulaki, Mohammad

Curriculum restructuring in geomatics education: a systems approach

TP VI-10

*Ayeni, Olubodun

Geo Information - The Emerging Scenario in India

TP VI-11

*Guntur, Kumar GS

Development of a GMS MCSST CD-ROM for computer assisted teaching

TP VI-12

*Cho, Kohei; Matsumoto, R.; Shimoda, H.; Sakata, T.

Cartographic initiation for young students, using aerial photographs and satellite images

TP VI-13

*Soares, Maria do Carmo; de Lourdes Neves, Maria; di Maio Mantovani, A.C.

Teaching of Digital Photogrammetry: The Experience of the Military Institute of Engineering in Brazil

TP VI-14

*Brito, Jorge; Garcia Augusto, E.G.

Learning kit and tutorials for the diffusion of digital photogrammetry

TP VI-15

*Albery, Elena; Lingua, Andrea; Maschio, Paolo

Geoinformation technology transfer: the remote sensing example

TP VI-16

*Quintanilha, José Alberto; de Lima, R.A.F.; Hamburger, D.S.; Bacchi, G.S.; Rodrigues, M.

New training mandates for surveying and geoinformatics institutions in Nigeria

TP VI-17

*Nwilo, P.C.; Peters, K.; Badejo, O.T.

Education, training, research and fellowship opportunities in remote sensing, GIS and applications - "a directory"

TP VI-18

*Sausen, Tania Maria

The university programme to foster creativity in surveying & mapping professionals

TP VI-19

*Liu, Yanfang; Liu, Yaolin; Zhenghua, Shi

Multi-spectral data process and expression of inter-relation in GIS

TP VI-20

*Wang, J.

Curriculum of Geoinformatics - Integration of Remote Sensing and Geographical Information Technology

TP VI-21

*Virrantaus, Kirsi; Haggren, Henrik

Processing spatial data on the Internet

TP VI-23

*Torun, Abdulvahit; Köbben, Barend; Lemmens, Rob

Back to the Roots of Photogrammetry, Remote Sensing & GIS

TP VI-24

*Schuhr, Walter; Kanngieser, E.

TP VII-03

Session: Sustainable resources management - forest and agriculture

Room: Room N

Date: 19th July

Time: 13:30 - 16:00

Chair: Clevers, Jan, The Netherlands

Forest inventory by means of satellite remote sensing and laser scanning

TP VII-03-01

Wimmer, A.; *Schardt, M.; Ziegler, M.; Ruppert, G.; Granica, K.; Schmitt, U.; Gallaun, H.; Hyyppä, J.; *Wimmer, Andreas

Relationship between SAVI and biomass data of forest and savanna contact zone in the Brazilian Amazonia

TP VII-03-02

*Araujo, Luciana Spinelli; Santos, João Roberto; Shimabukuro, Yosio Edemir

Characterisation of the areas in succession process (regrowth) in the Amazon region

TP VII-03-03

*Souza, Iris; Shimabukuro, Yosio; Duarte, Valdete

Multi-data fusion for sustainable forest management: a case study from northern part of Selangor, Malaysia

TP VII-03-04

*Hussin, Yousif; Musa, Muhamed Kamal

Detecting changes in the mangrove forests of southern Thailand using remotely sensed data and GIS

TP VII-03-05

*Hussin, Yousif; Sremongkontip, Somjai; Groenen-dijk, Liza

Inventory of remote sensing applications in forestry for sustainable management

TP VII-03-06

*Hussin, Yousif; Bijker, Wietske

Illustrative uses of continuous estimates of forest parameters derived from satellite data

TP VII-03-07

*Reese, Heather; Sandstrom, Per; Nilsson, Mats; Olsson, Hakan

Application of SPOT images and forest vegetation maps for creation of database for forested soils using GIS modelling.

TP VII-03-08

*Mroz, Marek; Bialousz, Stanislaw

Change Detection of Natural High Forests in Ethiopia using Remote Sensing and GIS Techniques

TP VII-03-09

*Reusing, Matthias

Monitoring forest growth using long time series of satellite data

TP VII-03-10

*Olsson, Håkan; Joyce, Steve

Detection of changes in forest landcover type after fires in Portugal

TP VII-03-11

*Barbosa, P.M.; Caetano, M.R.; Santos, T.G.

Vegetation index increases the quality of data processing results in the field of forest monitoring and management

TP VII-03-12

*Hoa Binh, Truong Thi

Vegetation mapping of a part of dry tropical rainforest of southern Nigeria from Landsat TM

TP VII-03-13

*Salami, A. T.

Mapping of forest using satellite remote sensing technique in Kurukshetra district of Haryana state.

TP VII-03-14

*Nigam, R.K.

Building a new system of forest inventory

TP VII-03-15

*Xianwen, Z.

Computer-assisted cartography: a powerful tool for sustainable management of natural resources: case study of n¹ tentoukoro area. Mali, West Africa.

TP VII-03-16

*Diarra, L.

Agricultural Crop Identification using SPOT and Landsat Images in Tasmania

TP VII-03-17

*Barrett, Rachel; Crowther, Paul; Laurence, Rowland; Lincoln, Ross

Crop Yield Estimation Using NOAA - AVHRR Data and Meteorological Data in the Eastern Wimmera (South Eastern Australia)

TP VII-03-18

*Aigner, E.; Coppa, I.; Wieneke, F.

Multi-scale remote sensing technique for agricultural land use monitoring in Russia

TP VII-03-19

*Vandysheva, Natalia; Vassilenko, G.I.; Filonov, S.V.; Zhoukova, G.A.; Clevers, J.G.P.W.; Nieuwenhuis, G.J.A.; Mucher, C.A.

Integration of remote sensing, GIS and expert knowledge in national knowledge-based crop recognition in Mediterranean environment

TP VII-03-20

*Cohen, Yafit; Shoshany, Maxim

Empirical Estimation of Vegetation Parameters Using Multisensor Data Fusion

TP VII-03-21

*Kurz, Franz; Hellwich, Olaf

Parcel-based approaches to the classification of fine spatial resolution imagery: Example methodologies using HRSC-A data

TP VII-03-22

*Smith, Geoff; Hoffmann, Andrea

A feasibility study for the implementation of an inventory statistical mapping of coffee and cacao plantations in Côte d'Ivoire by satellite remote sensing

TP VII-03-23

*N'doumé, C.; Hussard, A.; Lachenaud, Ph.; Nguyen, H.; Flori, A.

Yield constraints of mango orchards in Thailand

TP VII-03-25

*de Bie, Kees; Rugege, Denis

Soil resource appraisal in lower Vellar basin, Tamil Nadu, India using remote sensing techniques

TP VII-03-26

*Jayaraman, Somasundaram; Natarajan, S.; Mathan, K.K.; Arunkumar, V.

Multitemporal Forest Change Analysis - A Case Study: Sariyer Region

TP VII-03-27

*Musaoglu, Nebiye

Geoinformation for sustainable development. Spatial and structural analysis of deforestation in an urban area since 1950: the Pointe-Noire case study (R. of Congo)

TP VII-03-28

*Fabing, Aline; Simard, Marc; Mayaux, Philippe

Design and implementation forest vegetation map of Zonguldak region

TP VII-03-29

*Akyüz, Feyza; Ozalp, Gulen; Carus, Serdar

The use of the ordinary Kriging Techniques in measuring the sustainability in Sugar Beet Zone, Egypt

TP VII-03-30

*Erian, Wadid; Yacoub, Rafaat

ISO/TC211

Session: ISO/TC211

Room: Room M

Date: 19th July

Time: 14:30 - 17:30

IC-16

Session: Urban 3D modelling
 Room: Room B
 Date: 19th July
 Time: 16:00 - 17:30
 Chair: Förstner, Wolfgang, Germany

Improving the Integration of Digital Terrain Models

IC-16-01

*Schiewe, Jochen

Automatic building reconstruction from very high resolution aerial stereopairs using cadastral ground plans

TC-16-02

*Jibrini, Hassan; Paparoditis, Nicolas; Deseilligny, Marc
 Pierrot, Maitre, Henri

Building Model Creating and Storing in 3D Urban GIS

IC-16-03

*Yang, Bisheng; Li, Qingquan; Li, Deren

CAFM data structures: a review and examples

IC-16-04

*Schürle, Thomas; Fritsch, Dieter

Modelling for 3D GIS: spatial analysis and visualisation through the Web

IC-16-05

*Zlatanova, Siyka; Tempfli, Klaus

IC-21

Session: Hyperspectral sensing and applications
 Room: Room C/D
 Date: 19th July
 Time: 16:00 - 17:30
 Chair: Staenz, Karl, Canada

The Dais La Payne experiment: using the optical and thermal dais bands to survey and model the surface temperature

IC-21-01

Lucieer, Arko; Koster, Eva; *de Jong, Steven; Jetten, Victor

Spectral Unmixing Applied to Vegetated Environments in the Canadian Arctic for Mineral Mapping

IC-21-02

*Staenz, Karl

Field and Satellite radiometry of Soil Erodibility along the climatic gradient of the Judean Desert, Israel.

IC-21-03

*Shoshany, Maxim; Sarah, P.; Jarmer, T.; Hill, J.; Lavee, H.

Vegetation indices, above ground biomass estimates and the red edge from MERIS

IC-21-04

*van der meer, Freek; Clevers, Jan; Epema, Gerrit; Bakker, Wim; Skidmore, Andrew; de Jong, Steven; Scholte, Klaas

Integration of Hyperspectral Data for Rangeland Characterisation

IC-21-05

*Petrie, Gregg; Cullinan, Valerie; Cadwell, Larry; Downs, Janelle; Perry, Eileen; Turner, Jim

TC II-02

Session: Image transfer standards
 Room: Room L
 Date: 19th July
 Time: 16:00 - 17:30
 Chair: Schickler, Wolfgang, United States

ISO/TC 211 geographic information and geomatics - a framework and reference model

TC II-02-01

*Fadaie, Kian

Status report on image transfer standards

TC II-02-02

*Kresse, Wolfgang

NASA standards for earth remote sensing data

TC II-02-03

*Di, Liping; Kobler, Ben

TC IV-03b

Session: Spatio-temporal databases
 Room: Room A
 Date: 19th July
 Time: 16:00 - 17:30
 Chair: Pluemer, Lutz, Germany

A hybrid GIS for 3-D city models

TC IV-03b-01

*Wang, Xinhua; Grün, Armin

Operational GIS User-Interface for Hybrid Geo-data Based on Dynamic Data Retrieval

TC IV-03b-02

*Steinmeier, Charlotte

Toward an integrated solution for an optimised vector database updating process

TC IV-03b-03

*Croitoru, Arie; Doytsher, Yerachmiel

Research on the event-driven spatio-temporal data base for land subdivision system

TC IV-03b-04

*Jiang, Jie; Chen, Jun

Designing operators for an object-oriented spatio-temporal data model

TC IV-03b-05

*Raza, Ale; Kainz, Wolfgang

IC-07a

Session: Integration of image analysis and GIS: general
Room: Forum room
Date: 20th July
Time: 08:30 - 10:00
Chair: Schiewe, Jochen, Germany

Overview of the integration of GIS and RS

IC-07a-01

*Estes, John E.

Integrated geographic information systems: from data to analysis

IC-07a-02

*Ehlers, M.

Integrating Spatial Information and Image Analysis - One plus One makes Ten

IC-07a-03

*Baltsavias, Emmanuel; Hahn, Michael

Integration of Photogrammetric and Spatial Information Systems

IC-07a-04

*Woodsford, Peter; Edwards, Daniel; Simpson, Justin

Change detection using the integration of remote sensing and GIS: a polygon-based approach

IC-07a-05

*Turker, Mustafa

TC III-02a

Session: Surface reconstruction
Room: Room A
Date: 20th July
Time: 08:30 - 10:00
Chair: Krupnik, Amnon, Israel

Stereo matching for pushbroom stereo cameras

TC III-02a-01

*Jahn, Herbert

Improvement of Automatic DSM Generation over Urban Areas using Airborne Laser Scanner Data

TC III-02a-02

*McIntosh, Kerry; Krupnik, Amnon; Schenk, Toni

Complementarity of LIDAR and Stereo Imagery for Enhanced Surface Extraction

TC III-02a-03

*Toth, Charles; Grejner - Brzezinska, Dorota A.

Slope based filtering of laser altimetry data

TC III-02a-04

*Vosselman, George

Colour Image Matching for Automatic DTM Generation and House Extraction

TC III-02a-05

*Park, Hee Ju; Zimmermann, Petra

TC V-04

Session: Image sequence analysis
Room: Room L
Date: 20th July
Time: 08:30 - 10:00
Chair: Maas, Hans-Gerd, The Netherlands

Automatic 3D modelling from image sequences

TC V-04-01

*Pollefeys, Marc; Vergauwen, Maarten; van Gool, Luc

Analysis of dynamic scenes

TC V-04-02

*Handmann, Uwe; Leefken, Iris; Goerick, Christian

Development of High Accuracy Positioning System for Urban Area by Integrating Multi-Sensor and Image Sequence Analysis

TC V-04-03

*Chen, Tianen; Shibasaki, Ryosuke

Automatic stereo matching using optical flow for 3D object modelling

TC V-04-04

*Kunii, Y.; Chikatsu, H.

TC VII-01

Session: Local, regional and global monitoring
Room: Room B
Date: 20th July
Time: 08:30 - 10:00
Chair: Remetei-Fülöpp, Gabor, Hungary

Role of remote sensing and geographic information system in sustainable development

TC VII-01-01

*Rao, D.P.

High-Resolution Satellite Imagery: A Review of Metric Aspects

TC VII-01-02

*Fraser, Clive

Use of geo-information in sustainable development at regional level

TC VII-01-03

*Changchui, He

Mapping with the use of Russian space high resolution images

TC VII-01-04

*Lavrov, V.N.

First experience in the application of laserscanner data for the assessment of vertical and horizontal forest structures

TC VII-01-05

Koch, B.; *Friedlaender, H.

TC II-01

Session: Systems for new data products
 Room: Room C/D
 Date: 20th July
 Time: 08:30 - 10:00
 Chair: Harris, Ray, United Kingdom
 Forum discussion

IC-07b

Session: Integration of image analysis and GIS: case-specific
 Room: Forum room
 Date: 20th July
 Time: 10:30 - 12:00
 Chair: Ehlers, Manfred, Germany

Fusion of Satellite Imagery and Digital Topographic Database Based on Disjoint Objects

IC-07b-01

Leebmann, Johannes; *Kunz, Dietmar

Matching linear features from satellite images with small-scale GIS data

IC-07b-02

*Busch, A.

GIS Database Revision --The problems and solutions

IC-07b-03

*Shi, Zhongchao; Shibasaki, Ryosuke

Towards the automatic interpretation of images for GIS update

IC-07b-04

*Straub, Bernd-M.; Wiedemann, Christian; Heipke, Christian

3D Reconstruction of Building Models

IC-07b-05

*Suveg, Ildiko; Vosselman, George

IC-11a

Session: Sensor orientation
 Room: Room B
 Date: 20th July
 Time: 10:30 - 12:00
 Chair: Colomina, Ismael, Spain

Hierarchical Recovery of Exterior Orientation from Parametric and Natural 3-D Curves

IC-11a-01

*Zalmanson, Garry

An evaluation of rational functions for photogrammetric restitution

IC-11a-02

*Dowman, Ian; Dolloff, John T.

Automatic space resection using a constrained relational matching

IC-11a-03

*Dal Poz, Aluir; Garcia Tommaselli, Antonio M.

Combined block adjustment for evaluating GPS/Inertial system in a highly accurate photogrammetric production environment

IC-11a-04

Wicherson, Remko; Van den Heuvel, Frank; Heine, Mark, *Bresters, P.W.

Potential and Limitation of Direct Sensor Orientation

IC-11a-05

*Jacobsen, Karsten

TC IV-01

Session: Advanced geoinformation concepts for all

Room: Room A

Date: 20th July

Time: 10:30 - 12:00

Chair: Fritsch, Dieter, Germany

Internet-Based Large Distributed Geospatial Databases

TC IV-01-01

*Bishr, Yaser

Three conceptual uncertainty levels of spatial objects

TC IV-01-02

*Molenaar, Martien

Qualified Inheritance in Spatio-Temporal Databases

TC IV-01-03

*Donini, Pier; Monties, Sophie

Multi-scale datasets in distributed environments

TC IV-01-04

*Volz, Steffen; Sester, Monika; Fritsch, Dieter; Leonhardi, Alexander

Modelling and Detecting Change in an Integrated Spatio-temporal Environment

TC IV-01-05

*Mountrakis, Giorgos; Agouris, Peggy; Stefanidis, Anthony; Beard, Kate

UNESCO/CIPA

Session: UNESCO/CIPA

Room: Room C/D

Date: 20th July

Time: 10:30 - 12:00

SS-03

Session: Remote sensing and global change. Challenges for the future

Room: Room L

Date: 20th July

Time: 10:30 - 12:00

Moderator Barbosa, Marcio, Brazil

Divino, Maurino

Director of the International Research Institute for Climate Prediction (USA)

Rabuffetti, A.

Director of the Inter-American Institute for Global Change Research (Headquarters in S.J. Campos, Brazil)

Kayana, M.

PhD in Meteorology, INPE's Co-ordinator of External Relations (TBD): a representative for Europe.

TP I

Session: Sensor and SAR application development

Room: Room A

Date: 20th July

Time: 13:30 - 16:00

Chair: Miller, John, Canada

Correction of Non-Linear Distortion in Digital Images Using a Proposed Normalisation Algorithm

TP I-01

*Alhusain, Othman

Staggered Line Arrays in Pushbroom Cameras: Theory and Application

TP I-02

*Jahn, Herbert; Reulke, Ralf

Performance of the imaging system in the LH Systems ADS40 airborne digital sensor

TP I-03

*Eckardt, Andreas; Braunecker, Bernhard; Sandau, Rainer

Airborne sensor integration and direct orientation of the CASI system

TP I-04

*Alamús, Ramon; Talaya, Julia

U.S. FGDC Content Standard for Digital Geospatial Metadata: Extensions for Remote Sensing Metadata

TP I-05

*Di, Liping; Schlesinger, Barry M.; Kobler, Ben

Radiometric Normalisation and Colour Composite Generation of the DMC

TP I-07

*Diener, Stefan; Kiefner, Michael; Dörstel, Christoph

Derivation of topographic maps from high-resolution airborne SAR data

TP I-08

*Keim, Andreas

Statistical testings for determining significant SAR-image orientation parameters

TP I-09

*Wu, J.; Liu, C.J.; Lin, D.C.

Research about Virtual SAR System

TP I-10

*Ge, Yong; Wang, Jinfeng; Wang, Zhensong; Lou, Xiaoguang

Target related multispectral and true colour optimisation of the colour channels of the LH systems ADS40

TP I-11

*Reulke, Ralf; Franke, Karl-Heinz; Fricker, Peter; Pomierski, Torsten; Sandau, Rainer; von Schoner-mark, Maria; Tornow, Carmen; Wiest, Lorenz

DEM Generation from Multi-sensor SAR images

TP I-12

*Fang, Yong; Chang, Benyi; Wensong, Hu; Hong, Chen

Monitoring the urbanisation of Dar Es Salaam using ERS SAR data

TP I-13

*Dekker, Rob

Estimation of Land Cover Change in Brazilian Rainforests using JERS-1 Satellital Images

TP I-14

*Lopez Cornelio, David

Integrated use of interferometric SAR data and levelling measurements for monitoring land subsidence

TP I-15

*Zhou, Yueqin; Molenaar, Martien; Li, Deren

Rice Growth Monitoring using time-series RADARSAT imagery in Korea

TP I-16

*Hong, Sukyoung; Rim, Sang-Kyu; Yo, In-Sang

Mapping of large areas in tropical countries using high-resolution airborne interferometric radar

TP I-17

*Al-Nakib, Nuri

Automatic derivation of generalised contour lines for topographic maps using high-resolution airborne interferometric radar data

TP I-18

*Schmieder, Anselm; Huber, Reinhold

Multi-source DEM evaluation and integration on The Antarctica Transantarctic Mountains Project.

TP I-19

*Felus, Yaron A.; Csatho, Beata

Operationalisation Of SAR Polarised Data for coastal Erosion

TP I-20

*Marghany, Maged; Hobma, Tjeerd W.

SAR Image Geocoding Using A Stereo-SAR DEM and Automatically Generated GCPs

TP I-21

*Chen, Pu-Huai; Dowman, Ian

Towards the development of an operational strategy for oil spill detection and monitoring in the Caspian Sea based upon a technical evaluation of satellite SAR observations in Southeast Asia

TP I-22

*Gadimova, Sh.

Development of the Technology of Utilisation of Airborne Synthetic Aperture Radar (SAR)

TP I-23

*Koarai, Mamoru

Airborne repeat pass interferometry for deformation measurements

TP I-24

*Groot, Jos; Otten, Matern; van Halsema, Erik

Quality Assessment of interferometric SAR DEMs

TP I-25

Crosetto, Michele; Crippa, Bruno; *Forlani, Gianfranco

TP IV-04

Session: Concepts for spatial databases, hierarchical approaches and inter-operability

Room: Room B

Date: 20th July

Time: 13:30 - 16:00

Chair: Sester, Monika, Germany

A hopfield neural network algorithm for automated name placement for point feature

TP IV-04-01

*Fan, Hong; Zhang, Zuxun; Du, Daosheng

Various Events Involved in Spatio-temporal Databases

TP IV-04-02

*Shu, Hong; Chen, Jun; Gold, Christopher

An Implicit Topology Description

TP IV-04-03

*Nonaka, Hideki; Ohsawa, Yutaka

Topological Issues in Raster Space from Viewpoint of Pan-systems

TP IV-04-04

*Li, Zhilin; Li, Yongli; Chen, Yongqi

GIS-Internet Architectures

TP IV-04-05

*Leukert, Kristin; Reinhardt, Wolfgang

Integration of GIS as a component in federated information systems

TP IV-04-06

*Weindorf, Manuel; Hofmann, Claus; Wiesel, Joachim

Semantic aspects for 3D modelling

TP IV-04-07

*Koehl, Mathieu; Grussenmeyer, Pierre

The Implementation of object-oriented Tin-based subsystems for GIS

TP IV-04-08

*Abdul-Rahman, Alias; Drummond, Jane E.

Modelling Movement Relations in Dynamic Urban Scenes

TP IV-04-09

*Partsinevelos, Panayotis; Agouris, Peggy; Stefanidis, Anthony

The application of Genetic Algorithm in GIS Network Analysis

TP IV-04-10

*Wu, Qishi; Shan, Jeffrey J.

Developing A Three-Dimensional Topological Data Model

TP IV-04-11

*Mesgari, Saadi

Towards automation of update propagation in vector-structured spatial databases

TP IV-04-12

*Kufoniyi, O.

Making the EO catalogues work together: CIP experiences

TP IV-04-13

LeBlanc, Nathalie; Henaff, Yves; de Hauteclocque, Bertrand

The Construction Model to Internet GIS Based on Browser/Multi-server

TP IV-04-14

*Haiyang, Han; Jianya, Gong; Deren, Li

Dynamic data presentation and the WWW

TP IV-04-15

*Ogao, Patrick; Kraak, Menno-Jan

Development of ACTIVITY-based Domain Analysis (ADA) by Designing Spatial data Infrastructure (SDI)

TP IV-04-16

*Sakakibara, Tsuneki; Shibasaki, Ryosuke

Data Structure Research on 3D City Road Network

TP IV-04-17

*Sun, Min; Chen, Jun

Spatial Relation Operations Based on V9I Model

TP IV-04-18

*Zhao, Renliang; Chen, Jun

Spatial Deductive Database

TP IV-04-19

*Zhang, Yong; Wang, KeWen; Zhou, Lizhu

The application of a Bi-level geographic information systems database model to encourage the dissemination, use and production of geoinformation in developing countries

TP IV-04-20

*Martinez, Iuma; Abbott, John

Research On Multi-resolution Seamless Image Database

TP IV-04-21

*Wang, Mi; Gong, Jianya; Li, Deren

Layered R-tree: An Index Structure for Three Dimensional Points and Lines

TP IV-04-22

*Zhang, Yong; Zhou, LiZhu; Chen, Jun

Dynamic hierarchical indexing model based on Voronoi

TP IV-04-23

*Zhao, Xuesheng; Chen, Jun

Real-time Generalisation of Geodata on the Web

TP IV-04-24

*Lehto, Lassi; Kilpelainen, Tiina

TP V-02

Session: Vision metrology and integration with CAD

Room: Room M

Date: 20th July

Time: 13:30 - 16:00

Chair: Fraser, Clive, Australia

Fundamental researches into the development of inertial photogrammetry using accelerometer and gyro

TP V-02-01

*Takemoto, A.; Koizumi, T.; Shirai, Y.; Adachi, I.; Yamamoto, A.

Orientation of images captured with video-theodolites

TP V-02-02

*Huang, Y.D.; Chen, D.

Digital photogrammetry - a necessary part of the total help offered from survey enterprises

TP V-02-03

*Vach, K.

Photogrammetric measurement techniques for quality control in sheet metal forming

TP V-02-04

*Bösemann, W.; Godding, R.; Hütte, H.

Object-oriented measurement of pipe systems using edge matching and CSG models with constraints

TP V-02-05

*Tangelder, Johan; Ermes, Pierre; Vosselman, George; van den Heuvel, Frank

Image Orientation and Object Reconstruction via Points on Contours

TP V-02-06

*Legenstein, Dietmar

Integration of digital photogrammetric-obtained data with autocad to car surface model

TP V-02-07

*Ergün, B.; Kulur, S.

Orientation and reconstruction of close-range images using lines

TP V-02-08

*Tommaselli, Antonio

Constraints in CAD models for reverse engineering using photogrammetry

TP V-02-09

*Ermes, Pierre

Development of real time 3D measurement system and synthesis of range images with video images

TP V-02-10

*Kuroda, K.; Miyasaka, T.; Hirose, M.; Araki, K.

Constrained line-photogrammetric 3D reconstruction from stereopairs

TP V-02-11

*Petsa, Elli; Karras, George E.

Automated Surface Extraction in Real Time Photogrammetry

TP V-02-12

*Zhou, Ming; Fraser, Clive

PC-based digital close-range photogrammetric system for rapid 3D data input in CAD systems

TP V-02-13

*Stepanyants, Dmitry; Knyaz, Vladimir

Creating 3D models for aircraft components and systems for support in aircraft accident investigation

TP V-02-14

*Robertson, G.

Using knowledge about shape and position of plant elements in photogrammetric as-built-documentation

TP V-02-15

*Bürger, Thomas; Busch, Wolfgang

The AS-built on-line modelling technique

TP V-02-16

*Dumont, A; Naudet, S.

TP VII-02

Session: Image analysis and application development

Room: Room C/D

Date: 20th July

Time: 13:30 - 16:00

Chair: Staenz, Karl, Canada

Laser and radioactive irradiation as stress sources of cotton plants and phytoplankton

TP VII-02-01

*Tsipenyuk, D.

Unmixing of mixture pixel based on the chromatic characteristic of endmember spectra

TP VII-02-02

*Lin, H.; Zhang, L.

Estimation of the productivity parameters of wheat crops using high resolution satellite data

TP VII-02-03

*Kryvobok, O.

Evaluation of topographic normalisation methods for a mediterranean forest area

TP VII-02-04

*Karathanassi, V.; Andronis, V.; Rokos, D.

Towards operational airborne remote sensing of water quality in the Netherlands

TP VII-02-05

*Hakvoort, J.H.M.; de Haan, J.F.; Jordans, Rob; Vos, Robert; Peters, Steef; Rijkeboer, Machteld

Wave height measurements with navigation radar

TP VII-02-06

*Vogelzang, J.; Boogaard, K.; Reichert, K.; Hessner, K.

Combined application of aerophotogrammetry, laser scanning and Dynamic segmentation to reconstruct three-dimensional watercourse networks

TP VII-02-07

*Brandt, S.; Vosen, P.

Retrieving biophysical data from airborne multispectral imagery of rice crops

TP VII-02-08

*Spackman, Sarah; McKenzie, Gary; Lamb, David; Louis, John

Measuring river-bed and flume morphology and parameterising bed roughness with a Kodak DCS460 digital camera

TP VII-02-09

*Chandler, Jim; Lane, Stuart; Ashmore, Peter

Vineyard spatial structure analysis by per-field arial photograph processing

TP VII-02-10

*Wassenaar, Tom; Baret, Frédéric; Robbez-Masson, Jean-Marc; Andrieux, Patrick

Optical properties of open-cast lignite mining lakes in Central Germany

TP VII-02-11

*Boine, J.; Gläber, C.

Modelling Crop Geometry Using Multiple View Angles

TP VII-02-12

*Vonder, O.W.; Clevers, J.G.P.W.; Desprats, J.F.; King, C.; Prevot, L.; Bruguier, N.

Geometric Registration and Classification of Hyperspectral Airborne Pushbroom Data

TP VII-02-13

*Bethel, James; Lee, C.; Landgrebe, D.A.

Extraction of the distribution of yellow sand dust and its optical properties from ADEOS/POLDER data

TP VII-02-14

*Kusaka, Takashi; Kodama, Michihiro; Shibata, Hideki

Classification of Spectroscopical Imagery by combining spatial and spectral information: the SSC method

TP VII-02-15

*Hornstra, Tom; De Jong, Steven; Maas, Hans-Gerd

Application of solar energy simulation for rainforest environment

TP VII-02-16

*Yamashita, M.; Yoshida, T.; Yoshimura, M.; Nakashizuka, T.

The shape of the specular peak of rough surfaces

TP VII-02-17

*Meister, G.; Rothkirch, A.; Spitzer, H.; Bienlein, J.

Realising the promise of high-resolution satellite data (products for photogrammetry, mapping and remote sensing applications)

TP VII-02-18

*Hargreaves, David

Statistical analysis of backscatter data from different genus of aquatic plants

TP VII-02-19

*Noernberg, Mauricio Almeida; Krug, Thelma; Novo, Evlyn Leão Moraes

Integration of multitemporal ERS SAR and LANDSAT TM data for soil moisture assessment

TP VII-02-20

*Hejmanowska, Beata; Mularz, Stanislaw

A Geographical Information System for Humanitarian Demining

TP VII-02-21

*Lacroix, Vinciane; Shimoni, Michal; Acheroy, Marc; Wolff, Eleonore

TP VII-08

Session: Monitoring of urban areas

Room: Room L

Date: 20th July

Time: 13:30 - 16:00

Chair: Forster, Bruce, Australia

The application of fractal theory based on urbanisation evaluation - Urumchi city as example

TP VII-08-01

*Tiyip, T.; Zhang, W.

Mapping of reclamation rate in the Egyptian deserts using SPOT satellite images

TP VII-08-02

*Farrag, A.; A-B Ebrahim, M.

Application of remote sensing and geographical information system for land use/land cover mapping and change detection in rural urban fringe areas of Enschede city, The Netherlands

TP VII-08-03

*Nigam, R.K.

Integrating GIS and remote sensing for evaluation and monitoring of Omerli region, Istanbul

TP VII-08-04

*Goksel, Cigdem; Turkoglu, Handan

Mapping Atlanta's Land use/cover Change and its Impact on the Environment using Time Sequential Landsat Images

TP VII-08-05

*Lo, Chor-Pang

Comparative analysis of land cover maps obtained from vertical aerial photographs and panchromatic Spot images

TP VII-08-06

*Bacchi, Gustavo Sanches; Rodrigues, Marcos; Quintanilha, J.A.; Hamburger, Diana S.

Urban sustainability using orbital remote sensing data and geoprocessing techniques

TP VII-08-07

*Kurkdjian, Maria de Lourdes N.; Valerio Filho, Mario; Pereira, Madalena Niero; Dias, Luiz Alberto Vieira

Monitoring urban expansion in the Büyükçekmece district of Istanbul using satellite data

TP VII-08-08

Maktav, D.; *Sunar, F.; Taberner, M.; Akgün, H.

A comparison of a visual interpretation and a two stage approach for classifying urban development using SPOT

TP VII-08-09

*Sliuzas, Richard; Gorte, Ben; Mitalo, Elifuraha Gerard

Remote sensing for operational applications in the environment of the megacities

TP VII-08-10

*Kudashev, Efim; Kravtsov, Yu.; Myasnikov, V.; Raev, M.; Armand, N.; Savorskii, V.; Tishenko, Yu.

TP VII-05

Session: Sustainable resource management - hydrology

Room: Room N

Date: 20th July

Time: 13:30 - 16:00

Chair: Rao, D.P. India

4D Data fusion technique in urban waterlog-draining decision support system

TP VII-05-01

*Li, J.; Bian, F.L.; Yu, X.Q.

Remotely sensed hydrological isolation to support sustainable use of fens in The Netherlands

TP VII-05-02

*Sanders, M.E.

The role of SPOT satellite images in mapping air pollution caused by cement factories

TP VII-05-03

*Ali Farrag, F.

Digital mapping for coral reef in Bintangor island West Sumatra Province, Indonesia

TP VII-05-04

*Cahyarini, Sri Yudawati Cahyari

GIS in the treatment and analysis of meteorological and oceanographic data

TP VII-05-05

*Stech, José Luiz; Ramos, Jorge A.P.; Alves, Diógenes S.

Remote Sensing application in evaluating the Southern Leyte Geothermal Project (SLGP), Southern Leyte, Philippines

TP VII-05-06

*Camit, Rex; Leynes, Raymund; Apuada, Nilo A.

Woopo Wetland Ecosystem Management based on Internet GIS

TP VII-05-07

*Yoo, Hwanhee; Kim, Jong-Oh; Park, Hong-Gi; Yeu, Yeon

Database and GIS for the investigation of heavily polluted industrial sites

TP VII-05-08

*Pitout, Cedric; Kergomard, C.

GIS for Point-Source Pollutant Dispersal Analysis

TP VII-05-09

*Ramachandran, Kausalya; Muralikrishna, I.V.

Baseline mapping of sediment distribution in the Western Scheldt estuary prior to tunnel boring

TP VII-05-10

*Vos, Robert; Peters, Steef; Pasterkamp, Reinold; Villars, Monique; Baptist, Martin; Kokke, Jos; Hoogenboom, Erin

Monitoring and Analysis of water pollution using Temporal GIS

TP VII-05-11

*Meratnia, Nirvana; Düzgün, Fusun; de By, Rolf A.

GIS and remote sensing (RS) data for estimation of the level change of the Caspian sea

TP VII-05-12

Mekhtiev, A.; *Ragimov, R.; Suleymanov, T.; Ismailov, J.

Assessment of groundwater pollution potential through remote sensing and GIS technique - a case study for Anekal Taluk, Bangalore Urban District, India

TP VII-05-13

*Chandrashekar, H.; Ranganna, G.; Nataraju, C.

Monitoring and Impact Assessment of Shrimp Farming in the East Coast of Thailand Using Remote Sensing and GIS

TP VII-05-14

*Hazarika, M.K.; Samarakoon, L.; Honda, K.; Thanwa, J.; Pongthanapanich, T.; Boonsong, K.

Necessity of Remote Sensing to improve the water management system in Pakistan (Abridged)

TP VII-05-15

*Munawar, H.Z.

Watershed management for sustainable development

TP VII-05-16

*Omakupt, M.

Black Sea viewed from space

TP VII-05-17

*Loghin, V.

Photogrammetry and GIS technologies for monitoring of coastal erosion along Dar Es Salaam coastline

TP VII-05-18

*Masele, Z.Y.; Mayunga, S.D.

Quantitative Assessment of Land use Changes Impact on Water Conservation for Reservoir Watershed

TP VII-05-19

* Chou, Tien-Yin

Soil moisture measurements by synthetic aperture radar and scatterometers in the arid and semi-arid environment

TP VII-05-20

* Blumberg, D.; Freilikhner, V.

The Open GIS Consortium (OGC) has achieved consensus on several families of APIs, and some of these have now been implemented in Off-The-Shelf software. All consensus APIs carry a pledge of commercial implementation by their submitting teams.

During the OGCs showcase, we will trace the value chain of these interfaces, report on recent accomplishments and exhibit to attendees the opportunities for use in ISPRS contexts, with particular emphasis on distributed spatial information systems that support a wide numbers of users. Interoperability of Members' products containing OGC specifications will be demonstrated using OGCs Web Mapping Technology.

NSEOG

Session: NSEOG: Geo-information in the networked society

Room: Room O

Date: 20th July

Time: 13:30 - 17:00

Chair: Bregt, Arnold The Netherlands

Specifically for interested persons from the Netherlands and all congress participants, an event has been organised with the theme 'Geo-information in the networked society'. This theme fits in very well with the congress theme 'Geo-information for all', because modern networks form an excellent way to distribute (geo) information to all.

Introduction

Arnold Bregt, Alterra

Distribution of earth observation (meta)information via the network

van Swol, Rob (NLR/Neonet)

Clearinghouse and NCGI, OpenGIS

Gehrels, Barend (Geodan IT)

AGRS network: principles and applications

van der Marel, Hans (TU Delft, Geodesie)

Connecting the Field to the Office through Pencomputers and Mobile Networking

ter Haar, Randolph (Oranjewoud)

Forum discussion 'future geo-information and networks'

OGC session

Session: OGC

Room: Room L

Date: 20th July

Time: 14:30 - 16:00

Theme OGC session: Interoperability: a Key Ingredient for Making Geoinformation Accessible, Understandable and Useful for All

IC-24a

Session: Disaster monitoring

Room: Room B

Date: 20th July

Time: 16:00 - 17:30

Chair: Singhroy, Vernon, Canada

Progress of the CEOS disaster management support project

IC-24a-01

*Wood, Helen

Strategy on landslide type analysis based on expert knowledge and the quantitative prediction model

IC-24a-02

*Kojima, Hirohito; Chung, Chang-Jo F.; van Westen, Cees J.

The Application of Remote Sensing to Natural Hazards of Geological Origin: Experiences learned from the GARS-Program of UNESCO and IUGS

IC-24a-03

*Bannert, Dietrich

Remote Sensing Observations for Volcano Monitoring and Hazard Mitigation

IC-24a-04

*Mouginis-Mark, Peter

SAR image techniques for mapping areas of landslides and debris flows

IC-24a-05

*Singhroy, Vern

TC I-02

Session: Perspectives on platforms and sensors for geoinformation needs

Room: Room C/D

Date: 20th July

Time: 16:00 - 17:30

Chair: Joseph, George, India

Fundamental study on real time measurement of altitude data with accelerometer and vehicle speed sensor

TC I-02-01

*Shirai, Yasuyuki; Koizumi, T.; Takemoto, A.; Adachi, I.

The synergy of optical data with microwave backscattering model for the retrieval of soil and vegetation conditions in heterogeneous Mediterranean environment

TC I-02-02

*Tal, Svoray; Shoshany, Maxim

Thermal remote sensing: Concepts, issues and applications

TC I-02-03

*Prakash, Anupma

New Potential and Applications of ADS

TC I-02-04

*Röser, Hans Peter; Eckardt, Andreas; von Schönemark, Maria; Sandau, Rainer; Fricker, Peter

On how future low-cost remote sensing satellites could meet the information needs of environmental managers

TC I-02-05

*Denore, Bernard

TC III-02b

Session: Surface reconstruction
Room: Room A
Date: 20th July
Time: 16:00 - 17:30
Chair: Toth, Charles, United States

Approaches to the filtering of Laser Scanner Data

TC III-02b-01

*Lohmann, Peter; Koch, Andreas; Schaeffer, Michael

Exploiting colour for edge extraction and line segment stereo matching in high-resolution aerial imagery

TC III-02b-02

*Scholze, Stephan; Moons, Theo; Ade, Frank; van Gool, Luc

Knowledge-Based 3D Surface Reconstruction

TC III-02b-03

*Heitzinger, David

Simulation studies and practical tests using multi image shape from shading

TC III-02b-04

Heipke, C.; *Piechullek, C.; Ebner, H.

Stereo image matching using robust estimation and image analysis techniques for DEM generation

TC III-02b-05

*Kubik, Kurt; Lu, Yihui

TC V-05

Session: Visualisation and virtual reality
Room: Room L
Date: 20th July
Time: 16:00 - 17:30
Chair: El-Hakim, Sabry, Canada

Virtualised Reality: An Application to Open-Pit Mine Monitoring

TC V-05-01

*Boulanger, Pierre; Lapointe, Jean - François; Wong, Winston

Reconstruction of the appearance of Schloss Herborn back in 1540 and its multimedia presentation

TC V-05-02

*Pomaska, Guenter

3D-visualisation of leisure & tourism information based on remote sensing data

TC V-05-03

*Almer, Alexander; Nischelwitzer, Alexander

Ground-based sensor integration for spatial data acquisition and database development

TC V-05-04

*Yoshimura, M.; Shibasaki, R.; Anai, T.; Chikatsu, H.

Development of low-cost VR systems based on real sites and objects 3D models

TC V-05-05

*Samoylov, D.; Bakhtina, T.; Grigoriev, R.

IC-11b

Session: Sensor orientation
Room: Forum room
Date: 21st July
Time: 08:30 - 10:00
Chair: Agouris, Peggy, United States

Photogrammetric resection differences based on laboratory vs. operational calibrations

IC-11b-01

*Merchant, Dean

Integrated sensor orientation - an OEEPE test

IC-11b-02

*Heipke, Christian; Jacobsen, Karsten; Wegmann, Helge; Andersen, Oystein; Nilsen, Barbi

T.O.P. concepts for sensor orientation

IC-11b-03

*Colomina, Ismael

DSM-based orientation technique for digital stereo photo images

IC-11b-04

*Oda, Kazuo; Doihara, Takeshi; Uchida, Osamu; Shibasaki, Ryosuke

Direct georeferencing using integrated GPS/inertial exterior orientation parameters for airborne photogrammetric applications

IC-11b-05

*Cramer, Michael; Stallmann, Dirk; Haala, Norbert

TC IV-05a

Session: Spatial database interpretation
 Room: Room B
 Date: 21st July
 Time: 08:30 - 10:00
 Chair: Sester, Monika, Germany

Multidimensional Representation of Geographic Features

TC IV-05a-01

*Usery, E. Lynn

A method for construction of 2D Hull for generalised cartographic representation

TC IV-05a-02

*Joubran, Jacqueline; Gabay, Yair

Modelling, computing and classifying topographic area features based on topologically non-structured line input data

TC IV-05a-03

*de Gunst, Marlies; van Oosterom, Peter; van Osch, Berry

Urban Classifications for Generalisation Orchestration

TC IV-05a-04

*Boffet, Annabelle; Coquerel, Caroline

Parameter-Free Cluster Detection in Spatial Databases and its Application to Typification

TC IV-05a-05

*Anders, Karl-Heinrich; Sester, Monika

IC-09

Session: Generation and maintenance of large scale databases

Room: Room C/D

Date: 21st July

Time: 08:30 - 10:00

Chair: Osterlund, Henrik, Sweden

The IGOS programme

David Williams, Head of Strategy and International Relations, EUMETSAT

Information Systems and Services

Peter Churchill, Head of SSSA Unit, Space Applications institute, JRC

Global geoinformation from Earth observation

Gunter Schreier, DELPHI2 GmbH, Munich

Validating global datasets

John Townshend, University of Maryland, USA

TC V-07

Session: CAD - based architectural and archeological photogrammetry

Room: Room L

Date: 21st July

Time: 08:30 - 10:00

Chair: Patias, Petros, Greece

First experience with the "Zurich city hall" dataset for architectural photogrammetry

TC V-07-01

*Streilein, André; Hanke, Klaus; Grussenmeyer, Pierre

Surveys in Archaeological Sites for 3D Modelling

TC V-07-02

*Tokmakidis, Kostas; Ito, Juko; Inada, Kosuke

An approach to estimation of 2D-3D motion of surfaces: the frequency domain technique

TC V-07-03

Cortelazzo, G.M.; *Guarnieri, A.; Lucchese, L.; Vettore, A.

The process of making a 3D-vector scenograph of ancient building with large quantities of data

TC V-07-04

*Yixuan, Z.; Zhiyong, Ch.

Application of spectral and textural classifications to recognise materials and damages on historic building facades

TC V-07-05

*Lerma, José Luis; Ruiz, Luis Angel; Buchon, Fernando

TC VII-02

Session: From raw data to user-defined quantitative products

Room: Room A

Date: 21st July

Time: 08:30 - 10:00

Chair: Staenz, Karl, Canada

The using of satellite image data from optic and microwaves data for development of a methodology for identification and extraction of flooded area

TC VII-02-01

*Potcoava, Mariana - Camelia; Stancalie, Gheorghe; Raducanu, Dan

On the Capabilities of Digital High Resolution Multispectral Remote Sensing Techniques to Serve Nature Conservation Requirements

TC VII-02-02

*Hansen, Wolfgang von; Sties, Manfred

A semi-empirical approach for estimating plant parameters within the ReSeDA project

TC VII-02-03

*Clevers, Jan; Vonder, Oscar; Jongschaap, Raymond; Desprats, J.F.; King, C.; Prevot, L.; Bruguier, N.

Simultaneous retrieval of surface parameters by model inversion

TC VII-02-04

*Verhoef, Wout

Spectral Unmixing for the Classification of Hyperspectral Images

TC VII-02-05

*Tseng, Yi-Hsing

CATCON

Session: CATCON
 Room: Room M
 Date: 21st July
 Time: 9:00 - 16:00 (9:00-12:00 Official Demo,
 13:30-16:00 Interactive Demo)
 Chair: Murai, Shunji (1st Vice President)
 Members: Lukman Aziz, Teuku (Com. VI President)
 Cho, Kohei (WG VI/2 Chairperson)
 Representative from each Commission and/or
 WG chairs of Commission VI
 Moderator: Cho, Kohei

CATCON is the name of a software contest organised by the ISPRS Commission VI working group 2: Computer Assisted Teaching (CAT) sponsored by the CCS (Central Computer Service) of Japan, and a total of 500,000 yen (about 4,500 US dollar) will be awarded to the winners of the contest.
 Gold Award (3,000 Swiss Francs)
 Silver Award (2,500 Swiss Francs)
 Bronze Award (1,500 Swiss Francs)

The main objective of the contest is to promote the development and dissemination of good/user-friendly software packages, WWW contents as well as datasets for computer assisted teaching. In general, the software, WWW contents or dataset is preferred to be non-commercial and preferably to be provided to the users free of charge.

LH Systems Panel Session in co-operation with ITC

Session: Panel discussion: training and retaining qualified photogrammetric staff.
 Room: Room C/D
 Date: 21st July
 Time: 10:30 - 12:00
 Chair: Wald, Bruce United States

Bruce Wald, President & CEO of LH Systems, will chair a discussion to address the problems that face today's leading photogrammetric private service companies and government departments, of finding and keeping staff of high quality to operate modern photogrammetric workstations productively. Panelists will include opinion leaders from private industry system suppliers and service companies, and from government and academia.

IC-13a

Session: Object recognition and image understanding
 Room: Forum room
 Date: 21st July
 Time: 10:30 - 12:00
 Chair: Guelch, Eberhard, Germany

Multi-source feature extraction and visualisation in Urban environments

IC-13a-01

*Mikhail, Edward M.

Automatic Extraction of Trees in Urban Areas from Aerial Imagery

IC-13a-02

*Bacher, Uwe; Mayer, Helmut

Automatic derivation of features related to forest stand attributes using laser scanner

IC-13a-03

*Hyypa, Juha; Hyypa, Hannu; Ruppert, Georg

A new framework for automatic building detection analysing multiple cue data

IC-13a-04

*Zimmermann, Petra

Method of 3D-object detection based on orthophoto difference analysis

IC-13a-05

*Zheltoy, Sergey; Sibiryakov, Alexander

IC-15a

Session: DTM generation and ortho-images I
 Room: Room A
 Date: 21st July
 Time: 10:30 - 12:00
 Chair: Welch, Roy, United States

Topographic line map production using high resolution airborne interferometric SAR

IC-15a-01

*Lorraine Tighe, M.

LANDMAP: Creating a DEM of the British Isles by SAR interferometry

IC-15a-02

*Morley, J.G.; Muller, J.-P.A.L.; Walker, A.H.; Kitmitto, K.; Mitchell, K.; Chugani, K.; Smith, A.; Barnes, J.; Cross, P.A.; Dowman, I.J.

InSAR DEM calibration for topographic mapping in Eastern Uganda

IC-15a-03

*Slob, Siefko; Kervyn, François; Lavreau, Johan; Odida, John; Kyagulanyi, David

DEM Generation Using ERS-1/2 interferometric SAR Data

IC-15a-04

*Shiping, Shi

Detection of deformation area in Mt. Mayon in the Philippines using differential SAR interferometry by EERS1 tandem data

IC-15a-05

*Tokunaga, Mitsuharu

TC IV-05b

Session: Generalisation of spatial data
 Room: Room B
 Date: 21st July
 Time: 10:30 - 12:00
 Chair: Richardson, Dianne, Canada

Multi-scale database generalisation for topographic mapping, hydrography and web-mapping, using active object techniques

TC IV-05b-01

*Hardy, P.G.

Generalisation based on Least Squares Adjustment

TC IV-05b-02

*Sester, Monika

Generalisation of vector datasets by simultaneous least squares adjustment

TC IV-05b-03

*Harrie, Lars; Sarjakoski, Tapani

Scale-Space Events for the Generalisation of 3D-Building Data

TC IV-05b-04

*Mayer, Helmut

Machine Learning Techniques for Determining Parameters of Cartographic Generalisation Algorithms

TC IV-05b-05

Lagrange, Francois; Landras, Bruce; *Mustiere, Sebastien

SS-02

Session: Geoinformation for sustainable development, knowledge chains for global and local action

Room: Room L

Date: 21st July

Time: 10:30 - 12:00

Chair: van Ginkel, Hans, UN University, Japan

Moderator: Beek, Klaas Jan, The Netherlands

GIS for sustainable development at local scales: Applications in the rural Hillsides, Savannas and forest Margins of Latin America

SS-02-01

*Leclerc, Gregoire; Beaulieu, Nathalie; Hyman, G.G.

The relevance of systematic data acquisition and large databases in the implementation of large projects.

SS-02-02

Zuluaga, Alfonso; *Valenzuela, Carlos R.

Satellite observations of international river basins for all

SS-02-03

*Bastiaanssen, W; Prathapar, S.A.

Monitoring of the effect of large-scale conversion of tropical rainforest on regional and global climates and on the sustainability of development

SS-02-04

*Kabat, P.

TP II-02

Session: Digital photogrammetry

Room: Room L

Date: 21st July

Time: 13:30 - 16:00

Chair: Sarjakoski, Tapani

Optimising present day photogrammetric operation

TP II-02-01

*Chaturvedi, Arvind; Bell, William; Acharya, Bishwa; Rochester, Keith

Running both Analytical and Digital Photogrammetric Production Lines in a mapping Environment

TP II-02-02

*Li, Xiaopeng; Baker, A. Bruce

Photogrammetric scanning innovation in the LH Systems DSW500

TP II-02-03

*Dam, Alex; Nagle, Gail; Miller, Scott; Walker, Stewart

Semi-automatic Building Reconstruction Integrated in strict Bundle Block Adjustment

TP II-02-04

*Rottensteiner, Franz

Stereo image matching with sub-pixel resolution

TP II-02-05

*Marinov, Borislav

The cost and benefits of softcopy photogrammetric production

TP II-02-06

*Saleh, Raad

On-line system for Real-Time Digital Photogrammetry

TP II-02-07

*Han, Seung-Hee; Bae, Sang-Ho

Image Scanning Resolution and Surface Accuracy, experimental research

TP II-02-08

*Saleh, Raad; Scarpace, F.

Z-space digital photogrammetric system for Russian TK-350 images

TP II-02-09

*Blokhinov, Yuri; Sibiryakov, Alexander V.; Skryabin, Sergey V.

A new tool for digital photogrammetry: the 3D navigator

TP II-02-10

*Dequal, Sergio; Rinaudo, Fulvio

Aerial triangulation data acquisition using a Low Cost Digital Photogrammetric System

TP II-02-11

*Rinaudo, Fulvio; Lingua, Andrea

StereoSpace: an idea for photogrammetric data collection

TP II-02-12

*Menci, L.

Concept and testing of an automatic system for aerial triangulation

TP II-02-13

*Scaioni, Marco; Forlani, Gianfranco; Pinto, Livio

Economics of Image Acquisition Alternatives for Digital Photogrammetric Production

TP II-02-14

*Jaafar, Maha; Saleh, Raad

Absolute and Exterior Orientation Using Linear Features

TP II-02-15

*Smith, Martin; Park, David

Photogrammetric development in Cuba

TP II-02-16

*Gomez Gallo, G.; Gonzalez Garcia, S.

New Approach to Solving Matching Problems in Photogrammetry

TP II-02-17

*Habib, Ayman; Asmamaw, Andinet; Kelley, Devin

From analogue to digital photogrammetry in Romania

TP II-02-18

*Zegheru, N.

A Strategy for Automatic Image to Map Registration

TP II-02-19

*Hild, H.; Haala, N.; Fritsch, D.

TP III-03

Session: DEM and image matching

Room: Room B

Date: 21st July

Time: 13:30 - 16:00

Chair: Toth, Charles, United States

Benefits of hybrid DCT domain image matching

TP III-03-01

*Reeves, R.; Kubik, Kurt

A compact vector-space algorithm for an analytical reduction of a stereogram

TP III-03-02

*Olaleye, J.B.; Sangodina, J.O.

Image matching towards maturity

TP III-03-03

*Skarlatos, D.

Non-linear Scale and Orientation Free Correlation Matching Algorithm Based on Edge Correspondence

TP III-03-04

*Zhou, Xiuguang; Dorrer, Egon

A countrywide TIN elevations database

TP III-03-05

*Ruiz, Antonio

Intelligent interpolation methods for a full-scale SPOT-DEM in coastal regions

TP III-03-06

*Kim, S.A.B.; Park, Wonkyu; Kim, Tag-Gon

A remote sensing image matching method combining genetic algorithm with Least Square Matching

TP III-03-07

*Xiong, Xing Hua; Qian, Ceng Bo; Wang, Ren Xiang

Development of Real-Time Visualisation Tools for the Quality Control of Digital Terrain Models and Ortho-images

TP III-03-08

*Wiggenhagen, Manfred

Least Median of Squares Matching for Automated Detection of Surface Deformations

TP III-03-10

*Xu, Zhu; Li, Zhilin

Vector data in semi-automatic corrections of dense DEM for ortho-images generation

TP III-03-11

*Jedryczka, Renata

Multi-Image Matching Using Segment Features

TP III-03-12

*Shao, Juliang; Mohr, Roger; Fraser, Clive

Surface reconstruction in urban areas from multiple views with aerial digital frame cameras

TP III-03-13

*Paparoditis, Nicolas; Thorn, Christian; Jibrini, Hassan

Multi-image matching in object space using airborne CCD-linescanner imagery

TP III-03-14

*Schlüter, Martin

Integration of object and Feature Matching for Object Surface Extraction

TP III-03-15

*Apaphant, Pakorn; Bethel, James

The development of an accurate DEM extraction strategy for satellite image pairs using epipolarity of linear pushbroom sensors and intelligent interpolation scheme

TP III-03-16

Lee, Hae-Yeoun; *Park, Wonkyu; Kim, Taejung; Kim, Seungbum; Lee, Heung Kyu; Kim, Tag-gon

Image rectification using a generic sensor model - rational function model

TP III-03-17

*Tao, C. Vincent; Mercer, J. Bryan; Zhang, Yun

Adjustment of Algebraic Surfaces by Least Squared Distances

TP III-03-18

*Kager, Helmut

A robust automatic digital terrain modelling method based on fuzzy logic

TP III-03-19

*Samadzadegan, Farhad; Rezaeian, Mehdi; Hahn, Michael

A new Algorithm for Automatic Precise Reconstruction of A Real Object Surface

TP III-03-20

*Tsay, Jaan-Rong

TP IV-05

Session: Data acquisition for spatial databases and global databases

Room: Room C/D

Date: 21st July

Time: 13:30 - 16:00

Chair: Tateishi, Ryutaro, Japan

The system for automated deciphering of cosmic earth surface photographs

TP IV-05-01

*Kandoba, I.; Kostousov, V.; Skripnuk, V.; Shabanov, G.

Mapping and visualisation of the retreat of two cirque glaciers in the Austrian Hohe Tauern National Park

TP IV-05-02

*Kaufmann, V.; Ploesch, R.

The new approach to processing of high resolution image data applied to image maps in scales from 1:10,000 to 1:50,000

TP IV-05-03

*Drachel, J.; Kaczynski, R.

Integrated application of geo-techniques for database updating studies

TP IV-05-04

*Sharif, Massoud; Hootsmans, Rob; Lugomela, Francis

Digital Map as Pre-Ready GIS using Quasi-Analysis Techniques

TP IV-05-05

*Amhar, Fahmi

Accuracy potential of point measurements in MOMS-images using a rigorous model and a rational function

TP IV-05-06

*Kresse, Wolfgang; Alamus, Ramon; Langner, Michael

Physiographic region interpretation: formalisation with Rule-Based Structures and Object Hierarchies

TP IV-05-07

*Argialas, Demetre; Miliareisis, George

Dynamic revision of spatio-temporal database with simulated features

TP IV-05-08

*Sekimoto, Yoshihide; Shibasaki, Ryosuke

Use of Airborne GPS Data for Highway Mapping

TP IV-05-09

*Appleton, James; Hussain, Mushtaq; Munjy, Riadh

An Alternative to Updating Topographic Maps Using SPOT Images

TP IV-05-10

*Freitas, Maria Isabel

Comparison of the results obtained from aerial photographs and SPOT stereo images in the production of 1:50,000 scale topographical maps

TP IV-05-11

*Ozbalmumcu, Mahmut

Topographic digital data collection and revision by photogrammetric methods for mapping and GIS

TP IV-05-12

*Nekhin, S.; Zotov, G.

Geo-plotter - a softcopy mapping system for low-cost digital mapping process

TP IV-05-13

*Sakamoto, M.; Uchida, O.; Doihara, T.; Oda, K.; Lu, Wei; Obata, Masayoshi

Global/continental land cover mapping and monitoring

TP IV-05-14

*Tateishi, R.; Wen, C.G.; Park, J.G.

A pilot project in Bulgaria supported by the PHARE programme of the European union

TP IV-05-15

*Katzarsky, I.

The estimate of topographical variables for soil erosion modelling through geoprocessing

TP IV-05-16

*Morisson Valeriano, Márcio; Garcia, Gilberto José

Satellite Hydrographic Monitoring Along the Russian Arctic Coast

TP IV-05-17

*Sharov, Aleksey; Raggam, Hannes; Schardt, Mathias

Computer technology in Determination of AREA of Submerged Territory according to digital elevation model

TP IV-05-18

*Burshtynska, Kh.; Tumska, O.; Lelukh, D.

Analysis of human-induced soil degradation because of urbanisation in China, by LUCC, using DMSP/OLS

TP IV-05-19

*Goto, Shintaro; Jiang, Qigang

Mathematical rectification of aerial photographs for cadastral mapping in Bolivia

TP IV-05-20

*Jamarillo, I.

Boundary Management Database based on Hypermedia

TP IV-05-21

*Wang, Guizhi

Database Generalisation: Concepts, Multi-Scale Database, Modelling

TP IV-05-22

*Peng, Wanning

The application of software SPRING (INPE) in mapping of touristic sites - case study of the municipality of São Sebastião, north shore of São Paulo state, Brazil

TP IV-05-23

*Freitas Pereira, Adriana

A Study on Simulation of IKONOS-I Satellite Imagery and Its Potential in Topographic Mapping

TP IV-05-24

*Li, Rongxing; Zhou, G.; Yang, S.; Tuell, G.; Schmidt, N.J.; Fowler, C.

Japanese spaceborne three-line-sensor and its mapping capability

TP IV-05-25

*Osawa, Yuji; Hamazaki, Takashi

A Proposal on Data Renewal Method for Car Navigation Systems

TP IV-05-26

*Sakamoto, A.; Ohsawa, Y.; Akai, S.

Flood Analysis using Satellite data and Geomorphological Survey Map showing Classification of Flood-inundated Areas

TP IV-05-27

*Yasuharu, Yamada

TP V-03

Session: Architectural & archeological photogrammetry & visualisation

Room: Room A

Date: 21st July

Time: 13:30 - 16:00

Chair: Patias, Petros, Greece

"As built" surveys of roadside features for GIS, visualisation and virtual reality

TP V-03-01

*Jeyapalan, K.; Bhagawati, D.

The definition of reference surfaces for architectural photogrammetry

TP V-03-02

*Theodoropoulou, I.

The photogrammetric contribution to archaeological documentation of prehistory

TP V-03-03

*Hanke, Klaus

3D Documentation for Archaeology during Finnish Jabal Haroun Project

TP V-03-04

*Koistinen, Katri

The potential of applying 3-D visualisation methods for representing destroyed settlements

TP V-03-05

*Georgopoulos, Andreas; Nakos, Byron

Fusion of Aerial Images and Magnetic Prospection

TP V-03-06

*Stephani, Manfred; Becker, Helmut; Brand, Rüdiger; Fassbinder, Jorg

Analysis of Korean megalithic Buddha using photogrammetric and laser scanning system

TP V-03-07

*Yeu, Bock-Mo; Kim, Gi-Hong; Sohn, Duk-Jae; Wondae, Kim

Erosion evaluation of the bas-reliefs of the S.Michele Basilica in Pavia.

TP V-03-08

*Spalla, Anna; Valetto, R.; Casella, V.

The cartographic projections for the representation of double curved surfaces

TP V-03-09

*Miniutti, Davide; Guerra, Francesco

Historic Photoplanes

TP V-03-10

*Pilot, Luca; Guerra, Francesco

Photogrammetric documentation of the historical castle of Heidelberg and results of deformation measurements (1997-1999)

TP V-03-11

Nutto, Michael; *Ringle, Konrad

VRML as a tool for Web-based, 3D, Photo-Realistic GIS

TP V-03-12

*Cöltekin, Arzu; Haggren, Henrik

Reconstruction of the Stadion Area of Ancient Messene using 3D Computer Graphics and Analysis of its Townscape

TP V-03-13

*Ito, Juko; Tokmakidis, Kostas; Inada, Kosuke

New methodologies for architectural photogrammetric surveys

TP V-03-14

*Boccardo, Piero; Comoglio, Giuliano

Detailed 3D representation of archaeological sites

TP V-03-15

Ioannidis, Charalambos; *Potsiou, Chryssy; Soile, Sofia; Badekas, John

3D-Display Techniques for Cartographic Purposes: Semi-otic Aspects

TP V-03-16

*Buchroithner, Manfred; Schenkel, R.; Kirschen-bauer, S.

Application of a new Model Helicopter System in Architectural Photogrammetry

TP V-03-17

*Zischinsky, Thomas; Dorffner, Lionel; Rottensteiner, Franz

Spatial sketch system for car styling design

TP V-03-18

*Yoshida, S.; Miyazaki, S.; Hoshino, T.; Ozeki, T.; Hasegawa, J.; Yasuda, T.; Yokoi, S.

Non-metric cameras in architectural photogrammetry

TP V-03-19

Malian, A.; *Zolfaghari, M.

Using Hough transform in line extraction

TP V-03-20

*Stylianidis, Efstratios; Patias, Petros

Publishing 3D geologic data and models on the World Wide Web using VRML

TP V-03-21

*Sides, Edmund

Towards automatic reconstruction of Visually Realistic Models of buildings

TP V-03-22

*Varshosaz, Masood; Dowman, Ian; Chapman, David

Photogrammetry using 3D graphics and projective textures

TP V-03-23

*Spann, J.; Kaufman, K.

Weighted geometric object constraints integrated in a line-photogrammetric bundle adjustment.

TP V-03-24

*Hrabacek, Jan; van den Heuvel, Frank A.

3D Measurement system using glancing angles of Line-laser beam for archeological artifacts

TP V-03-25

*Yokoyama, Hiroshi; Chikatsu, Hirofumi

Digital correlation experiences applied to close range photogrammetry

TP V-03-26

*Sanchez Dalotto, Roque; Loch, Carlos; Bähr, Hans-Peter

Warping methods of producing a development of historical frescos

TP V-03-27

*Jachimski, J.; Mierzwa, W.

TP VII-06

Session: Sustainable resource management - general 1

Room: Room O

Date: 21st July

Time: 13:30 - 16:00

Chair: Rao, D.P., India

Forest vegetation/land use change detection and impact assessment in part of Western Himalaya

TP VII-06-01

*Pant, D.N.; Groten, S.M.T.; Roy, P.S.

Indian scenario in the application of geographical information system and geo-informatics

TP VII-06-02

*Narayanan, L.R.A.

The use of remote sensing for environmental impact assessment and determination of the area affected by refugees in Ngara District, North Western Tanzania

TP VII-06-03

*Ndyeshumba, P.

Multi-temporal remotely-sensed data cartography for sustainable natural resource management practices: Gedaref region, East Central Sudan

TP VII-06-04

*Saeed Mosmar Alawad, Saeed

Remote Sensing in Regional Natural Resources Monitoring and Mapping: Challenges and Solutions in Chicago Wilderness Conservation

TP VII-06-05

*Wang, Yeqiao; Moskovits, Debra

National land cover Database of The Netherlands

TP VII-06-06

*Thunnissen, Herman; de Wit, Allard

Automatic building extraction from aerial images

TP VII-06-07

*Widmer, Thomas; Faig, Wolfgang

Characterisation of the Dynamic Response of the Vegetation Cover in South America by Wavelet Multiresolution Analysis of NDVI Time Series

TP VII-06-08

*Leguizamon, Saturnino

Comparative analysis of landscape fragmentation in Rondônia, Brazilian Amazon

TP VII-06-09

*Batistella, Mateus; Brondizio, Eduardo S.; Moran, Emilio F.

PCA used to discriminate phenological variations in Cerrado physiognomy in São Paulo - Brazil

TP VII-06-10

*Bitencourt, Marisa

Influence of topoclimatic variables derived from digital terrain models over the vegetation regeneration processes in burned areas

TP VII-06-11

*Porres de la Haza, M.J.; Pardo Pascual, J.E.

Towards environmental sustainability in Nigeria as economic development: a spatial information technology approach

TP VII-06-12

*Akinyemi, F.O.; Ogunkoya, Olayinka

Studying and monitoring the Greenland ice sheet using GIS techniques

TP VII-06-13

*Kim, Changjoo; Csatho, Beata; Thomas, Robert; van der Veen, C.J.

Design of a Multinational GIS-Based Information Management System for Environmental Decision-Making in the Mekong Region

TP VII-06-14

*Crain, Ian

Analysis of landuse change effects upon river discharge - application of a hydrological watershed model with integration of remote sensing and GIS-techniques

TP VII-06-15

*Jürgens, Carsten

Land use in the surroundings of nature reserves and multi-source geographic information

TP VII-06-16

*Kallio, Minna

TP VII-09

Session: Image interpretation and analysis 1

Room: Room N

Date: 21st July

Time: 13:30 - 16:00

Chair: Friedlaender, Hans, Germany

Mapping of tea gardens from satellite images - a fuzzy knowledge-based image interpretation system

TP VII-09-01

*Ghosh, J. K.; Godbole, P. N.; Ghosh, S. K.

The impact of data compression and neighbourhood information on the classification accuracy of artificial neural networks

TP VII-09-02

*Barsi, A.

Minnaert topographic normalisation of Landsat TM imagery in rugged forest areas

TP VII-09-03

*Vincini, Massimo; Reeder, David

Image Classification by Spatial Shift Invariant Neural Network

TP VII-09-04

*Kamiya, Izumi

Applications of Fractal Analytical Techniques in the Estimation of Operational Scale

TP VII-09-05

*Emerson, Charles; Quattrochi, Dale A.

Sliding Window for Relations Mapping

TP VII-09-06

*Klimesova, D.

The Effects on Image Classification Using Image Compression Technique

TP VII-09-07

*Lam, Wai-Keung; Lau, Wai-Leung; Li, Zhi-Lin

Comparison of Digital Stand Surface Models of HRSC-A (High Resolution Stereo Camera - Airborne) and LASER Scanner for Forest Stand Characteristics

TP VII-09-08

*Hese, Sören; Lehmann, Frank

Knowledge-based Interpretation of Moorland in Aerial Images

TP VII-09-09

*Pakzad, Kian; Heipke, Christian

The Influences of Image Classification by Fusion of Spatially-Oriented Images

TP VII-09-10

*Lau, Waileung; King, Bruce A.; Li, Zhilin

A Study on Image Restoration for Airborne Cameras

TP VII-09-11

*Homma, Kohzo; Yamamoto, Hiromichi; Iwata, Yoshitaka

Maximum likelihood method modified in estimating a prior occurrence probability and in improving misclassification errors

TP VII-09-12

*Susaki, Junichi; Shibasaki, R.

Automated Correction and Updating of Roads from Aerial Ortho-Images

TP VII-09-13

*Auclair Fortier, M.-F.; Ziou, D.; Armenakis, C.; Wang, S.

Determination of optimal ground reflectance sampling strategies for calibrating airborne multispectral data

TP VII-09-20

*Salvatori, Valeria

Anisotropy information from on track stereo datasets - investigation on the thematic evaluation of a second physical parameter of the backscatter complex

TP VII-09-21

*Schneider, Thomas; Manakos, Ioannis

Rectification of remotely-sensed images with artificial neural network

TP VII-09-14

*Sunar, F.; Özkan, C.

Comparison of a back propagation and a self-organising map: neural networks in classification of TM images

TP VII-09-15

*Marcic, I.; Ribaric, S.

Discrimination ability of neural network and maximum likelihood classifier

TP VII-09-16

*Liu, X.; Skidmore, A.K.; van Oosten, H.

Development of an algorithm of absolute atmospheric correction for multitemporal satellite images. Application to the region of Oran (West of Algeria)

TP VII-09-17

*Smahi, Z.; Benhanifia, K.; Bensaid, A.

Segmentation and classification of Landsat - TM images to monitor the soil use

TP VII-09-18

*Oliveira, Hermes; Bello, Olga Regina Pereira; de Geus, Klaus

Tracing of smoke plumes generated by Kuwaiti's oil wells fire, using model-based image analysis

TP VII-09-19

*Noroozi, A.

Special Session: 70th Birthday of Gottfried Konecny

Session: 70th Birthday of Gottfried Konecny
Room: Room L
Date: 21st July
Time: 14:30 - 16:00
Chair: Heipke, Christian, Germany

- Christian Heipke, Institute of Photogrammetry and Engineering Surveys, University of Hanover. Half a century of photogrammetric development - with examples from Gottfried Konecny's professional career.
- Kennert Torlegard, Department of Geodesy and Photogrammetry, Royal Institute of Technology, Stockholm.
- Remote sensing in the 21st century - issues and opportunities.
- John L. van Genderen, Division of Applied Geo-morphology, ITC, Enschede.
- Technical transfer for sustainable development in developing countries.
- Shunji Murai, Institute of Industrial Science, The University of Tokyo.

IC-13b

Session: Object recognition and image understanding
Room: Room B
Date: 21st July
Time: 16:00 - 17:30
Chair: Carsten, Steger, Germany

A step towards semantic-based building reconstruction using Markov-random-fields

IC-13b-01

*Brunn, Ansgar

Feature-Based Model Verification (FBMV): a new concept for hypothesis validation in building reconstruction

IC-13b-02

*Ameri, Babak

Automatic Completion and Evaluation of Road Networks

IC-13b-03

*Wiedemann, Christian; Ebner, Heinrich

BRDF measurements of urban surface materials at the ego facility using a laser source

IC-13b-04

*Rothkirch, A.; Meister, G.; Spitzer, H.; Bienlein, J.

Wavelet-based Image Matching for Different Sensor

IC-13b-05

*Chen, Ying

IC-15b

Session: DTM generation and ortho-images II
Room: Room A
Date: 21st July
Time: 16:00 - 17:30
Chair: Remillard, M.

On the performance of digital airborne pushbroom cameras for photogrammetric data processing - a case study

IC-15b-01

*Haala, Norbert; Fritsch, Dieter; Stallmann, Dirk; Cramer, Michael; Cramer, Micheal

GPS Surveys, DEMs and Scanned Aerial Photographs for GIS Database Construction and Thematic Mapping of Great Smoky Mountains National Park

IC-15b-02

*Welch, Roy; Jordan, Thomas; Madden, Marguerite

Surface modelling for Alpine Glacier Monitoring by Airborne Laser Scanning and Digital Photogrammetry

IC-15b-03

*Favey, Etienne; Pateraki, Maria; Baltsavias, Emmanuel P.; Bauder, Andreas; Bosch, Hermann

Comparative Study of Surface Matching Algorithms

IC-15b-04

*Krupnik, Amnon; Schenk, T.; Postolov, Y.

DEM Generation from Laser Scanner Data using Adaptive TIN Models

IC-15b-05

*Axelsson, Peter

IC-22

Session: Global RS and GIS and the Kyoto protocol
Room: Room L
Date: 21st July
Time: 16:00 - 17:30
Chair: Imhoff, Mark, United States
Co-Chair: Tateishi, Ryutaro, Japan

Remote Sensing and the Kyoto Protocol: A workshop summary

IC-22-01

Rosenqvist, A.; *Imhoff, Mark; Milne, A.; Dobson, C.

Relation between fossil fuel trace gas emissions and satellite observations of nocturnal lighting

IC-22-02

*Elvidge, C.D.; Imhoff, Mark; Sutton, P.C.

Climate change: evaluation of ecological restoration of Delhi ridge using remote sensing and GIS technologies

IC-22-03

*Mohan, Madan

Shoreline changes and evolution of the coastal zone in Southern Karnataka, India - an analysis based on multi-temporal data

IC-22-04

*Gangadhara Bhat, H.; Subrahmanya, K.R.

Modelling snow melt process in Alpine Areas

IC-22-05

*Jansa, Josef; Kraus, Karl; Bloschl, Gunter; Kirnbauer, Robert; Kuschnig, Gerhard

TC VII-08

Session: Environmental resource management and geo-technical applications
 Room: Room C/D
 Date: 21st July
 Time: 16:00 - 17:30
 Chair: Woldai, Tsehaie, The Netherlands

Studying a medium size city growth in Brazil and its consequences using geotechnologies

TC VII-08-01

*da Costa, Sandra; Pinheiro Junior, Osman José

Integrated datasets, GIS and 3-D system analysis for environmental impact assessment in a large alpine valley north of Trento (Italy).

TC VII-08-02

*Alkema, D.; Geneletti, D.; Cavallin, A.; van Asch, Th.; Fabbrì, A.; Zanchi, A.; de Amicis, M.; Bonomi, T.; de Francesch, F.; Moltre, A.; Tomasi, L.

Hydrological models for the assessment of impact of road construction on water-driven geomorphological processes

TC VII-08-03

*Bertens, Jurjen; Tamés, Patxi; Cendrero, Antonio; van Asch, Theo

A predictive model for base metal exploration in a GIS environment

TC VII-08-04

*Porwal, Alok; Sides, Edmund

Monitoring of oil and gas pipelines by integrated GIS

TC VII-08-05

*Kirsanov, Alexander

IC-23a

Session: Sustainable resource management
 Room: Room B
 Date: 22nd July
 Time: 09:00 - 10:30
 Chair: Rao, Dasika P., India

Land planning for sustainable development in watersheds using Geographical Information System

IC-23a-01

*Moraes, Jener Fernando; Donzeli, P.L.; Lombardi Neto, F.; Melo, A.R.; do Prado, H.

Radar and TM data: tools for desertification monitoring in Calchaquies Valleys (Argentina)

IC-23a-02

*Navone, S.M.; Palacin, E.; Maggi, A.; Rienzi, E.

Inventory of Alpine-Relevant Parameters for an Alpine Monitoring System Using Remote Sensing Data

IC-23a-03

*Schmitt, Ursula; Catalini, Manuela; Schardt, Mathias; Waser, Lars; Zini, Enrico

Satellite Remote Sensing and GIS Technologies to aid Sustainable Management of Indian Irrigation Systems

IC-23a-04

*Chintapalli, S. Murthy; P, Venkat Raju; K, Abdul Hakeem; Jonna, Saindranath

GIS-based study on the regionalisation of China's grain production system

IC-23a-05

*Anrong, D.; Shouyong, Y.; Yalan, L.

TC III-04a

Session: Automatic road extraction
 Room: Forum room
 Date: 22nd July
 Time: 09:00 - 10:30
 Chair: Hahib, Ayman, United States

Road extraction in urban areas supported by context objects

TC III-04a-01

*Hinz, S.; Baumgartner, A.

Knowledge-based system for the automatic extraction of road intersections from aerial images

TC III-04a-02

*Boichis, Nicolas; Viglino, Jean-Marc; Cocquerez, Jean-Pierre

Automatic road extraction through light propagation simulation

TC III-04a-03

*Guigues, Laurent

Semi-automated linear feature extraction using a knowledge-rich object data model

TC III-04a-04

Priestnall, Gary; *Wallace, Steve

Extraction of road information using multisensor data

TC III-04a-05

*Hazarika, M.K.; Honda, K.; Samarakoon, L.; Murai, S.

TC V-10

Session: World cultural heritage and information systems

Room: Room L
 Date: 22nd July
 Time: 09:00 - 10:30
 Chair: Patias, Petros, Greece

Development of hybrid video theodolite and application for 3D Modelling of Panoramic Objects

TC V-10-01

*Chikatsu, H.; Anai, T.

Signals in the sand: 3-D recording and visualisation of the Nasca geoglyphs

TC V-10-02

*Grün, A.; Bär, S.; Beutner, S.

Modelling historic sites and monuments in 3D heritage information systems by combining aerial and architectural photogrammetry

TC V-10-03

*Nour el Din, M.; Grussenmeyer, P.; Koehl, M.

Development of image-based information system for restoration of cultural heritage

TC V-10-04

*Hongo, K.; Matsuoka, R.; Fujiwara, S.; Masuda, K.; Aoki, S.

Photogrammetric investigation into the suitability of desktop image measurement software for architectural recording

TC V-10-05

*Mills, J.P.; Peirson, G.C.; Newton, I.; Bryan, P.G.

OEEPE

Session: OEEPE session

Room: Room A

Date: 22nd July

Time: 09:00 - 10:30

*Introduction to OEEPE new strategies and activities

OEEPE-01

Andersen, O.

Automation in digital photogrammetric productions

OEEPE-02

*Kölbl, Otto

The results of the workshop on NMAs and the Internet

OEEPE-03

*Murray, Keith

Laser scanning vs. automatic DEM generation: comparison of potential and limitations based on the results of OEEPE projects

OEEPE-04

*Petzold, B.; Axelsson, P.; Fritsch, D.

TC III-04b

Session: Automatic building extraction

Room: Forum room

Date: 22nd July

Time: 11:00 - 12:30

Chair: Stefanidis, Anthony

Segmentation of laser altimeter data for building reconstruction: different procedures and comparison

TC III-04b-01

*Geibel, R.; Stilla, U.

Building extraction and reconstruction from lidar data

TC III-04b-02

*Wang, Z.; Schenk, T.

Use of Bayesian Networks as Judgement Calculus in a Knowledge-Based Image Interpretation System

TC III-04b-03

*Grove, Stefan; Schröder, Torsten; Liedtke, C.-E.

3D modelling of buildings using laser scanning and spectral information

TC III-04b-04

*Vögtle, Thomas; Steinle, Eberhard

Towards Fully Automatic Generation of Textured City Models

TC III-04b-05

*Brenner, Claus

TC V-12

Session: Image sequence analysis

Room: Room B

Date: 22nd July

Time: 11:00 - 12:30

Chair: Maas, Hans-Gerd, The Netherlands

Robust Object Tracking for Robot Manipulation and Navigation

TC V-12-01

*Zillich, Michael; Legenstein, Dietmar; Ayromlou, Minu; Vincze, Marcus

Creation of temporal images from sequences of remotely-sensed images

TC V-12-03

*McCloy, K.R.

A new technique for vehicle tracking on the assumption of stratospheric platforms

TC V-12-04

*Fuse, T.; Shimizu, E.

Geo-spatial grasping of pavement with mobile mapping

TC V-12-05

*Takagi, H.; Nakane, T.

TC VII-07

Session: Radar processing for renewable resource monitoring

Room: Room A

Date: 22nd July

Time: 11:00 - 12:30

Chair: Lichtenegger, Jurg, Italy

Monitoring of rice-planted areas using space-borne SAR data

TC VII-07-01

*Suga, Y.; Takeuchi, S.; Oguro, Y.; Konishi, T.

Biomass estimation of forest and savanna transition vegetation zone by JERS-1 and SIR-C backscatter data

TC VII-07-02

*dos Santos, João Roberto; Keil, Manfred; Araujo, Luciana Spinelli; Pardi Lacruz, María Silvia; Krämer, Julia Charlotte Mari; Kandler, Otto

Monitoring of the water availability condition in tropical seasonal forest

TC VII-07-04

*Sawada, Haruo

Forest and woodland biomass and classification using airborne and spaceborne radar data

TC VII-07-05

*Milne, A.K.; Lucas, R.M.; Cronin, N.; Dong, Y.; Witte, C.

SS-01

Session: Unispace III Revisited

Room: Room L

Date: 22nd July

Time: 11:00 - 12:30

Moderator: Trinder, John, Australia

The policy of Non-discriminatory data access: a brief overview of its development from 1972 to 2000

SS-01-01

*Vonderdunk, F.G.

Models for satellite data pricing policy

SS-01-02

*Harris, Ray

Improving the use of earth observing satellites for hazards support

SS-01-03

*Lauritson, L.

Privately funded remote sensing systems

SS-01-04

*Cople, John

The need for, and provision of, training for developing countries

SS-01-05

*Othman, Mazlan

TP III-04

Session: Image orientation and laser altimetry

Room: Room A

Date: 22nd July

Time: 13:30 - 16:00

Chair: Krupnik, Amnon, Israel

Comparison of semi-automatic and automatic digital aerial triangulation

TP III-04-01

*Kaczynski, R.; Ziobro, J.

Application of laserscan to flood mapping of an urban stream

TP III-04-02

*Cavazzini, A.; Gentili, G.; Giusti, E.

Three-dimensional city modelling from laser scanner data by extracting building polygons using region segmentation method

TP III-04-03

*Masaharu, Hiroshi; Hasegawa, Hiroyuki

The use of anisotropic height texture measures for the segmentation of airborne laser scanner data

TP III-04-04

*Oude Elberink, Sander; Maas, Hans-Gerd

Initial testing of a Method to Geographically register Airborne Scanner Imagery through Parametric Modelling with Image-to-Image Matching

TP III-04-05

Pope, Paul; Scarpace, Frank; *Cage, James D.

Robustly Registering A Network of Range Images of Urban Objects

TP III-04-06

*Zhao, Huijing; Shibasaki, R.

Hough transform for interior orientation in digital photogrammetry

TP III-04-07

*Park, Byung-Uk; Sohn, Hong-Gyoo; Yun, Kong-Hyun; Yu, Kiyun; Jeong, Soo

Combining LIDAR and Photogrammetry for Urban and Rural Landscape Studies

TP III-04-08

*Asal, Fahmy; Priestnall, Gary; Asal, Fahmy

Control surface in aerial triangulation

TP III-04-09

*Jaw, Jen-Jer

Critical comparison between digital map and laser scanning

TP III-04-10

*Caprioli, Mauro

Results of the OEEPE WG on Laser Data Acquisition

TP III-04-11

*Petzold, Bettina; Axelsson, Peter

Comparison of the projective block adjustment method with the bundle method

TP III-04-12

*Niini, Ilkka

Geometric Correction of Airborne Whiskbroom Scanner Imagery Using Hybrid Auxiliary Data

TP III-04-13

*Breuer, Michael; Albertz, Jorg

Ground Control Points acquisition using SPOT image - The operational comparison

TP III-04-14

Kim, Kam-Lae; *Lee, Ho-Nam; Ho-woun, Lee

Orientation of High-Resolution Satellite Images Based on Affine Projection

TP III-04-15

*Hattori, Susumu; Ono, Tetsu; Fraser, Clive; Hasegawa, Hiroyuki

Automatic Building Extraction from Airborne Laser Scanning Data

TP III-04-16

*Morgan, Michel; Tempfli, Klaus

Automatic Image Orientation using GIS Data

TP III-04-17

*Shan, Jeffrey

Model-Based Autonomous Interior Orientation

TP III-04-18

*Seedahmed, Gamal; Schenk, Toni

Comparison of Digital Elevation Data from Airborne Laser and Interferometric SAR Systems

TP III-04-19

*Sties, Manfred; Krueger, Susanne; Mercer, J. Bryan; Schnick, S.

Digital Mapping Using High Resolution Satellite Imagery Based on 2D Affine Projection Model

TP III-04-21

*Ono, Tetsu; Hattori, Susumu; Hasegawa, Hiroyuki; Akamatsu, Shinichi

TP IV-06

Session: Data quality and uncertainty

Room: Room B

Date: 22nd July

Time: 13:30 - 16:00

Chair: Tempfli, Klaus, The Netherlands

Investigation into error distribution of aerial triangulation applying surface deformation theory

TP IV-06-01

*Ruzgiené, B.; Vainauskas, V.

Geostatistical analysis by vector space methods

TP IV-06-02

*Olaleye, J.B.; Sangodina, J.O.

Accuracy assessment of DTM data: a cost-effective approach for a large-scale digital mapping project

TP IV-06-03

*Acharya, Bishwa; Fagerman, Jeffrey; Wright, Clarence

Data Integration and accuracy issues in digital topographic databases

TP IV-06-04

*Rachapudi, Siva Kumar

Usability of large scale topographic data for urban planning and engineering applications: examples of housing studies and DEM generation in Tanzania

TP IV-06-05

*Sliuzas, Richard; Brussel, M

Relationship between Spatial Resolution and terrain feature in DEM accuracy

TP IV-06-06

*Takagi, Masataka

Quality Assessment and Validation of Digital Surface Models derived from the Shuttle Radar Topography Mission (SRTM)

TP IV-06-07

*Koch, Andreas; Lohmann, Peter

On the use of the geostatistical estimation techniques to the generation, de-bugging and analysis of digital surface models

TP IV-06-08

*Delgado, Jorge; Cardenal, Javier; Gómez, Alfonso

A system to control the spatial quality of analogue and digital aerial images

TP IV-06-09

*Ahokas, E.; Kuitinen, R.; Jaakkola, J.

Automatic Checking of feature and attribute consistency of a spatial database

TP IV-06-10

*Tastan, Hayati; Altan, M. Orhan

Quality Management of a Geoinformation Utility: The Users' Perspective

TP IV-06-11

*Quiambao, Rowena

Assessment of Data Acquisition Error for Linear Features

TP IV-06-12

*Tsoulos, Lysandros; Skopeliti, Andriani

DEM accuracy and the base to height (B/H) ratio of stereo images

TP IV-06-13

*Hasegawa, Hiroyuki; Matsuo, Kaoru; Koarai, Mamoru; Watanabe, Nobuyuki; Masaharu, Hiroshi; Fukushima, Yoshikazu

Monitoring Marble Extraction in open-cast quarries

TP IV-06-14

*Forlani, Gianfranco; Pinto, Livio

Automated calibration of a zoom lens CCD imaging system for vidogrammetry

TP IV-06-15

*Chen, D.; Huang, Y.D.

Geostatistics in ILWIS

TP IV-06-16

*Hendrikse, Jan

Fuzzy logic analysis for modelling of natural resource processes

TP IV-06-17

*Beek, M.A.

TP V-04

Session: Site modelling and cultural heritage recording

Room: Room C/D

Date: 22nd July

Time: 13:30 - 16:00

Chair: El-Hakim, Sabry, Canada

Determination of Islamic art accuracy using digital close range photogrammetry

TP V-04-01

*Ebrahim, M. A.-B.

Conception of an integrated 3D-GIS for primary data acquisition and data management; applied to an inventory of historic monuments

TP V-04-02

*Kölbl, O.; Cherradi, F.; Hostettler, H.

Use of radio-controlled model helicopters in archaeology surveying and in building construction industry.

TP V-04-03

*Theodoridou, S.; Tokmakidis, K.; Scarlatos, D.

Precision Measurement of Cultural Assets Using Digital Photogrammetry

TP V-04-04

*Oh, Won-Jin; Yeon-Soung, B.; Seung-Ho, S.

Close-Range Photogrammetric Technique For Documentation of NAQSH I RUSTAM

TP V-04-05

*Homainejad, Amir Saeed

The integration of conventional and automatic photogrammetric methods with the building survey in historic building research

TP V-04-06

*Weferling, Ulrich

Analytical and quantitative methods for analysis of the geometrical content of Historical Cartography

TP V-04-07

*Balletti, Caterina

Recording of Historical Monuments for Mono-differential Restitution

TP V-04-08

*Silva, Simone; Dalmolin, Quintino

A stone-by-stone photogrammetric survey using architectural knowledge formalised on the ARPENTEUR photogrammetric workstation

TP V-04-09

*Drap, Pierre; Gaillard, Gilles; Grussenmeyer, Pierre; Hartmann-Virnich, Andreas

2W: new technologies for the geo-referenced visualisation of historic cartography

TP V-04-10

*Guerra, Francesco

Topographic survey of the control points for a photogrammetric record

TP V-04-11

*Soria Medina, Alex; dos Anjos Gomes, S.J.; da Silva, Simone

The Spatial Analysis and Acquisition of precision digital data due to Cultural Properties

TP V-04-12

*Kang, Joon-Mook; Bae, Sang-Ho; Lee, Sung-Soon

3D Modelling and photogrammetry - supported GIS in archaeology

TP V-04-13

*Neto, Francelina

Information systems for preservation of the cultural heritage

TP V-04-14

*Villa, Benedetto; Bartolotta, Michelangelo; Lo Brutto, Mauro; Misuraca, Paola; Di Naro, Sabrina

Reconstruction of Historical Buildings Based on Images from the Meydenbauer Archives

TP V-04-15

*Wiedemann, Albert; Hemmleb, Matthias; Albertz, Jorg

Digital orthophoto as a tool for the restoration of monuments

TP V-04-16

*Bitelli, Gabriele; Baratin, Laura; Unguendoli, Marco; Zanutta, Antonio

Terrestrial photogrammetry applied to architectural restoration and archaeological surveys

TP V-04-17

*Jauregui, L.M.; Jauregui, M.

A case study on landslide with the 3D laser mirror scanner

TP V-04-18

*Ono, N.; Tonoko, N.; Sato, K.

Close Range Photogrammetry, Virtual Reality and their integration in Archaeology

TP V-04-19

*Vittuari, Luca; Bitelli, Gabriele; Tini, Maria Alessandra

Fast and accurate documentation of archeological sites using in-the-field photogrammetric techniques

TP V-04-20

*Charalampos, Georgiadis; Patias, Petros; Tsioukas, Vasilios; Sechidis, Lazaros; Stylianidis, Efstratios

Hagia Sophia - Photogrammetric Record of a World Cultural Heritage

TP V-04-21

*Dorffner, Lionel; Kraus, Karl; Tschannerl, Josef; Altan, Orhan; Kular, Sitki; Toz, Gonul

Visualisation of photogrammetric documentation for architecture of cultural heritage

TP V-04-22

*Kosmatin, Frasn; Janezic, M.

"ARCA" Project collecting data to know and preserve works of art: the sanctuary S. Damiano in Assisi

TP V-09-23

*Grimaldi, Pietro

TP-VII-07

Session: Sustainable resource management - general 2

Room: Room M

Date: 22nd July

Time: 13:30 - 16:00

Chair: Rao, D.P., India

The Contribution of GIS and Remote Sensing to Urban Land Use Negotiation in Developing Countries

TP VII-07-02

*Karanja, Faith; Lohmann, Peter

Pilot Project on a land use/land cover database in the Arezzo Province (Tuscany, Italy)

TP VII-07-03

*Napolitano, Pierpaolo; Carbonetti, Giancarlo; Zini, Enrico; Bocci, Michele; Miozzo, Marcello; Petri, Paolo

Land use and its dynamic studies with Landsat images in the watersheds of the Xilin River, China

TP VII-07-04

*Wang, Pengxin; Gong, Jianya; Chen, Xiaoling; Li, Feipeng

Monitoring Urban Dynamics for Bratislava in 1949-1997

TP VII-07-05

*Patikova, Alice; Kemper, Gerhard

Combining Geographical Information System and multicriteria evaluation to deal with land use problem

TP VII-07-06

*Daoud Brikci, Hichem

Investigation of the distribution of vegetation in Turkey by using remote sensing data and GIS

TP VII-07-07

*Seker, Dursun Zafer; Musaoglu, Nebiye; Kaya, Sinasi

Change Detection for Urban Spatial Databases Using Remote Sensing and GIS

TP VII-07-08

*Darvishzadeh Varchehi, Roshanak

GIS and remote sensing techniques applied for land use suitability study

TP VII-07-09

*Ippoliti, Gabriela; Mortara, Magaly O.; Rezende, Ana C.; Simoes, Mauricio S.; Valerio Filho, Mario

Environmental characterisation and land use development in the Ribeirao Vermelho watershed in Lavras (MG) Brazil

TP VII-07-10

*Resende, R.J.T.P.; Alves, H.M.R.; Andrade, H.; Rebelatto, A.; Esteves, D.R.

The utilisation of the Geographic Information System in the environmental problems evaluation of Itajuba City

TP VII-07-11

*Grilo, Roseana; Foresti, Celina; de Freitas Viadana, Maria Isabel C.

A spatial economic and environmental computer predictive model of land use change in Thailand using a statistical three classification approach

TP VII-07-12

*Folkner, John

Integration of remote sensing and GIS in land use planning for sustainable natural resources management within the Mount Cameroon region - West Africa

TP VII-07-13

*Naburo, N.P.

Remote sensing and Geographic Information System, an aid to selecting habitable site in Central Himalayan region, India

TP VII-07-14

*Sharma, S.K.

Temporal Mapping and Spatial Analysis of Land Transformation Due to Urbanisation and Its Impact on Surface Water System: A Case from Dhaka Metropolitan Area, Bangladesh

TP VII-07-15

*Islam Khan, Nasreen

Land cover mapping and multi-criteria modelling for explaining the spatial and temporal distribution of a papyrus swamp at Lake Naivasha Wetland, Kenya

TP VII-07-16

*Bemigisha, J.

Study of the vegetal covering and land use dynamics in the region of Ji-Paraná/ro using classification techniques

TP VII-07-17

*Andrade, Nilo Sergio de Olive; Araujo, Luciana Spinelli; Numata, Izaya; Filho, Mario Valerio

Integrated analysis of changes in rice cropping systems in the Mekong River Delta, Vietnam, using remote sensing, GIS and hydraulic modelling

TP VII-07-18

*Kam, S.P.; Tuong, T.P.; Hoanh, C.T.; Minh, V.Q.; Ngoc, N.V.; Liew, S.C.; Chen, P.

Spatial decision-support system to evaluate possible areas for the disposal of urban solid wastes in Porto Alegre metropolitan region (Brazil)

TP VII-07-19

*Bragança, Francisco; Loch, Carlos

TP VII-10

Session: Image interpretation and analysis 2

Room: Room N

Date: 22nd July

Time: 13:30 - 16:00

Chair: Drees, M., Germany

Potential of automatic classification in alpine areas for supporting the update of CORINE landcover

TP VII-10-01

*Steinnocher, K.; Aubrecht, P.; Schmitt, U.

The use of remote sensing in determination of the impermeable soil growth in the Belem river basin area

TP VII-10-02

*Schmidlin, D.; Fendrich, R.

Integration of satellite imagery and GIS for land-use classification purposes

TP VII-10-03

*Silva Centeno, Jorge

Land Cover Category Definition by Image Invariants for Automated Classification

TP VII-10-04

*Nguyen Dinh, Duong

Estimating landscape pattern from supervised and unsupervised classification: studies in the Western Ghats, India

TP VII-10-05

*Nagendra, Harini

Land use map production by fusion of multispectral classifications of Landsat images and texture analysis of high resolution images

TP VII-10-06

*Arbiol, Roman; Otazu, Xavier

Recognition of Ambiguous Shape Structures in Satellite Ocean Observation Images

TP VII-10-07

*Yamamoto, Hiromichi; Homma, Kohzo

Photogrammetry applied in land use control in city-country combinative area

TP VII-10-08

*Wang, Shuliang; Wang, Xinzhou

Evaluation of medium-resolution satellite images for land use monitoring using spectral mixture analysis

TP VII-10-09

*Kressler, Florian; Mucher, C.A.; Steinnocher, Klaus T.; Thunnissen, H.A.M.

Urban Land Use Classes with Fuzzy Membership and Classification based on Integration of Remote Sensing and GIS

TP VII-10-10

*Zhan, Qingming; Molenaar, Martien; Gorte, Ben

Estimation of Tree Species Proportions of Forest Stands Using Laser Scanning

TP VII-10-11

*Törmä, Markus

Comparative analysis of LANDSAT-5 and LANDSAT-7 data for land cover classification, qualitative evaluation of image fusion products and investigation of thermal characteristics of industrial discharge sources

TP VII-10-12

Patrono, A.; *Munro, D.

Combining remote sensing data sources and terrestrial sample-based inventory data for use in forest management inventories

TP VII-10-13

*Dees, Matthias; Duvenhorst, Jan; Gross, Claus Peter; Koch, Barbara

Land use classification at meso-scale using remotely sensed data

TP VII-10-14

*Bouzidi, Sonia; Lahoche, Fabien; Herlin, Isabelle; Hochschild, Volker; Staudenrausch, Helmut; Bouzidi, S.

The Classifications used by the Merged Image Data from SPOT and LANDSAT

TP VII-10-15

*Kang, In-joon; Choi, Hyun; Chang, Yong Ku; Lee, Jong-Chul

The Composition of the Output Layer Architecture in a Neural Network for Remote Sensing Image Classification

TP VII-10-16

*Zhu, G.; Blumberg, D.

Wavelet-based Analysis of Hyperspectral Data for Detecting Spectral Features

TP VII-10-17

*Hsu, Pai-Hui; Tseng, Yi-Hsing

TP VII-04

Session: Non-renewable resources

Room: Room O

Date: 22nd July

Time: 13:30 - 16:00

Chair: Woldai, Tsehaie, The Netherlands

Hyperspectral MIVIS scanner data integrated into a GIS for an industrial area

TP VII-04-02

*Cavazzini, A.; Miccadei, E.; Silvestri, F.; Ferrarini, A.; Zaccarelli, N.

Surface rising model of Caspian Sea

TP VII-04-04

*Tarikhi, Parviz

Image classification from Landsat TM, Airborne Magnetics and DEM data for mapping Paleoproterozoic bedrock units, Baffin Island, Nunavut, Canada

TP VII-04-05

*Schetselaar, Ernst; de Kemp, Eric

Seismic prone linears of a part of Tamil Nadu, India and its impact on environment - an analysis through remote sensing

TP VII-04-06

*Balaji S; Ramasamy, S.M.

Determination Of Geomorphological Characteristics Around The Isiklar Mountain Using Remote Sensed Data And DEM.

TP VII-04-07

*Kaya, Sinasi

Design and implementation of a GIS-based report management tool for the "Zona Volcànica de la Garrotxa" Natural Park (Catalonia, Spain)

TP VII-04-08

*Marcer, Arnald; Pons, Xavier; Vicens, Jaume

Mathematical model for frontogenesis in turbulent flow through porous media

TP VII-04-09

Rudraiah, N.; Ranganna, G.; *Vinay, C.V.

A generic concept to assist the EIA of ski-runs using an integrated dataset, GIS and 3D-analysis, applied in Sölden (Austrian Alps)

TP VII-04-10

*Pfeffer, Karin; Ghinoi, Alessandro; van Asch, Theo W.J.; Bauer, Berthold

Computer assisted methods for the assessment of impacts on geomorphological resources; application to a case study in Northern Spain

TP VII-04-11

*Cendrero, Antonio; González-Díez, Alberto; Bruschi, Viola; de la Pedraja, Almudena; Rivas, Victoria; Remondo, Juan

Integrated GIS data and 3D analysis for EIA in the Castel-franco Emilia area (Modena Province, Italy)

TP VII-04-12

*Marchetti, Mauro; Barbieri, Massimo; Bertens, Jurjen; Castaldini, Doriano; Giusti, Cecilia; Gonzalez Diez, Alberto

Merging Landsat TM images and airborne photographs for monitoring of open-cast mine area

TP VII-04-13

*Mularz, S.; Drzewiecki, W.; Pirowski, T.

Regional geo-chemical exploration for gold and base metals in Hazara division N.W.F.P., Pakistan

TP VII-04-14

*Khan, N.

DGPS and GIS used as tools for the analysis and modelling of beach ridges on the Brazilian South coast

TP VII-04-15

*Quadros, Clécio José Lopes de; Noernberg, Mauricio Almeida; Lautert, Luiz Fernando de Car

Monitoring of Coal Mining Subsidence by HRSC-A Data

TP VII-04-16

*Spreckels, Volker

Design and simulation of soil saving dams in mountainous areas using GIS with digital elevation map

TP VII-04-18

*Shikada, Masaaki; Yamashita, Junko

The interpretation of ERS-1 and ERS-2 InSAR data for mining subsidence monitoring in upper Silesian Coal Basin, Poland

TP VII-04-19

*Perski, Z.

Structure controlled iron ore deposits of Kanjamalai, Salem, India, using IRS-1C data

TP VII-04-20

*Rajendran, S.; Chandrasekaran, V.A.

Integrated analysis of remote sensing, aeromagnetic, geological and mineral occurrence data for the assessment of a subduction setting along the Zagros Orogenic Belt of Iran

TP VII-04-21

Asadi, H.H.; *Erren, H.; Westerhof, A.B.

Using 2D GIS to assist 3D modelling of the Zarshuran gold deposit, Iran

TP VII-04-22

*Asadi, Hooshang; Sides, Edmund; Ngonzi, Kiiza

Effect of polluted rainfall related to burning Kuwaiti oil wells on vegetation in south of Iran

TP VII-04-23

*Fatehi, A.; Jalali, N.

Lineaments on Landsat images - detection, mapping and tectonic significance in North-western depressions of Syria

TP VII-04-24

*Dalati, M.

Soil engineering interpretation for road allocation in Sokoto State, Nigeria

TP VII-04-25

*Ohamobi, S.I.; Ofoegbu, C.O.

High resolution vs. low resolution images, a planner's viewpoint

TP VII-04-26

*Mahavir, Mr

GPS and GIS-based data collection and image mapping in the Antarctic peninsula

TP VII-04-27

*de Sanchez, Richard

Satellite image mapping at the 1:250,000, 1:100,000 and 1:25,000 scales in the South Ross Sea region

TP VII-04-28

*Thomas, Jean-Claude

IC-04

Session: Sensor callibration

Room: Room B

Date: 22nd July

Time: 16:00 - 17:30

Chair: Schröder, Manfred, Germany

Radiometric intercalibration of MOMS and SPOT by vicarious method

IC-04-01

*Schröder, M.; Müller, R.; Reinartz, P.; Dinguirard, M.; Poutier, L.; Briottet, X.

Enhancement of the radiometric image quality of photogrammetric scanners

IC-04-02

*Neumann, Klaus J.; Baltsavias, E.

Calibration of the LH Systems ADS40 airborne digital sensor

IC-04-03

*Schuster, Reinhard; Braunecker, Bernhard

Geometric Calibration of the MICAS CCD Sensor on the Deep Space One Mission: Laboratory vs. Inflight Data Analysis

IC-04-04

*Oberst, Juergen; Brinkmann, B.; Giese, B.

Evaluation of the "Salar de Uyuni/Bolivia" as radiometric calibration test site for satellite sensors

IC-04-05

*Ponzoni, Flávio Jorge; Lamparelli, Rubens; Pellegrino, Giampaolo Q.; Zullo Junior, Jurandir

IC-08b

Session: CEOS WGISS

Room: Room L

Date: 22nd July

Time: 16:00 - 17:30

Chair: Cudlip, Wyn, United Kingdom

A Scene Similarity Metric for Matching Configurations of Image Objects

IC-08b-01

*Agouris, Peggy; Bertolotto, Michella; Carswell, James; Stefanidis, Anthony

Organising and Managing of Distributed Geographical Information

IC-08b-02

*Gong, Jianya

Factors that influence local area access and processing of satellite remote sensing data

IC-08b-03

*Moll, Bob; Downey, Ian; van Leeuwen, Hans; Stephenson, John; Stephenson, Richard

The CCRS quicklook swath browser

IC-08b-04

*Adair, Michael

The visual factory suite: facing evolving mass production in spatial data processing environments

IC-08b-05

*Navarro, J.

IC-23b

Session: Sustainable resource management

Room: Room C/D

Date: 22nd July

Time: 16:00 - 17:30

Chair: Rao, Dasika P., India

National level spatial modelling of agricultural productivity: study of Indian agro-ecosystem

IC-23b-01

*Priya, Satya

Precision agriculture and remote sensing: variance analysis of wheat crop by spectral indices

IC-23b-02

*Beeri, Ofer; Peled, A.; Kitain, S.

A GIS-Based Integrated Land Use/Cover Change Model to Study Human-Land Interactions

IC-23b-03

*Rajan, K S; Shibasaki, Ryosuke

Integrated Geoinformation Model for Environmental Planning in Rio de Janeiro, RJ, Brazil.

IC-23b-04

*Oliveira, Ronaldo Pereira de; Lumbreras, Jose Francisco; da S. Pedroza, Guilherme

Evaluation of the conversion from forest to pasture using remote sensing for soil fertility analysis

IC-23b-05

*Numata, Izaya; Soares, J.V.; Batista, G.T.; Roberts, D.A.; Chadwick, O.A.

TC VII-05

Session: New developments in automated image interpretation and analysis

Room: Room A

Date: 22nd July

Time: 16:00 - 17:30

Chair: Drees, M., Germany

Tropical forest change assessment: the use of aggregates, a semantic approach.

TC VII-05-01

*van Schaijk-Obbink, Marion; Molenaar, Martien; de Gier, Alfred

Utilising satellite imagery and digital detection of clear cuttings for timber supply management

TC VII-05-02

*Haapanen, Reija; Pekkarinen, Anssi

A combined model-based remote sensing approach for estimating forest characteristics

TC VII-05-03

*Varjo, Jari; Gemmell, F.; Strandstrom, M.

Classifier for Remotely-Sensed Imagery Using Kohonen's Self-Organising Feature Map with Region Growing

TC VII-05-04

*Tomiya, Mitsuyoshi

High-resolution environmental monitoring of wooded mountainous regions supported by airborne laser scanning

TC VII-05-05

Csaplovics, E.; *Wagenknecht, St.

IC-08a

Session: Integrated Global Observing System and other integrated systems

Room: Room A

Date: 23rd July

Time: 08:30 - 10:00

Chair: Dowman, Ian, United Kingdom

Master scheme for planning, designing and implementing a GIS for drinking water network in Quito- Ecuador (South America)

IC-08a-02

*Flores, Eduardo

Three-Dimensional digital photogrammetric update of the Israeli National-GIS database

IC-08a-03

*Raizman, Yuri; Peled, A.

A Digital National Framework for Topographic Data in Great Britain

IC-08a-04

*Holland, David; Murray, Keith

Digital Photogrammetry, Developments at Ordnance Survey

IC-08a-05

*Allan, Lynne; Holland, David

IC-12a

Session: Feature extraction
 Room: Forum room
 Date: 23rd July
 Time: 08:30 - 10:00
 Chair: Baumgartner, Albert, Germany

Subpixel - Precise Extraction of Lines and Edges

IC-12a-01

*Steger, Carsten

A quantitative measure for the similarity between features extracted from aerial images and road objects in GIS

IC-12a-02

*Abramovich, Tal; Krupnik, Amnon

Automated Road Vectorisation with Self-Organising Maps

IC-12a-03

*Doucette, Peter; Agouris, Peggy; Musavi, Mohammad; Stefanidis, Anthony

A new segment shape parameter for grid data and its application to land use segmentation

IC-12a-04

*Günzl, Manfred H.; Hellwich, Olaf

ATOMI - Automated reconstruction of Topographic Objects from aerial images using vectorised Map Information

IC-12a-05

*Eidenbenz, Christoph; Kaeser, Christoph; Baltsavias, Emmanuel

TC V-11

Session: Performance of close range imaging systems
 Room: Room L
 Date: 23rd July
 Time: 08:30 - 10:00
 Chair: Beyer, Horst, Switzerland

The control of a robot end-effector using photogrammetry

TC V-11-01

*Clarke, Tim; Wang, X.

Design and calibration of a four-headed camera system for use in microgravity research

TC V-11-02

*Willneff, Jochen; Maas, Hans-Gerd

Microtopography - The Photogrammetric Determination of Friction Surfaces

TC V-11-03

*Hemmler, Matthias; Albertz, Jörg

Measurements Of Granite Joint Surfaces Using area-based matching and a surface model

TC V-11-04

*Mustaffar, Mushairry; Mohd Amin, Mohd For; Teo, King Beng

Recommendation for an acceptance and verification test of optical 3D measurement systems

TC V-11-05

*Luhmann, Thomas; Wendt, Klaus

TC I-01

Session: Space systems for disaster management
 Room: Room B
 Date: 23rd July
 Time: 08:30 - 10:00
 Chair: Jayaraman, V., India

Extraction of Damaged Regions Using SAR Data and Neural Networks

TC I-01-01

*Ito, Yosuke; Hosokawa, M.; Lee, H.; Liu, J.G.

Geometric correction of ADEOS-II/GLI

TC I-01-02

*Hashimoto, Toshiaki

SAR and Landsat TM Image Fusion for Land Cover Classification in the Brazilian Atlantic Forest Domain

TC I-01-03

*Dupas, Claudio

A digital multi-CCD camera system for near real-time mapping

TC I-01-04

*Savopol, Florin

Construction of Internet geographical information system for clearing of offshore and onshore oil spills

TC I-01-05

*Utsunomiya, Y.; Yoshie, H.; Shimamura, H.; Tsuchiya, T.

IC-12b

Session: Feature extraction
 Room: Forum room
 Date: 23rd July
 Time: 10:30 - 12:00
 Chair: Mayer, Helmut, Germany

Multi-scale road extraction using local and global grouping criteria

IC-12b-01

*Baumgartner, Albert; Hinz, Stefan

Semi-automated Feature Extraction using Simulated Annealing

IC-12b-02

*Trinder, John

Straight edge extraction from multiple views for reconstruction of man-made objects

IC-12b-03

*Bibitchev, Andrew

Topological and Geometrical Reasoning in 3D Grouping for Reconstructing Polyhedral Surfaces

IC-12b-04

*Heuel, Stephan; Förstner, Wolfgang; Lang, Felicitas

Knowledge-based image analysis for 3D edge extraction and road reconstruction

IC-12b-05

*Zhang, Chunsun; Baltsavias, Emmanuel

IC-24b

Session: Risk assessment
Room: Room A
Date: 23rd July
Time: 10:30 - 12:00
Chair: Singhroy, Vernon, Canada

A Distributed Flood Vulnerability & Risk Maps Service

IC-24b-01

*Vizzari, Sergio

Satellite monitoring of forest of the Chernobyl disaster influence area for ecological and fire risk assessment

IC-24b-02

*Lyalko, V.I.; Hodorovsky, A.Ya.; Sakhatsky, A.I.; Azimov, A.T.; Sportjuk, Z.M.; Sibirtseva, O.N.

Remote Sensing for Natural Disaster Management

IC-24b-03

*van Westen, C. J.; Woldai, T.

Flood risk zoning of Ghana: Accra experience

IC-24b-04

*Nyarko, B.K.

Modelling of terrestrial erosion and change of soil features under soil erosion on the hilly relief of Lithuania

IC-24b-05

*Jankauskas, B.

TC V-08

Session: Site recording and modelling
Room: Room B
Date: 23rd July
Time: 10:30 - 12:00
Chair: El-Hakim, Sabry, Canada

Semi-automated approaches to site recording and modelling

TC V-08-01

*Grün, A.

Short-baseline active triangulation for CAD reconstruction of room-sized industrial environments

TC V-08-02

*Chapman, David; El-Hakim, Sabry

Circular image block measurements

TC V-08-03

*Heikkinen, Jussi

Low-cost documentation of Brazilian historical towns: integrating photogrammetry with virtual reality and web-based approaches

TC V-08-04

*Renuncio, Luiz Ernesto; Bähr, Hans-Peter

Construction of stereo vision system for 3D objects modelling

TC V-08-05

*Kakiuchi, T.; Chikatsu, H.

SS-04

Session: Education and the profession. Expected new developments

Room: Room L

Date: 23rd July

Time: 10:30 - 12:00

Moderator: Rüter, Heinz, South Africa

Distance Learning

SS-04-01

*Cho, Kohei; Hoehle, Joachim

Geo-information education in developing countries: example Indonesia and Brazil

SS-04-02

*Sausen, Tania Maria; Lukman-Aziz, Teuku

Environmental Geology Education in Developing Countries: Relevant?

SS-04-03

*Woldai, Tsehaie

A discussion on co-operative works on distance learning

SS-04-04

*Knoop, Hans

Technical Commission I: Sensors, Platforms and Imagery

George Joseph, Commission-I President, (India)

Secretaries:

Shri A.K.S. Gopalan, India

Shri V. Jayaraman, India

1. Introduction

Technical Commission – I deals with sensors, platforms and imagery, with the following terms of reference.

Terms of Reference

- Planning for aerial and space missions
- Design, construction, testing, installation and calibration of analogue and digital imaging sensors
- Design and performance of data reception and pre-processing systems
- Geometric and radiometric properties of image data and quality standards, and factors (environmental and others) affecting data quality
- Technical systems for recording sensor data, film scanners and auxiliary data (time, position, attitude, etc.) and media (film, magnetic, optical, etc.)
- Pre-processing techniques to generate data suitable for analysis and measurements (radar image synthesis, multisensor integration, radiometric and geometric corrections, etc.)

The activities of Technical Commission – I are carried out through five Working Groups as given below:

- WG-1 - Sensor parameter standardisation and calibration
Chair: Dr Manfred Schröder, Germany
Co-Chair: Dr Alan Belward, Italy
- WG-2 - Pre-processing, Archival and Dissemination of Image data
Chair: Dr Dan Rosenholm, Sweden
Co-Chair: Dr Jolyon Thurgood, USA
- WG-3 - Sensors and Platforms for Topographic Survey
Chair: Dr Karsten Jacobsen, Germany
Co-Chair: Dr T. Natarajan, India
- WG-4 - Microwave and optical sensors for geospheric-biospheric studies
Chair: Dr Jean Louis Fellous, France
Co-Chair: Dr John Miller, Canada
- WG-5 - Advanced Platforms and Sensors
Chair: Mr Takashi Moriyama, Japan
Co-Chair: Mr K. Thyagarajan, India

2. Symposium, Workshops, Meetings, Congress

2.1 Symposium

The ISPRS TC-I organised the International Symposium on 'Earth Observation System for Sustainable Development' from February 25th-27th, 1998 at Hotel Atria, Bangalore, India.

The technical programme was organised in eleven sessions, including the theme session 'Earth Observation

System for Sustainable Development'. The other sessions covered various aspects related to sensors, platforms, preprocessing, etc. There was also a special session on CEOS. 46 technical presentations were made in these sessions. The papers were from Canada (2), Germany (18), India (19), Italy (2), Japan (2), Korea (1), The Netherlands (1), Switzerland (3) and USA (5).

173 participants from 29 countries participated in the deliberations. The delegates were mainly from space departments (98), industry (25) and academia (50).

Proceedings containing forty technical papers was also published at the time of the symposium. The proceedings are priced at 30 Pounds Sterlings and are available at the RICS Books (RICS Books, Surveyor Court, Westwood Way, Coventry, CV4 8JE, United Kingdom).

Commercial presentations were made by Radarsat International, Canada on the Radarsat Mission, operations and programme and Intergraph, ISA on Data handling and information, dissemination for sustainable development.

A technical exhibition was also organised along with the symposium. Seven exhibitors from USA, Canada and India participated.

Two pre-symposium tutorials, on 'Pre-processing of Image data' and 'Electro-optical Sensors for Remote Sensing', were organised on February 23rd-24th, 1998 at ISRO Headquarters, Bangalore, India. The faculty was drawn from India, Germany and Japan. The tutorials were attended by 49 participants from 21st countries.

2.2 Workshops

The workshop "Sensors and Mapping from Space" was organised jointly with the working groups I/1 "Sensor Parameter Standardisation and Calibration of Space Sensors", I/3 "Sensors and Platforms for Topographic Survey" and I/4 "Mapping Using High Resolution Satellite Imagery", from September 29th up to October 2nd, 1997 at the University of Hannover, 36 papers were presented and published as number 17 of the "Publications of the Institute for Photogrammetry and Engineering Surveys of the University of Hannover". 85 participants from 30 different countries took part. The workshop covered not only the area mapping from space, including the used and coming sensors, but also the new airborne sensors like laser scanning, 3-line sensors and also the sensor orientation by IMU and GPS. The major outcome was that new systems are available and space systems with very high resolution should be available soon, which could open up new avenues in mapping.

The workshop 'From Producer to User' was jointly organised by WGs I/2 "Pre-processing Archival and Dissemina-

tion of Image Data” and II/3 “Spatial Data Handling Technologies” from Oct. 7th-9th, 1997 at Boulder, Colorado, USA. The workshop discussed aspects such as Future requirements on data archival and preprocessing technology, Preprocessing algorithms, Future role of preprocessing and archival organisations, Requirements on data dissemination – products, media, delivery, speed, archive maintenance, The needs of the data users – expressed by themselves, etc. There was also a panel discussion on user requirements.

The workshop “Sensors and Mapping from Space 1999”, held jointly with WGs I/1, I/3 and IV/4, from September 27th up to 30th 1999, again at the University of Hannover, was visited by 69 participants from 19 countries. The 54 presented papers are published in the “Publication of the Institute for Photogrammetry and Engineering Surveys of the University of Hannover” on CD as number 18. The topics covered were the same as during the first workshop. New results with the new sensors were presented, the first commercial digital airborne camera was announced and the new area of the INSAR was included. The major recommendation of the workshop was the use of a larger variety of space- and airborne sensors. With their new possibilities, new fields of applications have been opened up.

2.3 Meetings

A special session on ISPRS Technical Commission-I was organised at the Annual Convention of the Indian Society of Remote Sensing at the University of Pune on December 4th, 1996, Pune, India. Five papers were presented.

The TC-1 President participated in the Cal-Val Working Group meeting on 24th Feb. 2000 and presented the paper ‘EO Sensor specifications – issues of standardisation and understanding’.

A Workshop on ‘In-orbit geometric characterisation of optical imaging systems’, held in Bordeaux, France from November 2nd-5th, 1999, was jointly organised by CNES, IGN, SFTP in co-operation with ISPRS. 49 participants attended. Proceedings are available at CNES - Délégation à la Communication, 18, avenue, Edouard Belin, F-31401 Toulouse, Cedex 4, France.

The WG-5 regular domestic meeting was held in June and Sept. 1998 in Tokyo, with Seven WG-I members. The meeting was focused on the current status and technical trends in the POS/DG (Positioning and Orientation System for Direct Georeferencing). The group have been investigating small satellites for earth observation. The advanced sensor, such as the “smart sensor”, is being investigated.

The report entitled ‘Survey of Small Earth Observation Satellites’ was published and distributed to the ISPRS COM-I members. Additional surveys have been done by WG I/5 members by attending related international / domestic conferences and symposia.

Under WG I/IV review, studies were carried out on ‘Data needs for the geosphere-biosphere programme and satellite sensors for the required observation’ and on ‘An overview of spaceborne SAR systems, their techniques and technologies’.

2.4 Congress

The Commission was actively involved in the planning of Congress-related activities. Theme sessions under TC-1 are as follows:

- (I) Perspective of platforms and sensors for Geoinformation needs
- (II) Space systems for disaster management.

Apart from this, TC-1 members are conveners for the following Inter-Technical Commission Theme sessions:

- (a) Advances in synthetic aperture radar development
- (b) Recent development in SAR applications
- (c) High Resolution satellites
- (d) Sensor calibration
- (e) Data standards

Input has also been provided for the following Inter-Technical Commission:

- (I) Sensor orientation
- (II) DTM generation and ortho-images
- (III) Interoperability of GIS
- (IV) Sustainable resource management

3. Trends in Science and Technology

There is a paradigm shift in earth observation systems the world over. From massive multi sensor satellites, the trend is towards having many small spacecrafts, which have a faster response to mission needs to fly in formation and gather concurrent data from different sensors on a ‘virtual platform’. Another shift in the earth observation scenario is the increasing role of commercial operators in the space sector. The authorisation to own and operate satellites giving 1 meter resolution has stimulated a number of companies to develop high resolution earth observation systems. Dedicated sensors with fixed fore and aft imaging capability for DEM generation (ALOS, Japan, Cartosat, India) and interferometric SAR along with airborne Laser altimetry have given a new dimension to Cartographic mapping. Spectrometric observation has gained in importance, with a number of systems being planned for the same. The platform capabilities and preprocessing techniques have to be improved to meet the demands posed by the improved sensor quality and observation techniques.

The first successful high resolution imaging system is IKONOS-2, launched in Sept. 1999, providing 1 meter resolution in panchromatic and 4 meter in multispectral. A number of similar systems are planned in the near future. A medium resolution (~ 10 meter in VNIR and 20 meter in SWIR) system is being planned by Boeing, GDE, called Resource-21. Resource-21 will be a constellation of four satellites providing a temporal resolution of twice weekly for nadir viewing. In addition to these commercial ventures, the Governments of USA (Landsat), France (SPOT), India (IRS) and Russia have their own programme of earth observation systems giving improved continuity to the existing data, as well as new observational capability. Similarly, in the microwave area, the Canadian Government’s RADARSAT and ESA’s ERS have made Radar images available for many applications.

The major aerial camera manufacturers have announced digital aerial cameras with an information content similar to the existing large size aerial film cameras. This will speed up the photogrammetric workflow by saving the time for film scanning, which is not negligible.

Laser scanning has become a standard tool for photogrammetry with, new possibilities in forest and coastal areas and also cities. The problem of the removing of objects not belonging to the bare soil has been solved partially but still has to be improved, as also the correct matching of neighbouring flight strips.

Interferometric Synthetic Aperture RADAR –systems (INSAR) can determine the Digital Elevation Model (DEM) of large areas in a short time. Depending upon the wavelength used, usually only the visible surface will be determined, which means that the effect of the vegetation and buildings has to be removed. With the Shuttle RADAR Topographic Mission (SRTM) from the Space Shuttle, a large part of the land area has been imaged by INSAR. Based on this, in a few years a homogeneous DEM will be available, though the absolute height accuracy is only about 16 meters.

Platform technology has been improving so as to make spacecraft with lower weight and less power. Another important development is to make the platform agile enough to point at any point of interest. Flight navigation by GPS has become a standard for satellite position determination. The ending of GPS Selective Availability has improved the accuracy, without relative positioning.

Aerial cameras are being supported by relative kinematic GPS-positioning and also Inertial Measurement Units (IMU), allowing a direct sensor orientation. Direct sensor orientation has come into practical use. An accuracy of 20cm on the ground can be reached.

With a number of earth observation cameras having similar characteristics operating from different platforms, it will be necessary to integrate the data from different sensors for proper interpretation. Time series will be essential for certain applications, such as NDVI changes for proper understanding of the natural phenomenon happening, extraction of yield etc. This calls for a reliable radiometric calibration programme before launch and in orbit. Similarly, complex high resolution systems with along-track stereo capability, will place high demands on geometric calibration. This means that

- (a) Procedures for radiometric and geometric calibration (both laboratory and inflight) of digital camera systems should be investigated with the objective of deriving recommendations for standards.
- (b) Large area test sites with highly accurate ground truth should be established and maintained world wide to ensure reliable verification of geometric lab-derived calibration parameters of different digital camera systems.
- (c) For vicarious calibration, ground test fields with known spectral reflectance should be established world-wide.

- (d) Field campaigns for radiometric intercalibration of data of different satellites should be conducted.

In the context of the increasing relevance of, and dependence upon, fusion of data from various sensors, it is necessary to identify a set of sensor parameters, which, if standardised globally, would ensure maximal retrieval of information. In order to make inter-comparison more meaningful it is also necessary to formulate standard procedures for measurement of these parameters.

In summary, the past few years have witnessed a number of innovations in the field of sensors and platforms which could make the remotely-sensed imagery useful for several new tasks. With a large number of sensors it is necessary to investigate independently from the manufacturers information performance parameters. This calls for a uniform code for specifying sensor parameters and evaluation methodology. This should be one of the major tasks of the next commission.

4. Resolutions

Standardisation of Sensor Parameters

Resolution 1.1

The Congress

Noting

- that a number of earth observation sensors with similar capabilities are available and planned by various space agencies/manufactures that users will have to use data from more than one sensor for their specific applications

Recognising

- that such usage requires good understanding of the sensor parameters
- that there is no uniform way of specifying sensor parameters

Recommends

- the generation of a common set of parameters to be specified for each camera / sensor, in conjunction with manufacturers

Radiometric and Geometric Calibration

Resolution 1.2

The Congress

Noting

- that the number of high resolution, multispectral and hyperspectral imaging sensors in space is increasing
- that radiometric calibration of this data is essential for quantitative environmental and ecological research with multispectral image data
- that data from various sensors have to be used for long-term observations and for change detection
- various test fields exist or are planned for calibrations
- that the accuracy potential of high resolution digital camera systems in space is better than 10 m and thus appropriate for the production or updating of topographic (image) maps of scale 1:50,000 and larger
- that accurate and reliable geometric calibration parameters of those digital camera systems are a precondition to taking full advantage of their accuracy potential to produce high quality photogrammetric products, such as DEM, orthoimages, etc.

Recognising

- that natural test-sites were successfully used for calibration of certain sensors
- that high-precision models for radiation transfer through the atmosphere exist
- that the geometric laboratory calibrated parameters need to be confirmed or updated in orbit by inflight calibration methods using large area test sites with highly accurate ground truth
- that highly accurate geometric calibration of digital camera systems places high demands on the laboratory calibration equipment and that this task is costly and time-consuming
- that varying geometric calibration concepts for different digital camera systems exist, showing different accuracy characteristics

Recommends

- investigations of calibration and inter-calibration of all optical imaging space sensors
- that all existing and planned test-fields be identified and characterised
- that collaboration be established with other bodies studying ground test fields with known spectral reflectance characteristics, which can be used for calibration

Swath Sensors*Resolution 1.3**The Congress**Noting*

- that swath systems, e.g. SPOT Vegetation, IRS, WiFS, Sea WiFS, MODIS, etc, are now available with various spectral and spatial resolution
- that such systems' response is subject to bidirectional reflection factor, sun angle, etc. due to wide swath

Recognising

- that this data could be used to study long-term changes, especially in vegetative cover

Recommends

- studies to understand the effect of viewing geometry on the radiometric accuracy of the products.

Sensors for DTM Data Generation*Resolution 1.4**The Congress**Noting*

- that a number of optical systems specifically to generate DTM are planned for the future
- that interferometric SAR has proved its capability to generate DTM
- that Airborne laser systems are operational
- that substantial parts of the world still do not have topographic maps of desired scale and accuracy

Recognising

- the need that terrain height / slope is an important parameter for many applications of remote sensing data

Recommends

- detailed study on the accuracy and cost effectiveness of various techniques
- identification of standard sites for intercomparison and evaluation of different methods

Resolution 1.5: Work with CEOS*The Congress**Noting*

- that the Committee on Earth Observation Satellites (CEOS) has accorded Affiliate position to ISPRS;
- that coordination of EO missions and allied activities (like calibration / validation activities; application activities; EO information services activities; EO education and training activity etc.) are the major aims of CEOS and ISPRS and could mutually gain by working together.

Recognising:

- the need to strengthen international coordination of EO missions
- the need to bring together the government and private sector in various EO activities - space, ground and utilisation segments

Recommends

- ISPRS actively work with CEOS towards bringing cooperation and coordination of EO programme activities
- ISPRS work with CEOS to foster public/private collaboration in EO activities;
- ISPRS support and contribute to the EO education and training efforts worldwide and specifically focus on newer technology elements;
- support and focus on emergence of IGOS as a major international endeavour

1.6 Platform and Orientation Integration*The Congress**Noting*

- that the capability of the current earth observation system to provide high resolution images
- and the availability of modern technology such as differential GPS and high-precision attitude sensing and orientation systems.

Recognising

- the potential use of high-resolution data for field level application
- and the need for high-precision location accuracy of the data

Recommends

- smart integration of attitude and position information with data processing software algorithm
- standardisation of data format, referencing system and data archival and retrieval system.

Technical Commission II: Systems for Data Processing, Analysis and Representation

Ian Dowman, President

Ray Harris, Secretary

1. Introduction

With the current and planned increase in sensors acquiring data of the Earth, there is an urgent need to use this data in the most economical and productive way. This implies efficient systems for handling the large amounts of data collected and the accurate fusion of the different types of data to provide the maximum information. Commission II set itself the goal of promoting systems and techniques for carrying out this task and bringing together scientists and users from a range of disciplines to discuss and tackle the problems involved.

The Commission set two specific themes for its activities. The first of these is the development of involvement of industry in ISPRS with a view to having a forum to discuss ideas between researchers, users and the industrial sector, and to discuss issues such as transfer formats and standards. The second is the processing of SAR data in such a way as to remove the mystique of SAR and yet allow applications groups to use the data with some understanding of the principles and limitations involved. The theme of system integration is implicit in both of these themes.

The terms of reference of the Commission are:

- Design and development of integrated systems for measurement, processing, analysis, representation and storage of photogrammetric, remote sensing and GIS data.
- study and evaluation of system integration aspects for photogrammetric, remote sensing and GIS data processing.
- analysis of systems and their components for automated, semi-automated and manual digital processing systems.
- development of systems and technologies for radar data processing.
- study of real-time mapping technologies.
- standardisation of digital systems for photogrammetry, remote sensing and GIS.

Eight working groups were initially established to cover these terms of reference. Unfortunately because of changes in personal and employment circumstances, the officers of Working Group II/5 were forced to resign after the Commission symposium. Their efforts in supporting the commission up to that time are much appreciated. The working groups were as follows:

WG II/1	Real time mapping technologies
Chair	Dr Rongxing Li
Co-chair	Holger Schade
WG II/2	Software and modelling aspects for integrated GIS
Chair	Dr Manfred Ehlers
Co-chair	Mark Gahegan

WG II/3	Spatial data handling technologies
Chair	Henrik Osterlund
Co-chair	Dr Wyn Cudlip

WG II/4	Systems for processing SAR data
Chair	Dr Douglas Corr
Co-chair	David Stanley

WG II/5	Systems for integrated geoinformation production
Chair	Dr Charlotte Gurney
Co-chair	Dr Nick Veck

WG II/6	Integration of image understanding into cartographic systems
Chair	Dr David McKeown
Co chair	Olivier Jamet

WG II/7	Practical and implementation issues in digital mapping
Chair	John Thorpe
Co-chair	José Colomer

WG II/8	Digital systems for image analysis
Chair	Dr Christian Heipke
Co-chair	Dr Tapani Sarjakoski

An ad hoc working group on Rational Functions, under the chairmanship of Ian Dowman was set up by Council and has prepared a paper on rational functions for the congress. The working group will report to Council in the autumn.

2. Meetings

The ISPRS Commission II symposium was held at Robinson College, Cambridge University, UK, from 13th -17th July 1998. This symposium was organised by the Remote Sensing Society and The Photogrammetric Society of UK. Over two hundred delegates from twenty-five countries attended the symposium. There were forty-six oral presentations and sixteen poster presentations. Three panel discussions were held on special, topical issues. Eight exhibitors displayed their latest products during the symposium and some of them gave presentations. Two tutorials on SAR and data fusion were organised and a workshop on automated triangulation was held just before the main part of the symposium started. The social programme included punting on the River Cam and Shakespearean drama at an open-air theatre.

The working groups have been active besides their participation in the planning and attendance at the symposium. These activities are given in detail below. There has been considerable collaboration between Commission II working groups and other ISPRS working groups, as well as with other bodies, such as CEOS and the Open GIS Consortium. The following meetings were organised or co-organised by the working groups of Commission II:

Integrating Photogrammetric Techniques with Scene Analysis and Machine Vision III,
(SPIE Aerosense Symposium). WG II/6, WG II/8, 21st-23rd April, 1997 in Orlando, Florida, USA.

ISPRS Workshop Theoretical and Practical Aspects of Surface Reconstruction and 3-D Object Extraction.
WG II/8, WG III/2 and WG III/3, 9th-11th September 1997, Haifa, Israel.

ISPRS Workshop From Producer to User.
WG I/2, WG II/3 7th-9th October 1997, Boulder, Co, USA.

Workshop on Integrating SAR Data.
WG II/4, WG II/5. 28th April 1998, London, UK

Spatial Data Infrastructures
(SDI'98, 10th International Geomatics Conference). WG II/2. June 8th - 11th 1998, Ottawa, Ontario,

ISPRS Workshop on 3D Geospatial Data Production: Meeting Application Requirements.
WG II/6. 7th-9th April 1999, Paris, France

ISPRS Workshop on Mobile Mapping Technology
WG II/1 21st-23rd April 1999, Bangkok Thailand.

ISPRS Conference Automatic Extraction of GIS objects from digital imagery.
WGs II/6, II/8, III/1, III/2, III/3, III/4. 7th-10th September 1999, Munich, Germany.

ISPRS Open meeting on transfer standards.
WG II/7. 22nd September 1999, Stuttgart, Germany.

Second International Workshop on Dynamic and Multi-Dimensional GIS.
WGs IV/III/1, IV/III/2, II/2, IV/1, IV/3, VI/3.
4th-6th October 1999. Beijing, China.

3. Research Activities and Trends

Real Time Mapping Technologies (WG II/1)

In addition to GPS, INS and CCD cameras, integration of laser, SAR and hyper-spectral sensors is becoming advantageous in applications where not only real-time but also all-weather and high accuracy is essential. Research in multisensor and multiplatform-based sensor integration and data processing will be an important topic over the next few years. Its applications may be found in emergency management, environmental monitoring, and other fields.

Great efforts have been made in high-accuracy real-time navigation data using radio-link-based local DGPS correction techniques for a broad range of applications. These will greatly improve the real-time positional accuracy of sensor orientation. Supported by this development, and along with the progress in GPS/INS integration, real-time accurate sensor orientation will soon be a reality in some parts of the world.

Intelligent processing of mobile mapping data remains a research topic. Knowledge of camera orientation and pos-

sible object models in the object space can be very helpful for feature extraction, as well as for object recognition. Multiple image-based matching has found its application in mobile mapping processing. Bayesian networks have been actively researched and promise great potential for feature extraction. The application of invariance theory for sensor orientation and georeferencing in cases of weak navigation data has attracted attention. Object recognition and feature extraction will benefit from the availability of high quality orientation parameters and image sequential information. Algorithms for automatic data processing, such as model-based object recognition, multiple image-based matching and Hopfield and Bayesian networks have found applications in mobile mapping data processing.

Software and Modelling Aspects for Integrated GIS (WG II/2)

Two of the main focuses concerning three dimensional data in GIS are the data acquisition on one side and the management and modelling of 3D data on the other. Work has been going on to use airborne laser scanning for high resolution mapping. 3D data has also been created from moving vehicles. New concepts for integrating the data components to create detailed large scale realistic 3D models have been developed. Methods combine the generation of 2D building information with a data structure and with topological models to manage them in context with a digital surface model. Generally, performance still seems to be a problem but further technical developments in the field of digital acquisition techniques will have 3D GIS applications combined with acquisition techniques as one of the main future topics in the field.

Time stamps as the most basic way to store time parameters may be regarded as a database application more than as a specific GIS. The GIS way would be to apply GIS operators to objects, with time as an additional dimension or separate level. Yet there still seems to be sufficient demand for further studies regarding a consistent time management in GIS. At least, we have not seen any sort of satisfying implementation. There is an interest in using fuzzy techniques, algorithms and applications, and there is work on integration of fuzzy rules and neural networks in GIS modelling for land use classification with different layers and parameters. Visualisation standards, and also spatial analysis through the Internet, advance at high speed. These are topics which will be of considerable interest in the future.

Spatial Data Handling Technologies (WG II/3)

Rapid development in Web-based services using the Internet is continuing and distributed search and retrieval for distribution is a major issue. Many new tools, mostly based on Java, are being developed. New fully commercial end-to-end providers are entering the Earth observation market, providing very high resolution data at high processing levels via the Internet. They will meet the increasing demands of faster satellite data distribution. The lack of globally accepted standards and non-existing co-ordination in related fields leads to different metadata standards, protocols and incompatible services being developed and this continues to be a problem.

Systems for Processing SAR Data (WG II/4)

The key trend in SAR data processing is in the use of

datasets with increasing dimensionality. This trend began with the use of multi-temporal interferometric datasets from satellites ERS and RADARSAT. A further increase in dimensionality now exists through increasing research interests involving the use of multi-temporal, multi-polarimetric data derived from experimental platforms such as the E-SAR airborne system operated by DLR. This trend will enable data from future satellites, such as ALOS and RADARSAT 2, to be fully exploited.

Techniques supporting this high dimensionality are multi-temporal speckle reduction processes, coherence measurement and polarimetric signature techniques. An important example of speckle reduction is an annealing technique that produces an image segmentation with common region boundaries, as far as is possible. Coherence is a feature that measures the similarity of two complex SAR images. It is now fundamental to many applications, although these are constrained by the satellite repeat cycles available. Recently, coherence techniques have been extended for use with fully polarimetric radar data and spectacular results have been achieved that isolate returns from particular scattering mechanisms. It is likely that these multi-polarimetric techniques will produce an explosion of new applications in the next few years, in the same way that interferometric data has over the past decade.

Systems for Integrated Geoinformation Production (WG II/5)

A working group was set up to consider the design of processing systems for specific processes or applications which involve the use of multiple sensors and image processing techniques, for example for monitoring crop growth, and look at integration of techniques for correction and analysis, standards for systems and methods of design and of testing performance. It was specifically intended to involve commercial organisations who carry out this type of work for clients. The working group was unable to develop these aspects but there have been important developments in the global and regional aspects of integrated production through the projects of the Integrated Global Observing Strategy (IGOS) and a session at the Congress will focus on this type of project.

Integration of Image Understanding into Cartographic Systems (WG II/6)

In the research arena, work continues on the design and implementation of automated and semi-automated cartographic feature extraction (CFE) systems. These systems have reached a level of competence at which rigorous performance evaluation is required to truly understand their characteristics. A main thrust of this Working Group has been the definition and dissemination of meaningful evaluation standards for CFE systems.

Equipment manufacturers and data producers are looking seriously at automated systems, in terms of in-house development and for licensing technology. While current applications of CFE automation are fairly limited, the demand for such technology is high. We expect to see more examples of automated applications in production systems within the next four years.

At the workshop held in Paris, the major theme was to encourage participants from government, academe and industry to share requirements and research results in the area of performance evaluation of image understanding systems for geospatial data capture. Included in this theme were issues in predictive analysis of internal quality measures in automated processes and end-user quality metrics and post processing analysis of automated systems.

Practical and Implementation Issues in Digital Mapping (WG II/7)

WG II/7 has been concerned solely with practical and implementation issues in digital standard data transfer formats, especially image data transfer formats. A small committee met in Neubrandenburg (Germany) in December 1998 to produce a first draft of the Image Transfer Standard (ITS). This document proved to be very effective in attracting attention and influencing ISO and OGC.

From 1999 through to 2000 the WG has collaborated with the Open GIS Consortium (OGC), and the International Standardisation Organisation (ISO), mainly through Prof. Wolfgang Kresse. These activities may be summarised as follows:

- The proposal by ISPRS WG II/7 will form the two important components of the ISO/TC211 standard that has been under development since the first meeting of the Project Team (project 19124) in March 1999. The ISO/TC211 standard will be completed by the end of 2001. It is worth mentioning that this is thanks to the tireless activity of Prof. Wolfgang Kresse, who is an active member of ISO/TC211.
- The WG has established links with the proponents of the standard Coordinate Transformation Interface to the OGC.

WG II/7 has worked successfully to gain credibility and recognition in ISO and OGC and has succeeded in having ISPRS viewpoints accepted by both organisations. By participating in the development of these standards we may be confident that ISPRS ideas will be included and that the industry will adopt them as soon as they become public.

Digital Systems for Image Analysis (WG II/8)

A large number of Digital Photogrammetric Systems (DPS), including input and output devices with different degrees of functionality, user friendliness, and automation potential, are now commercially available. Vendors of DPS include traditional photogrammetric, but increasingly also remote sensing and GIS, companies. The traditional photogrammetric companies are concentrating their resources and merging, meaning that fewer systems will be available in future years. However, a major trend may be observed towards using Windows NT as an operating system.

Modules for automatic interior and relative orientation and for automatic aerial triangulation (AAT) are operational and are in daily use in practice. For AAT interactive editing is necessary, at least as a safeguard against distorted blocks. The direct acquisition of the image orientation by means of GPS and IMU is a serious alternative to aerial triangulation for a number of applications and begins to be used in practical work. Automatic DTM generation has been accepted in practice for some time, but interactive

verification and editing is here to stay, especially in difficult terrain and at large scales. Digital ortho-images are being produced routinely on a daily basis and are being integrated into geographic information systems (GIS). There is a need especially for large scale applications to use true ortho-images, i.e. to correct for effects from 3D topographic objects.

Semi-automatic extraction of GIS and CAD (computer aided design) data is still mostly restricted to research and development. Implemented algorithms combine computer vision approaches with rigorous photogrammetric modelling. Some results indicate that future systems will be equipped with more powerful tools. The human-computer interface is increasingly being seen as an important factor. In practice, GIS and CAD data are often still acquired from film imagery using analytical plotters. The term 'semi-automatic' is interpreted in at least two different ways: it is used to mean (1) post-editing of automatically generated results, and (2) a close interrelationship between human operator and computer in the actual data acquisition phase. Clarification of the term is needed.

Photogrammetric and remote sensing imagery play a significant role in spatial data base revision. As compared to map revision, there are many more attribute data to be acquired. The research arena is starting to develop integrated updating concepts, including various data sources and automation. The workflow in practice is still highly manual and GIS data capture often occurs from paper plots showing the actual GIS objects, even though digital imagery might be used for acquiring the object geometry. Relatively little attention is being paid to data compression and its effects on photogrammetric and remote sensing processing. It is estimated that this topic will receive more attention once digital cameras become available.

The major project of the WG was a multi-site test on the "Performance of tie point extraction in automatic aerial triangulation", carried out in co-operation with OEEPE. The final report of the test was published in December 1998 in the official OEEPE series No. 35, pp. 125-185. The WG also initiated and edited the theme issue 'Automatic Image Orientation' in the ISPRS Journal for Photogrammetry and Remote Sensing, Vol. 52 No. 3, June 1997.

Progress, Achievements and Trends

Commission II has made good progress towards its objectives and these culminate in the ISPRS Congress in Amsterdam. The main achievements of the 4 years can be summarised as:

- Progress towards establishing Image Transfer Standards through collaboration with OGC and ISO;
- Test on Performance of tie point extraction in automatic aerial triangulation, carried out in co-operation with OEEPE;
- Collaboration with CEOS in the areas of information systems and services, calibration and validation and IGOS;
- Promotion of technical advances in the areas of mobile mapping and integration of photogrammetric techniques with automatic processes, through workshops and other meetings;
- Promotion of knowledge of SAR through tutorials.

It is recommended that work in all areas of commission activity be continued and that collaboration with other organisations be intensified. In particular, there is a need for further study of techniques in GIS for efficient acquisition and revision of geospatial information and for an increase in knowledge of Digital Photogrammetric Workstations by making available training and information on the skills needed to select and use them.

Technical Commission III: Theory and Algorithms

Submitted by T. Schenk

1. Mandate of Commission III

The scientific agenda of a Commission is determined by the resolutions and the terms of reference. These resolutions have been translated into the following terms of reference:

- Algorithms for geometric determination and analysis of photogrammetric data
- Feature extraction from multi-sensor, multi-resolution, multi-temporal imagery
- Image understanding
- Integrated sensor orientation
- Image sequence analysis
- Algorithms for digital photogrammetric systems and their GIS integration
- GIS concepts, with particular emphasis on integration of image data
- Merging theories from remote sensing and computer vision to interpret multi-sensor, multi-spectral and multi-resolution imagery
- Quality control, verification and performance meas-

ures of algorithms

- Theory and algorithms for synthetic aperture radar

2. Organisation of Commission III

President:	Toni Schenk
Scientific Secretary:	Kim Boyer
Administrative Secretary:	Ayman Habib

The position of the scientific secretary was created in order to have a direct link with the computer vision community. Kim Boyer is Director of the Machine and Robot Vision Laboratory at The Ohio State University.

In order to effectively address the issues raised by the terms of reference, the following working groups were created:

WG III/1 Integrated Sensor Calibration and Orientation

Chair	Peggy Agouris
Co-chair	Ismael Colomina
Secretary	Anthony Stefanidis

Terms of Reference:

- Single- and multi-sensor system calibration;
- Automatic sensor orientation using GPS and INS information, and digital image processing techniques;
- Automatic aerial triangulation;
- Combination of sensor orientation and calibration algorithms with 3D scene reconstruction algorithms;
- Multi-sensor information integration, e.g. aerial and satellite imagery, radar data, multi-spectral imagery, in conjunction with WG III/2

WG III/2 Algorithms for Surface Reconstruction

Chair Amnon Krupnik
Co-chair Charles Toth
Secretary Maxim Fradkin

Terms of Reference:

- Algorithms for surface reconstruction from different cues, such as stereo, shading, shadows, texture, and spectral properties
- Integration of information from different sources, including aerial and satellite imagery, radar data, range data, multiple images and GIS data
- Automatic verification and quality control of reconstructed surfaces
- Interrelations between matching and interpolation
- Role of surface reconstruction in automatic scene analysis

WG III/3 Feature Extraction and Grouping

Chair Helmut Mayer
Co-chair Ram Nevatia
Secretary Albert Baumgartner

Terms of Reference:

- Segmentation of images into meaningful features, such as points, edges and regions
- Investigation of the impact of geometric and radiometric image formation on image segmentation
- Aggregation of features by iterated grouping methods
- Verification of global consistencies by optimisation techniques
- Investigation of the potential of performing grouping processes in 3D under special consideration of object space constraints, precision and reliability
- Evaluation of the performance of feature extraction and grouping algorithms in co-operation with similar efforts in computer vision

WG III/4 Image Understanding/Object Recognition

Chair Wolfgang Eckstein
Co-chair Eberhard Gülch
Secretary Carsten Steger

Terms of Reference:

- Theoretical/conceptual investigations in 3D object space recognition and image understanding
- Spatial modelling of man-made and natural objects like buildings, roads, or vegetation (geometric and semantic modelling)
- Theory and algorithms of automation of 3D object recognition and object extraction
- Automatic model generation from CAD data and example images

- Generic control structures
- Knowledge engineering
- Integration of multiple sources (DEM, GIS, colour, etc.) in co-ordination with WGIII/5
- Performance characterisation of algorithms (quality control, test procedures), jointly with WGIII/3

WG III/5 Remote Sensing and Vision Theories for Automatic Scene Interpretation

Chair Beata Csatho
Co-chair DeLiang Wang
Secretary Erzsebet Merenyi

Terms of Reference:

- Merging theories from remote sensing (classification) and computer vision for Object Recognition/ Image Understanding, to analyse and interpret multi-spectral, multi-sensor imagery
- Exploration of the potential of scale space theory on multi-spectral imagery; extending the theory by including the spectrum
- Combination of modelling efforts of real world objects in GIS, digital photogrammetry and computer vision
- Investigation of the possibility of constraining the 3D image understanding and object recognition problem by GIS information, in co-operation with IC WG IV/III.2 and WGIII.4

WG III/6 Theory and Algorithms for SAR

Chair Laurent Polidori
Co-chair Søren Madsen

Terms of Reference:

- Theory and algorithms for SAR, particularly for interferometry and feature extraction
- Establishment of state-of-the-art radar mapping
- Geometric relationships in processing and interpreting SAR data
- Quality control aspects of radar images and derived products, such as radar maps and DTMs

3. Workshops Organised under the Auspices of Commission III

Commission III addresses a wide range of activities, from data acquisition, surface reconstruction, object recognition to image understanding. The State of Science in these diverse topics can be judged from papers presented at the following workshops, organised by the working groups of Commission III.

The most important trends that emerged during the 4 year period may be summarised as follows:

- Sensor orientation enjoys new research interest. Two major trends can be observed. First, the mathematical model is extended to allow for direct solutions, increasing the flexibility of data acquisition and reducing the need for good approximations. Second, there is a trend towards including features as entities into the orientation process. This is a significant step forward because features are more robust entities than points.
- The workshop in Barcelona, Direct vs. Indirect Orientation (see Table), provided an excellent snapshot of the status of direct platform orientation systems that have reached a high level of performance. But it also showed limitations. While some of these limitations will

be overcome in future, others are inherently related to the difficulty of accurately modelling the sensor's interior orientation. The conclusion from papers related to this subject and presented at the Congress are similar: direct orientation is not (yet) reliable or, in more challenging cases, accurate enough. Thus, a combined adjustment is recommended.

- New applications, most notably city modelling, increase the need for generating DEMs and DTMs quickly and economically. Airborne laser ranging has become a very viable option to traditional photogrammetry methods. The workshop in LaJolla demonstrated the potential of laser altimetry, but also the need for standardising calibration procedures. Certain applications, for example extracting man-made objects, require the combination of laser ranging with imaging methods. This is another example of a challenging fusion problem; increased research activities are expected in this area, as well as in developing suitable algorithms for processing laser datasets (thinning, merging, segmenting, etc.).
- The majority of research related to Commission III is in the area of object recognition and image understanding. Since these are hard problems, progress is incremental. The workshop in Munich reflected the state-of-the-art. There is an increasing trend towards the utilisation of multispectral data for the recognition process. However, most approaches are still ad-hoc. More theoretical investigations into object recognition with multispectral and multisensor data are required. As an example, models of real world objects must include spectral aspects to the extent that they are recorded by multispectral/hyperspectral sensors.
- Grouping is essential because feature extraction alone cannot be expected to result directly in parts of objects. Particularly, three trends can be noticed: First, grouping uses more and more attributes, such as the strength of the gradient or colour values of the features themselves, as well as of adjacent features. The second tendency is that grouping is done in three-dimensional object space using photogrammetric camera models and constraints on two or more images. Third, there is a trend towards interleaving grouping and matching processes.
- Almost all object recognition systems developed so far contain a problem-specific control structure. Therefore,

the adoption of these systems to, even slightly, changed conditions or new applications remains very difficult. As a consequence of this research should focus more on the general strategies instead of solving specific problems.

- There is a definite trend towards real incorporation of interaction due to the so far limited success rates of so-called "fully automatic" methods; this holds for object recognition in images and digital surface models. This will have the consequence that in coming years more research results will become available for practical applications.
- Newest investigations concern the quality and efficiency of image understanding algorithms, and results on building and road extraction were presented.
- The use of multispectral/multisensor data increases the potential for solving the object recognition and scene classification problem more effectively. However, exactly how to solve this difficult multi-stage fusion problem is not clear and only little progress has been achieved. It remains a major research topic.
- A sensor combination that delivers independent information about the object space comprises laser ranging, imaging, and multispectral/hyperspectral systems. It is even conceivable to have this combination on one platform.
- Traditional object recognition approaches must be extended to include classification techniques that have been successfully used in remote sensing for many years. Another "burning" issue is object modelling: it ought to include information that the new sensors deliver, such as spectral aspects of objects.
- Fusion becomes increasingly important and must be addressed on different levels. The trend of using several sensors on the same platform requires establishing a common reference system for the sensors (fusion on the physical (sensor) level). Similarly, data obtained by different sensors, perhaps not on the same platform, must be merged (fusion on the data level). Not all multiple sensor data can be merged on that level, however; it may be necessary to extract features independently and merge them on the feature level.
- The test site Ocean City has been established by WGIII/5 during the 4 year period. Aerial photography (b/w), multispectral and hyperspectral data, and several laser altimeter flights are available (see respective reports).

Technical Commission IV: Spatial Information Systems and Digital Mapping

by **Commission IV President: Dieter Fritsch (Germany)**
and **Commission IV Secretaries: Monika Sester (Germany)**
Markus English

Report of Outgoing President

In the year 2000 we can review the position of the Commission in the light of the changes introduced after the Congress in Vienna. It was decided during the Vienna Congress that in future this commission should be a "homebase" for Geographical Information Systems, in particular dealing

with fundamental theoretical developments, operational aspects and GIS applications. The review today clearly confirms that this move was very. Co-operation has started with the International Cartographers Association (ICA) and with the Spatial Data Handling Expert's Group of IGU - the incoming meeting of SDH in 2001 will be a Joint Meeting

together with ISPRS Commission IV. It should be an objective of the future President to integrate SDH and TC IV.

It was also realised that the integration of image analysis and GIS is an important issue for data collection processes, in particular for GIS data revision. Up to now most of the image analysis strategies are data driven in a bottom up mode. Using existing GIS data this will strengthen the knowledge-driven approach, in top-down mode. It seems to be clear, that especially for GIS data revision processes the combination of top-down and bottom-up is the result for the future.

Technical Commission IV started to integrate indoor mapping capabilities offered by CAD and Facility Management Systems with 3D GIS. Therefore there is a need to inter-

face Computer Aided Facility Management Systems with 3D city models to make our real world also virtually accessible. ISPRS can play an active part here. Preparations have been made to use high resolution satellite imagery producing these products, but unfortunately through the lack of data not that much experience could be gained. This hopefully will change in near future.

TC IV started also with models for spatial-temporal data management and analysis to consider time as an additional co-ordinate. It became clear that the work should be continued to study the behaviour of spatial objects according to its geometry, topology and semantics. TC IV brought out a book for the documentation of existing global databases, this book is a valuable source for all those scientists and practitioners who are concerned with environmental monitoring.

Technical Commission V: Close-range Techniques and Machine Vision

by Commission V President: Hirofumi Chikatsu, Tokyo Denki University, Japan
and Commission V Secretary: Eihan Shimizu, University of Tokyo, Japan

Introduction

The last four years (1996-2000) have witnessed rapid progress of Commission V as close-range digital photogrammetry, inclusive of real-time imaging applications, has become a more widely adopted measurement tool in fields such as industrial metrology, machine and robot vision, medical and sports science, archaeology, architecture and construction management. Over this period, Commission V has pursued the goal of becoming a focal point, within both the ISPRS and associated organisations, for the communication of ideas and research progress in interdisciplinary areas where close-range imaging is used for 3D scene reconstruction and visualisation.

In order to pursue its scientific agenda, Commission V established seven Working Groups (WGs):

- WG 1. Close-Range Imaging and Metrology
- WG 2. Integration of Photogrammetric Systems with CAD/CAM
- WG 3. Scene Modelling for Visualisation and Virtual Reality
- WG 4. Human Motion and Medical Image Analysis
- WG 5. World Cultural Heritage
- IWG V/III. Image Sequence Analysis
- SIG. Special Interest Group on "Animation"

Main Accomplishments and Further Activities

In order to steer Commission V to success as an interdisciplinary commission, the following symposia and workshops, which were all either organised or co-organised by the Commission, were held during the past four years:

1. International Symposium on Real-time Imaging and Dynamic Analysis, Hakodate/Japan, June 2nd-5th, 1998
2. Videometrics VI, San Jose/USA, January 28th-29th, 1999
3. International Workshop on Mobile Mapping Technology, Bangkok/Thailand, April 21st-23rd, 1999

4. International Workshop on Photogrammetric Measurement, Object Modelling and Documentation in Architecture and Industry, Thessaloniki/ Greece, July 6th-9th, 1999
5. Technical Meeting of the Coordinate Measurement Systems Committee, Seattle/USA, July 26th-30th, 1999
6. International Workshop on Vision-based Techniques in Visualisation and Animation, Onuma/ Japan, October 14th-16th, 1999

It was noticeable at these events that there were many interesting new developments and applications in on-line and off-line multi-image and multi-sensor system configurations, laser scanning, virtual reality and computer animation. To further the aim of ensuring that Commission V remains closely associated with such new progress in close-range imaging, the following future conferences are being organised by WGs under the auspices of Commission V:

1. Commission V sessions at the XIXth ISPRS Congress, Amsterdam/The Netherlands, July 16th-23rd, 2000
2. Videometrics and Optical Methods for 3D Shape Measurement VII, San Jose/USA, January 24th-26th, 2001
3. International Workshop on Recreating the Past "Visualisation and Animation of Cultural Heritage", Ayutthaya/Thailand, February 26th- March 1st, 2001

State of the Science and Technology

Digital imaging and recording technology innovations over the past four-year reporting period have spanned a wide scientific spectrum, which has offered a significant opportunity for Commission V to broaden its focus and become more interdisciplinary in its activities. In particular, recently developed laser scanning technology will contribute greatly to issues such as real-time data acquisition, visualisation, 3D modelling and scene reconstruction. This example is

but one that can be used to indicate that developments in close-range photogrammetry and machine vision will continue to be both profound and rapid. In spite of the impact of new technologies, there are many research goals related to existing theories and technologies that need to be realised and work on these areas can be expected to continue. Such current topics include real-time image sequence analysis, automated sensor orientation and calibration, feature extraction and image matching.

In recognition of the emerging new technologies in interdisciplinary areas associated with close-range imaging, along with an understanding of current research topics and the prevailing state-of-the-art in digital photogrammetry, Commission V has proposed the following resolutions:

- Resolution V.1 Automation for Vision Metrology, recommends that stand-alone measurement systems integrating one or more imaging sensors and CAD/CAM, along with innovations in projected light systems for off-line and on-line vision metrology, should be further studied; and that target and feature extraction with associated solutions to the multi-image correspondence problem should be developed.
- Resolution V.2 Scene Modelling for Visualisation and Virtual Reality, recommends that automatic image analysis techniques to extract models of objects and scenes for applications in visualisation and virtual reality should be further developed; and that mechanisms be implemented for co-operation between Commission V and computer graphics and computer vision groups.
- Resolution V.3 Human Motion and Medical Image Analysis, recommends that research and development in techniques and systems for medical imaging, human motion studies, expression analysis and sports formulation analysis should be continued; and that Commission V should intensify co-operation and collaboration with the communities of medical/biomedical engineering, sports science and human/apparel engineering.
- Resolution V.4 Application of Close-range Vision Techniques and Spatial Information System to World Cultural Heritage, recommends the further development of integration of close-range vision techniques and spatial information systems for 3D reconstruction and documentation of monuments and buildings for world cultural heritage; and proposes further adoption of advanced techniques for the mapping, documentation and recording of the World's cultural heritage.
- Resolution V.5 Image Sequence Analysis, recommends investigations of core research topics be promoted, in close co-operation with researchers in, for example, engineering and computer vision; and proposes continued investigations of algorithmic aspects and developments in computational systems for applications with special emphasis on time-constrained solutions.
- Resolution V.6 Vision and Animation, recommends the development of image-based techniques for use in character and environment generation tasks; and the study of methods and technologies to support the interaction of real and virtual objects; and that collaboration with the computer vision and animation communities be intensified.
- Resolution V.7 Integration of Ground-based Vision Techniques with Aerial/Space Images, recommends

that new models and techniques for close-range and aerial/space image integration should be developed, with a focus on aspects such as the combination of data from various sources, object extraction techniques, 3D modelling and texture mapping.

WG V/1 'Close-range Imaging and Metrology'

by Chairperson: Clive Fraser, University of Melbourne, Australia
and Co-Chair: Horst Beyer, Imetric SA, Switzerland

State of the Science and Technology

Development themes in close-range imaging and vision metrology over the past four years have focused to a large degree upon automation in all phases of the photogrammetric process. Specific examples have included further development of "intelligent" cameras, stand-alone measurement probes integrating one or more imaging sensors, and projected light systems for off-line and on-line vision metrology. There have also been further advances in target and feature recognition, with associated fast and robust solutions to the multi-image correspondence problem and new developments in models and procedures for automated sensor orientation and calibration. A resurgence has also been witnessed in the development of integrated systems, where the vision metrology component is used as a real-time dimensional control mechanism for machining, milling or cutting control, for example. Progress in this area has given rise to further work on the integration of vision metrology and CAD, and on model-driven object reconstruction. Generally, the state of the science and technology of vision metrology could be characterised as reasonably mature in terms of fundamentals, with considerable development attention being given to advances in system automation, performance, reliability and productivity.

Main Accomplishments for the Period 1996-2000

Participation in the Optical 3-D Measurement Techniques IV conference in Zurich, Switzerland from September 29th to October 2nd, 1997. The WG organised Technical Session 5.

Two newsletters were distributed and an informal WG business meeting was held in Zurich in October, 1997. A web-site was developed to aid in dissemination of relevant information regarding WG activities and society events (<http://www.geom.unimelb.edu.au/isprswgv1/>).

The focus of working group activity in 1998 concerned participation in the very successful 'International Symposium on Real-Time Imaging and Dynamic Analysis' which was held in Hakodate, Japan from June 2nd-5th. Of all the working groups in Commission V, WG V/1 drew up the most papers, namely 37. A second activity of note in 1998 was the Coordinate Measurement Systems Committee (CMSC) conference held in St Louis in early July. Of the papers presented at the CMSC, eight dealt with vision metrology systems and were thus very relevant to WG V/1. Further information on the CMSC is available at the following web-site: www.cmssc.org.

The principal activity for WG V/1 in 1999 was the International Workshop on Mobile Mapping Technology held in Bangkok from 21-23 April. The WG was a co-organiser of this successful conference, which had close to 200 participants from 17 countries. Of the 42 oral presentations, a

number dealt specifically with WG themes of integration of imaging technology and sensor calibration.

The second main activity of 1999 was the annual CMSC Conference, held in Seattle from 26th-30th July. As a result of this meeting, ISPRS commenced a process by which a formal relationship with the CMSC could be established, in recognition of the prominent role played by the technology of close-range digital photogrammetry in the field of industrial measurement. CMSC'99 incorporated two technical sessions specifically for presentations related to ISPRS WG V/1 activities.

Activities in 2000 concentrated upon supporting Commission V in its organisation of the scientific programme for the Amsterdam ISPRS Congress, where WG V1 has two main technical sessions.

WG V/2 "Integration of Photogrammetric Systems with CAD/CAM"

by Chairperson: Jürgen Peipe, Bundeswehr
University Munich, Germany
and Co-Chair: Stuart Robson, City University,
United Kingdom

State of the Science and Technology

Over the last 20 or so years, CAD systems have evolved from tools for computer aided drafting and the design of three-dimensional objects to software systems applied to a wide range of different tasks such as design, planning, manufacturing, testing, quality assurance and facility management - i.e. CAX techniques such as CAP, CAM, CAT, CAQ Basically, CAD systems deal with the generation, manipulation, storage and visualisation of 3D data. They serve also as database for the integration of various data acquisition techniques, including photogrammetry. The interrelation between CAD/CAM and photogrammetry is bi-directional: on the one side, the results of photogrammetric processing are used for 3D object modelling in CAD systems, e.g. for the as-built documentation in architecture and industry, for indoor scene modelling, for visualisation and animation. In this case, photogrammetric measurement tools are interfaced with, or integrated in, existing CAD systems. On the other side, CAD modelling concepts support the (automated or semi-automated) photogrammetric recognition and measurement process by providing a priori knowledge of the object.

CAD-based photogrammetry may be defined as a close combination of CAD and photogrammetry aimed at the generation of 3D models containing geometry and topology. A variety of CAD-based photogrammetry systems exist offering different measurement and modelling concepts. Efficiency improvement by automation is often limited in close-range photogrammetry due to the complex structure of objects. In such cases, semi-automated approaches are advantageous: the human operator is responsible for scene interpretation and CAD model recognition. He selects approximations of objects from the CAD database and ensures initial fits of the projected model and the imaged object. The precise object measurement is then carried out by an automatic matching process.

The increasing interest in generating 3D models has driven the development of low-cost and user-friendly software systems for image measurement and object modelling.

These systems include photogrammetric knowledge as a "black box" and have been used by non-photogrammetrists, above all. In this way, the integration of photogrammetric tools with modelling techniques may lead to a closer partnering between the measurement and the end-user communities.

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WG V/3 'Scene Modelling for Visualisation and Virtual Reality'

by Chairperson: Sabry El-Hakim, National
Research Council, Canada
and Co-Chair: Wolfgang Förstner, University
Bonn, Germany

State of Science and Technology

Virtual reality (VR) is enjoying tremendous interest from researchers and developers across several disciplines, including photogrammetrists. The applications include: virtual museums, historical sites documentation, mapping of hazardous sites and underground tunnels (mine automation), as-built modelling of industrial and power plants for design verification and modification and virtual production for the entertainment industry. The problems include practical and precise sensor calibration, the automatic registration of images, the complete and accurate coverage of all details (which may require multiple sensors), the automation of the modelling procedure and maintaining realism during real-time display. Environment or site modelling is proving to be more difficult than object modelling because of the size and complexity. Given the application requirements, selecting and implementing the most efficient method for data collection and modelling is not obvious, since several methods and a variety of sensors exist. These vary significantly in the ability to capture details, cost, accuracy, speed and ease of use. Selecting the most suitable and efficient method, along with its configuration, is not easy because for some of the paradigms actual capabilities and limitations are not known.

Over the past few years many advances have been made, both on the scientific and commercial sides. Many efforts are being made in automating feature extraction, matching and modelling procedures. However, success has been limited to image sequences, such as those obtained by video cameras, and simple scenes and objects. The model-building procedure still requires a human in the loop, particularly for sites and complex objects. Efforts in automating this procedure will rely mainly on advanced computer vision and scene understanding techniques. Commercially, low cost photogram-

metry-based software packages such as Photomodeler™, ShapeCapture™, Synthonic's RVR™, CitiBuilder™, and Kodak Digital Science™ dimension software have become available in the past few years. PCs and 3D-accelerated graphic cards are continuing to improve in capabilities for 3D processing, display and interaction. Large models with several thousands of polygons can be manipulated in real-time with relatively low-cost PC hardware. Having such software and hardware tools, plus low-cost high-resolution digital cameras, has provided tremendous opportunities for photogrammetrists that did not exist at the start of the working group in 1996. We currently see hundreds of impressive 3D models created by photogrammetrists or by others who apply photogrammetry.

There is more integration of computer graphics with photogrammetry, image processing and computer vision. This is evident particularly in image-based rendering (IBR) and blending of real-world data (e.g. from 2D/3D images) with computer-generated imagery. The fusion of methodologies from all these disciplines was evident at the conferences and in journal papers over this period. It is obvious that the goal of the WG for the next period is to foster greater co-operation with those related disciplines.

Activities and Conference Report

1. The WG web-site was established in January 1997. It links to the members' Web pages (50 members from 16 countries) and e-mail, evaluated VR-useful sites, related conferences and various types of raw data provided by some of the WG members.
2. Commission V Symposium in Hakodate showed that Virtual Reality is becoming the technology of preference for representing and manipulating 3D data. Several papers described systems for creating accurate and photo-realistic virtual reality models of indoor sites using data from CCD cameras, range sensors, or both. CAD information is also utilised in some applications, along with the collected data to help reconstruct the complete model. Planning and documenting of urban and historic sites is one of the most popular areas of application for VR technology in published photogrammetric papers.
3. The official WG workshop was Videometrics VI, Part of SPIE Photonics West - Electronic Imaging 99, San Jose, California, January 23-29, 1999. Thirty-two papers from 16 countries were presented, covering the topics of this working group and the SIG on animation.
4. A theme issue of the ISPRS Journal on the topics of the WG, titled: Imaging and Modelling for Virtual Reality, was published in December 1998 (two additional papers were published in the February 1999 issue).
5. The working group co-operated in organising the V/SIG Animation International Workshop on Vision-Based Techniques in Visualisation and Animation, October 14-16, 1999, Onuma, Japan, and the second International conference on 3D Imaging and Modelling, October 4-8, 1999 in Ottawa, Canada.
6. In the ISPRS Congress in Amsterdam, two TC sessions (sessions TC V-5 and TC V-8) and one IC session (IC-16) and a tutorial (TU5 An introduction to virtualised reality systems) will be given. A total of 49 abstracts were submitted for the three sessions.

WG V/4 "Human Motion and Medical Image Analysis"

by Chairperson: Felix Margadant, University of Sydney, Australia
and Co-Chair: Masako Tsuruoka, University of Tokyo, Japan

Main Accomplishments

In 1996 a list of objectives for WG V/4 was compiled which comprised: (1) the development of medical real-time imaging systems, (2) the dynamic analysis of human motion, (3) the 3D medical imaging for anthropometry, (4) 3D representation and visualisation, and (5) fostering co-operation between photogrammetry and medical committee. Points 1 and 2 have been covered by the progress of technology, and 5 has been accomplished by integration.

In 1997, the previous chair, T. Leemann, raised a survey of the use of photogrammetry methods in medical image processing and he found a discrepancy between the broad interest of all participants from the photogrammetric side for the expanding field of medical imaging and the lack of concepts for actual implementations. On the other hand, he found some larger groups from the medical field which were attracted by the chance to incorporate well-established, scientific methods in their approaches. Namely, the 'Research Society for Spinal Deformities', the 'International Society of Biomechanics Technical Group' and, lastly, several individuals from the field of Humane Motion. The latter have been successfully integrated into WG V/4, together with Medical Imaging, so that the fifth strategic proposals of the 1996 outline was accomplished.

Since T. Leemann experienced a career change in the direction of applied IT, Felix Margadant was appointed as emergency chair for WG V/4 and took up the position in the first quarter of 1998.

In his farewell review in January 1998, the former Chair criticised the methods and the knowledge base of photogrammetry saying that they almost do not propagate into modern image analysis. Therefore promoting photogrammetry in computer vision became one of the basic missions of WG V/4.

The current Chair, myself, temporarily moved from the ETH Zurich (Switzerland) to the University of Sydney (Australia) to pursue more theoretical approaches towards ranging in microscopic imaging. Besides research work, my current work for WG V/4 has been limited to building up an archive on image understanding algorithms.

Concerning the field of Medical Imaging in WG V/4, I am working on a collection of edge description and marker localisation algorithms to be brought on-line. This can be useful to attract the interest of some image processing people, but it is of little use for the majority of the Human Motion workers attending the forthcoming meetings. It would be helpful if a Human Motion person could be appointed to add an archive for their field.

The only activity of WG V/4 in 2000 concerned preparation for the Amsterdam 2000 congress.

State of the Science and Technology

Due to the reasons listed above, Medical Imaging is more perceived as a photometric rather than a photogrammetric science, and acceptance for photogrammetric approaches is still low. Hospital use itself does not integrate the two fields but it unifies them in the area of medical applications, and in the long run there are good chances that the

ideas and experience of photogrammetry will prove contagious for the Medical Imaging workers as well.

There is a strong movement from Human Motion Analysis groups into the field of medical sciences. This step is straightforward and today spreads its influence into patient supervision, sports medicine and physio-therapy. Cautious and reluctant steps in these directions were already presented at the Commission V conference in Hakodate 1998. For Amsterdam 2000, more contributions are announced. The reliability issue of today's computers strongly affects the field, of course, and is a topic of discussion, especially for canonical approaches of redundancy.

Photogrammetry approaches slowly find access to medical images [<http://www.ai.sri.com/~konolige/svs/>] but surveys of typical medical image analysis show little interest in these measurement methods [Medical Image Analysis, Oxford University Press (Journal) 2000, ISSN: 1361-8423] [Segmentation of Skin-Cancer Images, Image and Vision Computing, January 1999, pp. 65-74]. One of the most predominant reasons is that the geometric and photometric aspects of medical imaging give little information to the investigating medical doctor, in the limited context and sense that the information does not match the experience of the medical expert. There are just no established standards and no training for images that suddenly arrive armed with quantitative information. Absolute image brightness and highly accurate localised features within images just do not co-operate with the brought-in working style the medical environment offers. Today's machines simply cannot be relied upon, computational results have to be regarded as potentially being erroneous and this severely restricts the penetration of modern IT achievements into clinical use. Interactive image understanding - the combination of machine visualisation followed by human decision-making is therefore the safe and natural way to enter this field. And this approach has been standard in photogrammetry for a long time. Useful user-interfaces for people whose main interest is not technology though, are yet to be developed.

Disclaimer

Since the new Chair was empowered in 1998, the review period for 1996-1997 is completely adopted from the previous Chair Dr. T. Leemann. There is no new review nor any critical discussion referring to the period before 1998. WG V/4 is now 'Human Motion and Medical Image Analysis', it was 'Biostereometrics and Medical Imaging' at the beginning of the reviewing period.

WG V/5 "World Cultural Heritage"

by Chairperson: Petros Patias, The Aristotle University of Thessaloniki, Greece

and Co-Chair: Feng Wenhao, Wuhan Technical University of Surveying and Mapping, China

Research Activities and Technology Trends

The documentation and conservation of cultural heritage are being increasingly seen as tasks of national - ultimately international - priority. Due to digital techniques, photogrammetry now appears as more efficient and inexpensive; today's user-oriented software is easier to handle by non-experts, thus widening the potential spectrum of application in architectural and archaeological recording.

The main strength of photogrammetry, that is the reconstruction of an object surface geometry by remotely sensing it, has been recognised also by other disciplines than photogrammetrists. This important merit is currently being enhanced by:

- a trend towards moving from traditional stereoscopy to multi-photo surface reconstruction
- the low-cost digital image acquisition capabilities of the current technology
- the potential of multi-sensor information collection
- the wide acceptance of Information Systems currently enhanced by digital images as well
- the wide spread of 3D modelling, visualisation and web-authoring tools

Both at the Commission V Inter-Congress Symposium (1998) in Hakodate, Japan, and at the International Workshop (1999) in Thessaloniki, Greece, trends and developments, regarding the WGs' topics had the opportunity to show up. The trends were clear:

- Development of vision-based techniques and novel systems under new concepts for documentation
- Multi-sensor data acquisition and multi-source information integration
- Developments in simple and efficient digital recording tools
- Integration of CAD with Photogrammetry for model-driven object reconstruction
- Automated and semi-automated production of constructive solid geometry models from image networks offering considerable potential for the future
- Automatic production of 3D models appropriate for visualisation purposes from image sequences captured by video camera equipment. Whilst yet not geometrically precise, such techniques can be combined with established photogrammetric geometry and calibration principles to promote them among non-photogrammetrists
- Development of Information Systems, with special attention for the use of digital images, for documentation and information management
- Visualisation in virtual environments (e.g. virtual museums, historical sites documentation, image-based 3D texture mappings, etc.) thus enhancing the promotion of the cultural heritage

Eagerness of the specialists from a variety of scientific communities, like photogrammetrists, architects, archaeologists, computer engineers, geophysicists, information managers, to communicate, interact and exchange knowledge and experience on a common aim: to map and document our cultural heritage.

And now, at the ISPRS XIX Congress, we are witnessing trends, like:

- Development of visualisation techniques for geometrically precise and aesthetically mature models of the world's cultural heritage
- Qualitative analysis of digital images for material study and damages assessment
- Assessment of the state-of-the-art in photogrammetric recording for close-range applications in architecture and archaeology
- Modelling and algorithmic aspects and demonstration of new techniques
- Management of large quantities of multi-sensor data

- for Information Systems applications
- 3D modelling and geo-referenced VR integration pertaining to cultural heritage
- Low-cost systems development and demonstration
- On-line as-built modelling techniques
- Combining aerial and close-range information in Information Systems
- Testing, calibration and efficiency assessment of new data acquisition equipment and their integration to enhance photogrammetric means for cost and time reduction in mapping cultural goods
- Promotion of cultural heritage through VR
- Reverse engineering and CAD automation
- Model-oriented photogrammetric measurement of industrial installations

Having in focus these changes and their future evolution, the role of ISPRS can be defined as to:

- Continually monitor and evaluate the state-of-the-art of new technology (camcorders, CCD cameras, smart cameras, laser scanners, other sensors, low-cost software, new techniques, etc.) in terms of improving the quality and reducing the cost for data acquisition, processing and handling for architectural, archaeological and industrial applications.
- Develop methods and techniques to produce geometrically precise and aesthetically mature 3-D models for cultural items.
- Popularise the photogrammetric techniques by developing user-friendly processes and broaden the market pull by introducing innovations and developing a 'critical mass' through co-operation with other scientific disciplines.

Intercommission WG V/III "Image Sequences"

by Chairperson: Hans-Gerd Maas, Dresden
University of Technology,
Germany

and Co-chair: Horst Haussecker, Xerox Palo
Alto Research Center, USA

General

ISPRS intercommission working group IWG V/III "Image Sequences" has been established for the period 1996-2000 as a joint working group of ISPRS Commission V "Close-Range Techniques and Machine Vision" and Commission III "Theory and Algorithms".

Image sequence analysis has been playing an important role in many applications in computer vision, machine vision and robot vision and is also of increasing interest in several fields of digital photogrammetry, especially in digital close-range photogrammetry. Examples of the application of image sequence analysis in digital close-range photogrammetry are 3-D object tracking, the analysis of dynamic processes, deformation measurements, monocular or stereoscopic mapping of the environment of an autonomous robot, mobile mapping systems, biomedical motion analysis, 3-D data gathering for computer animation, and many others. Image sequence analysis techniques are also of increasing interest in aerial photogrammetry in the context of automated triangulation techniques, as well as in general change detection tasks of aerial photogrammetry and remote sensing.

The working group had some 35 members, mainly from

academic institutions in the fields of photogrammetry, computer vision and robot vision.

Working Group Activities

IWG V/III contributed as a sponsor or organiser of technical sessions to the following events:

- 2nd ARIDA/SGPBF Workshop on Image Sensing and its Application, Zurich/Switzerland, 1997
- ISPRS Com. V symposium, Hakodate/Japan, 2nd-5th June 1998
- Videometrics VI, SPIE Electronic Imaging '99, San Jose/USA, 23rd-29th January 1999
- ISPRS/IAG workshop 'Mobile Mapping Technology', Bangkok/Thailand, 21st-23rd April 1999
- ISPRS workshop 'Vision-based Techniques in Visualisation and Animation', Onuma/Japan, 14th-16th October 1999
- ISPRS congress 'Geoinformation for all', Amsterdam 2000

Trends in WG-related Topics

A number of trends can be recognised from the contributions to the above mentioned conferences, the member list of IWG V/III and the abstracts submitted to the ISPRS congress:

- A considerable amount of the work has been performed on various practical applications. On the algorithmic side, work was mainly oriented towards image flow analysis and spatio-temporal matching techniques.
- A certain focus of activities may be found in traffic-oriented applications, including airborne traffic surveillance, mobile mapping systems and autonomous car navigation tasks.
- Sensor fusion and integration is of major importance, especially in the field of mobile robots. Here, the information retrieved from vision systems is combined with data from other sensors, such as distance meters, odometers and inertial navigation systems or range images acquisition systems. It also plays an important role in aerial triangulation, where INS and GPS are used as additional sources of data.
- New developments in hardware components are mainly related to the storage of digital image sequences and to the development of high-speed cameras. Digital video systems now coming onto the consumer market at very reasonable prices will considerably simplify the acquisition of monocular image sequences in the near future. The general increase in computer speed will allow real-time solutions for an increasing number of image analysis tasks in the future.
- A large percentage of the IWG V/III members do not consider themselves photogrammetrists in the classical sense. In fact, their provenance shows a large variability, ranging from neuro-biology to remote sensing. This heterogeneity made it difficult to find topics for common efforts, but was considered positive from the aspect of knowledge transfer between communities.

Special Interest Working Group on "Animation"

by Chairperson: Armin Grün, ETH -
Hönggerberg, Switzerland

and Co-Chair: Shunji Murai, University of Tokyo,
Japan

Introduction

In a broad sense, Computer Animation (in brief: Animation) is concerned with procedures, algorithms, software and hardware for the purpose of synthesising real world objects and processes, as well as events of fantasy and imagination. As such, animation belongs to the larger fields of VR (virtual reality) or VE (virtual environment). Technically and scientifically the ISPRS Special Interest Group on "Animation" is mainly concerned with objects in motion (typically humans, animals, plants, etc.), as opposed to topographical and GIS-relevant objects, which are treated by other ISPRS Working Groups. Since the issue of animation, as it is perceived in this SIG, is fairly new to ISPRS, the prime focus of our group was to build up relations between scientists of the different disciplines, making up the animation community. The long-term goal would then be to upgrade this SIG to a Working Group, in order to give animation the status it deserves within ISPRS.

State of the Science and Technology

Image-based animation is a wide field which draws scientists from many disciplines. World-wide there are such a vast number of conferences and other events which relate to visualisation and animation that it is very difficult to give a comprehensive picture of the state of all sciences involved. Photogrammetrists seem to enter this field only reluctantly. They obviously consider it an exotic area offering not much gain. We believe that this attitude is fundamentally wrong and that photogrammetric experts could contribute quite a lot to this ever-increasing market. This is true in particular at this very moment, in which animation people turn more and more to image-based techniques for more realistic landscape, city, face and body modelling and motion estimation.

As indicated by the conferences which were co-organised by our group, we see a great variety of sensors, platforms and data being used in this field (satellite, aerial and terrestrial images, laser scanners, video theodolites, mobile mapping cars, spectrometers, computer radiographs, x-rays, magnetic positioning devices, DTMs/GIS, maps, historic maps, historic and current reports). A similar variety holds for the processing algorithms used (image and template matching, deformable contour models, feature extraction of points, lines and regions, optical flow, tracking in image and object space, slit scanning, video mosaicking, DTM modelling, DSM segmentation, reflectance modelling and so forth).

At the Onuma conference alone we encountered the following array of applications: landscape modelling, city modelling-including historic towns, tourist guide, dynamic process simulation, vehicle and human motion, bone mineral density determination, stomach wall analysis, traffic sign recognition, roadside image database generation, power lines, slope management, coral reef, sea surface temperature, biomass, flame detection, violin bowing, refraction analysis, solar energy simulation. It is obvious from these facts that the use of photogrammetry in visualisation and animation is both scientifically interesting and technically rewarding. It is to be hoped that ISPRS will recognise this fact and pay more attention to these issues in the near future. As a very interesting and appealing animation entry Web page we recommend: ligwww.wpfl.ch.

The Commercial Scenery

Among the many research issues in animation, two central problems are of particular interest to this SIG: motion capture and surface reconstruction (possibly under motion and deformation). Since photogrammetrists are not very familiar with the animation scene we give here some information about commercial data capture systems.

There are already quite a number of commercial motion capture systems available, some on a magnetic basis (UltraTrak Pro, Flock of Birds, Motion Star), others using optical techniques (Integrated Body Capture, HiRez, VICON, Multi Trax, Face Trax, Face Tracker, Photo4D, APAS, MacReflex, Cyber Sight, Biovision, BioMechanics, Sim Graphics, HISIS 2001, Clovis).

Here is a sample of vendors of motion-capture tools: Adaptive Optics, Cambridge, MA; Ascension Technology, Burlington, VT; Complint, Nepeau, Ontario; Digital Image Design, New York, NY; Elektra Shock, LA; Motion Analysis, Santa Rosa, CA; Oxford Metrics, Oxford, England; Polhemus, Colchester, VT; Virtual Technologies Inc., Palo Alto, CA.

The optical systems are either tracking devices for a set of (retroreflective) points or systems for reconstructing faces or facial expression.

For 2-D face tracking, systems are offered by the following vendors: Adaptive Optics, Cambridge, MA; Digits 'n Art, Montreal, Canada; Motion Analysis, Santa Rosa, CA; Sim Graphics, South Pasadena, CA; Vierte Art GmbH, Munich, Germany.

For 3-D object reconstruction a number of low-end systems are available, such as 3D Builder Pro (3D Construction Company, TN), Photo Modeler (Eos Systems, Inc., Vancouver, Canada), 3D Express (3rd Dimension Technologies Inc., CA), ShapeCapture (NRC, Ottawa), Wireframe Express (Synthonics, CA).

Most systems do have in common that very little photogrammetric expertise is incorporated (exceptions: Photo Modeler, Integrated Body Capture, HiRez, ShapeCapture). Therefore not much is known in general about performance in terms of both precision and reliability. It should be a vital goal of the photogrammetric community to let the animation people, in particular those concerned with motion capture and surface reconstruction, know about the capabilities of videogrammetric concepts.

Plans for the Future

The participants in the Onuma Workshop have agreed that it would be appropriate to the relevance of the topic to hold such an international workshop every two years. The next one is planned for Ayutthaya, Thailand, 26 February-1 March 2001 and is concerned with Recreating the Past-Visualisation and Animation in Cultural Heritage. The idea is to continue with these Workshops into the future and to try to attract to these events people from the animation community as well.

As to the future of this group, we recommend a continuation as SIG, because activity in this area within ISPRS is still not at the required level to form a Working Group, as evidenced by the contributions to the XIXth ISPRS Congress.

Technical Commission VI: Education and Communication

President 1996-1997 Ir. Klaas VillanueVva; 1997-2000. Dr. Teuku Lukman Aziz

Scientific Secretary 1996-2000, Dr. Riadika Mastra

Communication Secretary 1996-2000, Dr. Fahmi Amhar

Introduction

The main event occupying the Commission VI was the ISPRS mid-term Symposium TC-VI which was held in Bandung, Indonesia, from April 15-17, 1999. All chairpersons within WG VI attended the Symposium. This Symposium was originally planned for August 1998 but due to political and economic problems in Indonesia in 1998 we had to postpone the event. The ISPRS Council agreed on this rescheduling.

The theme of the symposium was Sharing and Cooperation in Geo-Information Technology. It covered topics in education in survey, photogrammetry, remote sensing and GIS; CAT/CAL, Internet, knowledge sharing and technology transfer. Prior to the Symposium, a High Level Tutorial (HLT) Session was organised. The spirit of this tutorial was useful international cooperation and transfer of mature and innovative technologies with the positive aim of their peaceful use.

Major Results of Working Groups

WG VI/1 Education

Chair: Tania Maria Sausen (Brazil),

Co-chair: Walter Schuhr (Germany)

1. Building of the Educators Network to identify people involved with education, remote sensing and photogrammetry throughout the world.
2. Meeting in Munich from October 14th-16th 1996 and workshops in Camboriu, Brazil, May 20-23, 1997. At the meeting in Munich we planned to change the traditional additive discipline-oriented curriculum into a so-called integrated way of study.
3. Update the UN Directory on Education, Training, Research and Fellowship Opportunities in Space Science and Technology and its Applications.

WG VI/2 Computer Assisted Teaching

Chair: Kohei Cho (Japan),

Co-chair: Joachim K. Höhle (Denmark)

1. Establishment of the homepage of the WG for information, software, data dissemination and exchange within the WG

2. Software distribution. The WG is collecting/developing non-commercial software for CAT which is currently available via internet (LDIP, ORTO, WinASEAN, GIWIN, CD-ROM Remote Sensing Navigator)
3. Participating in several conferences on CAT/CAL including the XXI FIG Congress in Brighton

WG VI/3 International Cooperation and Technology Transfer

Chair: Luigi Mussio (Italy),

Co-chair: Mojca Kosmatin (Slovenia).

1. Organised several meetings on "Int. Cooperation and Tech-Transfer" in Padua (Italy), Bahia Blanca (Argentina) and Ljubljana (Slovenia).
2. Keep close contact with regional member organisations in Asia, Africa and East Europe to help them in preparing the workshops and tutorial sessions as well as to encourage them in ISPRS activities.

WG VI/4 Internet Resources and Spatial Data Sharing

Chair: Tuan-Chih Chen (Taiwan),

Co-chair: John Felkner (USA)

1. Investigation of the Internet environment for each ISPRS ordinary member.
2. Promotion of homepages created by each ordinary member, commission and working group and linked by the ISPRS main homepage.
3. Presentation of the Internet and webpage guidelines for ISPRS
4. Completed the Internet domain name of ISPRS to be registered as isprs.org. The new address is now active.

Concluding Remarks

Working with such an excellent team (i.e. WGs) during these 4 years has been really remarkable. I thank you all for your strong support and outstanding teamwork. Thanks also to the Council in guiding me in all ISPRS activities. It is unfortunate that I could not attend the Congress due to my illness.

Technical Commission VII: Resources and Environment Monitoring

Gábor Remete-Fülöpp, Commission VII President (Hungary)

Péter Winkler, Commission VII Secretary (Hungary)

Frank Hegyi, Commission VII Secretary (Canada)

Terms of Reference for the Period 1996-2000

Methodology of visual image interpretation. Computer-aided interpretation and analysis of sensor data. Spectral, spatial and temporal radiation properties of objects. Environmental studies, resources inventories and interpretative aspects of thematic mapping as applied in studies of vegetation, forestry, agriculture, soils, land and water use, geology, geomorphology, hydrology, oceanography, coastal zones, snow and ice, atmospheric sciences, archeology, human settlements and engineering. Integration of remote sensing and GIS techniques for the monitoring of resources and environment.

State of Science and Technology of Commission VII Topics

Remote Sensing Became Inevitable Technology Tool for Science and for Society

Applied remote sensing became a more and more inevitable technology tool, contributing to human progress toward sustainability by supporting solving of environment-related tasks on a local, regional and global level. Major challenges are the exploitation of research and global co-operation, where the application potential brings direct benefits in climate change research, agriculture, environmental monitoring, cartography and natural resources management. It helps policy decisionmaking to reduce negative societal-economic impact and assist in ensuring sustainable development in the long run. Prof. Hiroyuki Yoshikawa, President of ICSU¹, wrote (in Science International, December, 1999): "Because technology is always a part of the society, we might say that engineering is a mapping of science into society. Consider any relationship between science and society, and engineering will be necessary." Today, remote sensing will become an integrated part of the advanced Information Technology and Telecommunication infrastructure, basement of the information society. Building spectral databases and cross-border, continental or global datasets; refining validation, calibration procedures in a multi-source, multi-temporal environment and paving the way for standardisation are some of the strategic imperatives of the application-oriented research and development initiatives which support the daily, operational utilisation of the technology.

Major Improvements

Major improvements have been made especially in the hyperspectral opportunities, data fusion experience, storage, management and retrieval of large datasets. The accelerating impact of the available enabling technologies (computers, Internet and NGI, high-speed communication, mobile environment) should also be emphasised. Important is the timely use of data in extraction and interpretation by digital image processing, pattern recognition and feature identification. Data quality issues play an important role: how accurate are the results? Satellite segment, extensive ground segment for processing, archival and

distribution, as well as data readily available to general scientific users, have been realised (e.g. in the Earth Observing System of NASA). Facilities (such as the Eros Data Center's DAAC) provide extensive Internet data access (e.g. AVHRR, DEM, Landsat, radar) for the interdisciplinary user community also helping a better understanding of the Earth as a total system. NASA's major scientific priorities in spectral sensing research applications focus for the next 10 years on atmospheric chemistry and ozone, seasonal and annual climate variability, long-term climate change, land cover/use change and global productivity and natural hazard mitigation by observation, understanding, building models and implementing scientific assessments. According to G. Asrar at the ISSR conference in 1999, there is a need for a pathfinder for international policy decision-making (e.g. monitoring and documenting the ozone hole). The present challenge: can we learn to predict regional climate variations from months to a year in advance? Next challenge: there is a need for systematic, calibrated, long-term data records and their assimilation into already existing general circular models (including oceans, atmosphere, cryosphere, land and biosphere) under evolution. To do so, even more diverse data is required. Future challenge: we have only the beginning of an observational strategy for global assessment of ecosystem behavior.

The integration of global-to-regional-to local scale observation is especially challenging. According to this strategy, a large number of missions are expected in the coming years. The "Digital Earth – Understanding our planet in the 21st Century" is a vision closely related to the subject. The concept document announced by Al Gore in February 1998 begins: "A new wave of technological innovation is allowing us to capture, store, process and display an unprecedented amount of information about our planet and a wide variety of environmental and cultural phenomena. Much of this information will be georeferenced. "Taking the list of the working group partners at the 8th Digital Earth meeting held in December 1999, the interdisciplinary work and the role and potential of remote sensing is reflected by the co-operating agencies such as ACE, EPA, FGDC, NASA, NIMA, NOAA, NSF, USDA and USGS. Relevant international projects close to the subject include:

- Digital Earth Information Resources (an index of on-line information resources)
- Analogue to Digital Earth (a list of sites similar to the Digital Earth concept)
- Global Spatial Data Infrastructure (GSDI, formed by linking of national and regional spatial data infrastructures is a global and open process for coordinating the organisation, management and use of spatial data and related activities)
- Global Mapping (a group of global geographic datasets of known and verified quality, with consistent specifications which will be open to the public)
- DEVELOP (the Digital Earth Virtual Environment and Learning Outreach Project of NASA Langley)
- Global Disaster Information Network (GDIN, established to improve the effectiveness and interoperability of

global systems for sharing natural disaster information, especially maps and data generated by remote and land-based sensors)

In a similar way, the synergetic impact of remote sensing and the GI will be the major theme of the ISPRS Congress in Amsterdam, selecting the motto "Geoinformation for All". Commission VII proposed its technical session related to this Congress theme be entitled "Resource and environmental monitoring – local, regional, global" with keywords data availability, accessibility, application-oriented data requirements, interoperability, spatial data infrastructures, remote sensing applications, Agenda 21, UN International Decade for Natural Disaster Mitigation.

Fundamental Research and Development on Physical Measurements and Signatures in Remote Sensing

The widest range of results in the fundamental research and development on physical measurements and signatures in remote sensing were highlighted and discussed under the ISPRS logo at the last Courchevel international conference organised by CNES, and JRC SAI of the European Commission. The topics included physical modelling for data simulation and sensitivity studies (e.g. in agriculture, recovering surface temperature and emissivity from thermal infrared multispectral data), inversion methods (used e.g. in satellite measurements and vegetation models for carbon cycle studies). In data pre-processing mostly the AVHRR, SPOT, ERS data were handled, also paying attention to the atmospheric influences on field spectrometry (i.e. the observed relationship between spectral irradiance and the variance in spectral reflectance). The atmospheric correction for short-wave sensors (e.g. MODIS, POLDER, VEGETATION, MERIS) have also been investigated. The physical modelling using experimental test areas for calibration of satellite sensors focused on coupling ground, airborne and Earth observation data. Investigations were mostly related to agriculture, highlighted by leading laboratories such as INRA, USDA RSRL, JRC SAI and CESBIO. As examples, assessment directional properties of emissivity and radiative temperature of vegetal covers, use of stochastic model for determination of leaf properties in the optical range, bi-directional measurements of leaf reflectance and transmittance as far as different land cover types and surface components to standardise vegetation indices or analysis of model sensitivity due to the impact of spatial and temporal variability of canopy and soil characteristics can be mentioned. The use of 3-D plant modelling and measurement in remote sensing was also introduced. The estimation of bio- and geo-physical/chemical variables was reviewed in depth. The application-oriented developments include land-use classification with the aid of neural networks, land subsidence mapping by differential SAR interferometry and modelling and characterisation of soil salinity in irrigation systems, as well as monitoring urbanisation and de-forestation using remotely sensed data. Using AVIRIS data-based algorithm, about 1 million reflectance spectra have been analysed, showing a range of spectral characteristics indicative of vegetation species. The "leaf water parameter" has been derived, which is shown to be strong indicator of leaf thickness and canopy spectra. Due to the fact that monitoring agricultural crops and estimating yields has become an issue of great importance, both for economic planners and for agribusiness, assimilation

of satellite data in crop monitoring and yield prediction has also been targeted. The technology has also been developed in small countries (such as Hungary, where - based on a 20 years R+TD with 300 man-year investment at FÖMI RSC - crop monitoring and yield estimation by multiplatform satellite remote sensing is operationally used and has been serving the decision-makers since 1997). The opportunities for, and limitations of remote sensing in precision farming were recalled by S. Moran at describing four major requirements as follows:

- Real-time information for on-the-go management
- Information on seasonally stable conditions (mapping long-term variability)
- Information on seasonally variable conditions (mapping short-term variability), and
- Information required to determine cause of variability and develop a management strategy.

Another field of investigations was the remote sensing-based impact assessments of environmental change, with targets estimating the status of terrestrial vegetation and with special emphasis on the tropical forests, the monitoring of urbanisation and analysis of enhanced plant growth in the high latitudes of the Northern Hemisphere. The VEGETATION potential for desertification monitoring, simulation of sand movement detection in Northern Africa, synergistic use of passive and active microwaves over semi-arid and peri-arctic regions, as well as discrimination of wetland and non-wetland community types with multi-spectral, multi-angle polarised POLDER data were highlighted and discussed.

Instruments Introduced in Application-oriented Environment at ISPRS Commission VII Related Conferences and Symposia

The most widely used sensors include AVHRR, Landsat, SPOT, IRS, ERS, JERS, METEOSAT, RADARSAT, MOMS-Priroda, KVR-1000 and SPIN-2. The ISPRS-CNES-JRC Courchevel conference and ISPRS-ISSR symposia highlighted the following airborne or space remote sensing instruments:

- AVIRIS NASA's airborne visible/infrared imaging spectrometer (used in spectral reflectance studies by R. Green of NASA JPL and D. Roberts of UCSB)
- IRSUTE – a minisatellite project for land surface fluxes estimation using hi-spatial resolution thermal infrared (introduced by B. Seguin et al, of INRA, LSIT-ENSPS and CNES)
- MERIS - medium resolution imaging spectrometer (introduced by ESA HQ and ESA/ESTEC, as well as by Jan G.P.W. Clevers of Wageningen University, Co-chair of ISPRS WG VII/1)
- SAR interferometry and its use (M. Zink et al of DLR)
- HSSL (Hot-Spot Search Light) using active illumination and multi-directional detection that would allow hotspot angular distribution measurements from space in a searchlight mode in order to retrieve leaf size and canopy height (introduced by A. Gerstl of Los Alamos Nat. Lab.)
- Positive Systems's HYDICE hyperspectral push-broom sensor (introduced by R. Pollina et al of Bechtel Nevada)
- Operational Hyperspectral Imager (introduced by Dornier-GeoFZ-CCRS)
- COIS (NEMO) and Warfighter (OrbView-4) and Hyperion

- (EO-1) (introduced e.g. by S. Blonski et al of Lockheed Martin and NASA CRSP in relation to satellite hyperspectral imaging simulation)
- HYPERION (EO-1, introduced by J. Pearlman et al of NASA CRSP)
 - Litton Emerge's airborne digital imaging system (using 6 Mpixel Kodak 640 DCS with GPS and INU)
 - APEX (Airborne PRISM experiment – a new airborne hyperspectral imager for the simulation of ESA's Land Surface Processes and Interactive Missions, as introduced by M. Shapman et al)
 - IFSAR (interferometric SAR, introduced by B. Housmand, JPL CALTECH in sensor integration with AVISRIS for urban analysis)
 - CASI compact airborne spectrographic imager (introduced by M.R. Davenport developing practical tools for shadow removal and also by K. Staenz of CCRS, Chair of the ISPRS WG VII/1 in classification of hyperspectral agricultural data with spectral matching techniques)
 - LWIR AIRIS multispectral infrared imaging chemical sensor (introduced by C. Gittins of Physical Sciences Inc) also referred as Adaptive Infrared Imaging Spectroradiometer
 - ASAS advanced solid state array spectroradiometer as used in the impact analysis of the 100-year event ice storm in US/Canada in January 1998.

Participation at the UNISPACE III, Vienna

Dr. D.P. Rao of NRSA, Chair of the ISPRS WG VII/2 delivered a lecture on "Sustainable development and remote sensing" at the ISPRS Workshop chaired by John Trinder (UNSW) and Klaas Jan Beek (ITC) devoted to "Resource Mapping from Space" on 10th June, 1999. The contribution of G. Csornai et al of FÖMI RSC, core members of WG VII/2, gave an in-depth overview on the operational crop monitoring and production forecast by remote sensing in Hungary. The papers can be found in the ISPRS International Archives Vol XXXII Part 7C2.

"The Special UNISPACE III Volume" published in July, 1999. The volume contains the papers of the ISPRS-EARSeL Workshop devoted to "Remote sensing for the detection, monitoring and mitigation of natural disasters, as well as the ISPRS/NASA Seminar on "Environment and Remote Sensing for Sustainable Development".

Goal: Supporting Information Requirements Posed by the Kyoto Protocol

In 1999, ISPRS VII/5 Working Group activities lead by Ake Rosenqvist were focused on the potential of remote sensing in the context of the 1997 Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC). The Kyoto Protocol stipulates quantified and legally binding national commitments on greenhouse gas emissions, and a principal aim of the working group has been to assess the potential and limitations of global scale remote sensing in the context of the Protocol, with particular emphasis on forest inventories and change monitoring of global carbon stocks. The review of available and future technology for monitoring treaty compliance was the subject of the meeting organised as shared team effort by Ake Rosenqvist of DG JRC SAI, Marc Imhoff of NASA GSFC, Tony Milne of UNSW and Craig Dobson of UoM, as joint action of the ISPRS VII/5 (Global monitoring) and VII/6 (Radar applications) working groups include co-operation

with the hosting University of Michigan (Dept. of Electrical Engineering and Computer Science, EECS) in Ann Arbor, October 20-22, 1999. The Protocol requirements on biomass monitoring were assessed and the capabilities of current and future RS sensors to meet those requirements were addressed. Particular emphasis was put on the potential of low frequency SAR sensor technology in improving the current capacity to perform quantitative biomass assessment from space, in service of the Kyoto Protocol. Meantime, the Report has been published entitled: Remote Sensing and the Kyoto Protocol: a review of available and future Technology for Monitoring Treaty Compliance". I would emphasise two of the recommendations of the authors made in the Report:

"Although political in nature, the global impact of the Kyoto Protocol on technical and scientific issues of relevance to the remote sensing community is considerable and unprecedented. Issues related to the Protocol, in particular to afforestation, reforestation and deforestation (ARD) activities, will affect the work of the scientific community for years to come. Consequently, it is recommended that a considerable part of international remote sensing research activities be focused and aligned to fulfill, the specific information needs posed by the Kyoto Protocol and, in a broader context, the needs relating to full carbon accounting and an improved understanding of the terrestrial carbon budget. Research topics of specific relevance, not only related directly to remote sensing but also to the need for adequate in-situ information, have been identified above", and

"The ISPRS, being an international organisation without national bias, can play a significant role in this context. It is therefore proposed that the ISPRS, in particular Commission VII (Resource and Environmental Monitoring), for its next mandate period, 2000-2004, forms a dedicated Kyoto Task Force with the aim of promoting and stimulating remote sensing research and development aligned with the topics identified above".

Some of the recent, significant technical breakthroughs include:

- After the successful launch of Ikonos 2, the era of the very high resolution satellite remote sensing has come true, having a positive impact on application-oriented R+D activities and it is anticipated that the commercial market will be increased significantly, especially if competition begins. In the mid-term, imagery will become one of the base data of many of public inventories and registers having a geospatial referencing possibility or requirement. Improved EO systems and knowledge-based information systems will facilitate the contribution of science to problem-solving in burning issues related to environment and resource monitoring.
- The development of virtual laboratories enabling knowledge-based effective design, analysis, simulation, optimisation and verification of application-tailored RS systems within pure software environments.
- According to the Landsat Remote Sensing Policy Act of 1992, NASA is charged to ensure Landsat data continuity through the use of advanced technology. Such a service will ensure long-term stability operational applications in environmental and resource monitoring at local, regional and global level. Final preparation of NASA's New Millennium programme Earth Observing-1 should

be mentioned, it having revolutionary land imaging instruments all in line with the Landsat 7 ETM+ (ALI, the advanced land imager, Hyperion, the imaging spectrometer and AC, the atmospheric corrector). Similar Earth-observation-oriented R+D achievements can be reported at ESA, NASDA, ISRO, and within other programme implementation. Nodal points of the institutional network (JRC SAI, CNES, DLR, CCRS, NASA, NRSA, AC, AUSLIG, INPE etc) have become inevitable fundaments for the wider global spatial data infrastructure.

- Advances in hyperspectral imagery (HSI) exploitation and field spectroscopy instrumentation using standardised spectral library. Achievements in this field were presented at numerous conferences, most notably at NASA's Annual AVIRIS Earth Sciences and Applications Workshop (Pasadena, 1999, 2000), the International SPIE Conference on Imaging Spectrometry (Denver, July 1999) and at the ISPRS Working Group VII/1 supported ISSSR symposia (San Diego, December 1997 and Las Vegas, November 1999).

Accomplishment of Commission VII (1996-2000)

For the years 1996-2000 a new Working Group structure was set up as follows:

WG VII/1	Fundamental Physics and Modelling
WG VII/2	Application of Remote Sensing and GIS for Sustainable Development
WG VII/3	Application of High Resolution Satellite Imagery
WG VII/4	Automated Image Interpretation and Analysis
WG VII/5	Global Monitoring
WG VII/6	Radar Applications
WG VII/7	devoted to "Non-renewal resources and geo-technical applications"

In Vienna, a co-operation between WG VII/5 and WG IV/4 on large/global dataset management was suggested and accepted. Invited Advisory Board members of Commission VII served as rapporteurs:

Sergio Camacho (OOSA, United Nations, AUSTRIA), Simonetta Cheli (ESA, FRANCE), Roberto Pereira da Cunha (U) and Thelma Krug (INPE, BRAZIL), Ake Rosenqvist (NASDA, JAPAN, later DG JRC SAI) and Charles T. Wooldridge (NOAA, USA).

Dissemination of Commission VII Related Information

The Internet web-pages of Commission VII were maintained by H.Goodenough and Paul Pilon in Victoria, Canada (<http://www.hegyi.com/isprsc7>). Mirrored web-pages can be accessed also at the Budapest Technical University, mastered by István Sándor (<http://mhsz.bme.hu/>).

Relevant Workshops and Seminars with Active Participation by ISPRS Commission VII

The actual scientific work of the Technical Commission was done in the seven Working Groups. However, some activities of the Commission officers are summarised as follows:

- *MERA 92 International Workshop on Soil Degradation Assessment* with the application of GIS and remote sensing. Budapest, September, 1996. Topics: Regional crop/land use inventory, Crop yield modelling, Forest ecosystem mapping, Land degradation assessment and related issues.
- *International Seminar Series - Land use from research*

to Teaching held at the Agricultural University, Debrecen Hungary December 1996. Topics: land use, rural development and land consolidation, use of remote sensing, aerial survey for sustainable agriculture.

- *Conference "Emerging Global Spatial Data Infrastructure"* Bonn-Königswinter, September, 1996. Organised by DDGI, AI, ILI, FIG Com.III, EUROGI. ISPRS was represented by Commission III and VII (Prof. Fritsch and Remetey-Fülöpp respectively)
- *ECO-INFORMA'96 Global Network for Environmental Information* Lake Buena Vista, Florida USA November, 1996 Organised by ERIM, NOAA-NESDIS, USDE, and others. Session Co-chair and lecturer was Dr. V.H. Singhroy, Co-chair of ISPRS WG VII/2.
- *EURISY Colloquium: Earth Observation and the Environment: Benefits for the Central and Eastern European Countries.* Budapest, May, 1997 in presence of Hubert Curien, Founder president of EURISY, chaired by G. Duchossois of ESA, V. Perdigao of DG JRC, Gottfried Konecny of IPI/ISPRS, H.Curien of EURISY and G. Remetey-Fülöpp of ISPRS Commission VII. Presentations included land cover project (Gy. Büttner), crop monitoring (G. Csornai), European Forest Inventory (S. Folving), satellite data for map updating (P. Winkler).
- *2nd world conference on "Global Spatial Data Infrastructure for Sustainable Development"* October, 1997, Chapel Hill NC, USA
- *International Symposium of Spectral Sensing Research*, San Diego, December, 1997
- *Inter-commission Workshop was prepared on GIS, Airborne Remote Sensing and Geospatial Data Clearinghouse* in Budapest, February, 1998 by ISPRS Commission III with direct involvement of President Toni Shenk, WG III/3 Co-chair Beáta Csathó (Ohio State University, Columbus) and Secretary Erzsébet Merényi (Arizona University, Tucson). Topics included geospatial databases, state-of-the-art of tools and methods, including photogrammetry, remote sensing, airborne geophysics, multispectral, hyperspectral sensors and methods, geophysical and geological interpretation methods, as well as multiple sensor integration.
- *ISPRS Council Strategic Planning Meeting* Silver Spring, March 1998. Written contribution based on completed questionnaire, sharing the views on ISPRS long-range strategic planning.
- *On accessibility of remotely sensed data – a vision.* Edited by Alison Munro of the Space Application Institute of the Joint Research Centre and contributed by G. Remetey-Fülöpp, the document entitled "A strategic view of GIS Research and Technology Development for Europe", has been published by the European Union.
- *The mid-term Symposium of the Commission VII (ECO BP'98)* on Resources and Environmental Monitoring. Budapest, September 1998. The event attracted 196 registered participants (including many of the ISPRS Council members) from 33 countries of 5 continents (35 from Hungary). Moreover, 62 invited Hungarian senior decision-makers and an additional 59 professional visitors attended the open day devoted to commercial exhibitions and presentations. From the scientific point of view, ECO BP'98 was a great success. Major application areas where novel research and technology development methodology were applied

include hyperspectral sensing, environmental risk and/or site analysis, global and regional and local monitoring, as well as assessments related to sustainable developments. The synergetic integrated use of RS and GIS technologies was the case in the majority of applications. By recommendation of the TCP, Peter Winkler, Secretary of the Commission VII was invited by Editor-in-Chief Dr. Manos Baltsavias to serve the Editorial Board of ISPRS Journal.

- *Information distribution related to ISPRS Commission VII activities.*

The early results of the ECO BP'98 were presented for the audience of the Annual GIS Workshop held in Cluj, Romania by dr. Gábor Remetey-Fülöpp in October, 1998. The event was organised for the third time by the Dennis Gábor Foundation with the main objectives of promoting the application of IT-based technologies with special emphasis on spatial data handling and analysis.

- *ISPRS on the agenda of the Annual Space Day attended by COSPARs President.*

The Annual Space Day was held in Budapest on October 20, 1998 in the presence of Dr. Gerhard Haerendel, President of COSPAR, Director of the Max Planck Institut für Extraterrestrische Physik. Based on the presentation material compiled by the Technical Commission President, Peter Winkler delivered a lecture on the ISPRS Symposium. The event was hosted by the Hungarian Space Research Office directed by dr. Előd Both, and the Hungarian Astronautical Society under the presidency of dr. Iván Almár. It should be mentioned, the Committee on Space Research (COSPAR) celebrated its 40th year in 1998.

- *Remote sensing content in applications related to European integration.*

At the Database Service Providers' Annual Conference, the use of GIS/RS as tools in European integration-related tasks were discussed in Budapest, in November, 1998. Four presentations were in line with the Commission VII activities: "CORINE Land Cover" (Gy. Büttner), "GEIX the European Geological Information eXchange System" (G. Erdélyi), "UNDP project on the applicability of DAIS for hyperspectral survey of Hungary" (P. Kardeván) and the "Multipurpose parcel-based information system" (A. Podolcsak et al).

- *3rd Conference on the Global Spatial Data Infrastructure.*

According to the recommendation of the 3rd Global Spatial Data Infrastructure (GSDI) Conference, "The organisational model recommended for the GSDI in the long run is the umbrella organisation which brings together regional committees, national committees, and other relevant international institutions e.g. ISO, OGC, ISCGM, ISPRS, ICA, etc in the context of action-oriented principles of flexibility, inclusivity and simplicity. As member of the GSDI Steering Committee, G. Remetey-Fülöpp attended the event hosted by AUSLIG in Canberra, between 17-19 November 1998. Before the conference, he had the opportunity to hold a two days consultancy on the workplan and follow-on actions at UNSW with ISPRS Secretary General Prof. John Trinder, Prof. Tony Milne and Prof. Bruce Forster.

- *UN ECE MOLA Workshop on Land Market.*

Over 120 registered participants of 20 countries attended the first workshop of the Meetings of Officials

of Land Administrations hosted by the Ministry of Agriculture and Regional Development of the Republic of Hungary under the auspices of the United Nations Economic Council for Europe. The Workshop held in Budapest in December 1998, highlighted and discussed the technological aspects and tools with special emphasis on photogrammetry, remote sensing and GIS.

- *European Spatial Metadata Infrastructure (ESMI) Workshop.*

Three countries were selected (Netherlands, Portugal and Hungary) to ensure direct feedback from the data provider, data broker and data user communities on a national level. The full day international meeting devoted to the metadata standards and services was held in Budapest. Relevant ISO, FGDC, CEN and OGC standards were discussed. The ESMI project is part of the INFO2000 Program of the European Union, participated in also by the Space Application Institute of the Directorate General JRC of the European Commission, providing expertise in cataloging and servicing remotely sensed data.

- *Remote Sensing for sustainable agriculture and rural development.*

The early results of the German-Hungarian pilot project on land consolidation called TAMA, as well as the applicability of the by-products of the remote sensing-based Hungarian Crop Monitoring Program were demonstrated and discussed at the Dutch-Hungarian expert meeting. TAMA Project, lead by Dr.W.D.Kneib, utilised merged SPOT panchromatic and multispectral imageries for site assessments and landscape planning in five pilot areas, while the Crop Monitoring Program lead by Gábor Csornai of FÖMI RSC uses AVHRR, Landsat, SPOT and IRS data.

- *ISPRS Council and Technical Commission Presidents' Joint Meeting.*

Commission VII was represented at the ISPRS Council and Technical Commission Presidents' Joint Meeting held in Stuttgart and Bad Wildbad in September, 1998.

- *Conference on structural change in the farming sector in Central and Eastern Europe.*

Organised by FAO, the European Commission and the World Bank in Warsaw, in June 1999, the conference was devoted to the structural change in the farming sector in Central and Eastern Europe. The Hungarian approach using remote sensing in monitoring was presented by G. Remetey-Fülöpp.

- *EARSeL/ISPRS workshop on "Fusion Sensor Data, Knowledge Resources and Algorithms for Extraction and Classification of Topographic Objects"* took place in June, 1999 in Valladolid, Spain. The workshop was organised by ISPRS WG III/5 "Remote Sensing and Vision Theories for Automatic Scene Interpretation", WG IV/3 "Integration of Image Analysis and GIS" and WG VII/4 "Computer Assisted Image Interpretation and Analysis" together with EARSeL SIG. The Valladolid symposium, also an inter-commission action, had been very successful and the income generated had been allocated to award travel grants to some students to attend the ISPRS Congress in Amsterdam in July 2000.

- *GSDI Steering Committee meeting.*

At the meeting held in St. John's College, University of Cambridge in July, 1999, Tim Foresman, leader of NASA's Digital Earth Concept was invited to deliver a presen-

tation for the Commission VII flagship session in Amsterdam.

- *The UNISPACE III Conference and Exhibition* was held in Vienna in July 1999. The Earth Observation session by was actively attended in WG VII/2 Chair Dasika.P. Rao, WG VII/2 Co-chair Vernon Singhroy, the TCP and both Commission Secretaries (Peter Winkler and Frank Hegyi). In Vienna, lecturers were selected and invited for the ISPRS Congress session TC VII-1 devoted to the event's topics: "Geo-information for All". The personalised invitation was accepted by Prof. Gottfried Konecny, He Changchui of FAO, Gábor Csornai of FÖMI RSC and D.P. Rao of NRSA.

- *ISPRS Council and Technical Commission Presidents' Meeting.*

In September 1999, G. Remetey-Fülöpp attended the ISPRS Council and TCPs joint meeting held in Enschede and Delft, having also the opportunity to make a site inspection of the RAI in Amsterdam, venue of the Congress.

- *The International Symposium on Spectral Sensing Research (ISSSR)* was for a second time organised by the US Army Topographic Engineering Center's GIS/Remote Sensing Center in co-operation with ISPRS Working Group VII/1, with the personal active involvement of Chair Karl Staenz. TEC Director Dr. William E. Roper and ISPRS Commission VII President G. Remetey-Fülöpp opened the event in the Tropicana Hotel of Las Vegas, on November 1, 1999. Jan Clevers, Secretary of WG VII/1 and liaison officer of the ISPRS Congress to Commission VII, as well as Prof. James Taranik Co-chair of WG VII/7, took part in the event having the motto "Systems and sensors for the New Millennium". The Symposium was attended in by 117 experts of 11 countries. The 27 exhibited posters included two last minute contributions from Europe highlighting applications in operational countrywide crop monitoring and yield estimation, as well as water-log monitoring featuring integrated use of remote sensing and GIS. (both prepared by Gábor Csornai et al of FÖMI RSC).

- *Workshop on Geographic Information Management.*

Using the Space Imaging electronic press release, the first Ikonos digital, high resolution satellite imagery was introduced for the first time in Hungary to the wider professional community at the FIG Commission 3 International Workshop on Geographic Information Management in a lecture delivered on the knowledge transfer project called PANEL-GI, in Budapest in October, 1999.

- *Workshop on Data Policy.*

Attended by invited experts from ten countries, an EUROGI-European Commission Data Policy Workshop was held in Amersfoort, the Netherlands on 15th November, 1999. National and Regional Perspectives were highlighted and discussed. G. Remetey-Fülöpp used the occasion to underline the emerging importance of "imaging". Attention was called to recent, related policy actions and can be found in the most recent following references: ASPRS policy on Earth Observation data acquisition and distribution policy with special emphasis on the advancement in imaging and geospatial information related technology (Published in: Photogrammetric Engineering and Remote Sensing, November, 1999) and "Earth Observation

Data Policy and Europe" (EOPOLE) Newsletter Issue 1-4, 1999 with information on data volume, ground infrastructures and distribution technologies, e-commerce, metadata, property rights, data policy etc.) More information: Prof. Ray Harris of ISPRS Commission II (rharris@geog.ucl.ac.uk). The Newsletter summarises the output of the workshop held on the subject in Oberpfaffenhofen from 7-9 July 1999. Also, the CEOS WGISS 8 Pre-workshop on EO data policy /intellectual rights 11 May 1999 are described in IACGEC - the Framework Principles on Data Policy agreed by the UK Inter Agency Committee on Global Environmental Change. The framework principles are introduced in the UNISPACE III Folder presented by University College London (same source as above). The edited proceedings prepared by Prof. Max Craglia has been published by the Space Application Institute of DG JRC.

- *5th Conference on the use of remote sensing in the control of agricultural area-based subsidies.*

The operational use of remote sensing in agriculture is more and more inevitable. The 5th Conference on the use of remote sensing in the control of agricultural area-based subsidies, chaired by Olivier Leo of SAI JRC, was held in Stresa in November 1999. The appearance of the new, very high resolution satellites will open a new line for cost-benefit analysis and pilot applications.

- *3rd GEIXS (ESPRIT) Workshop.*

The Workshop held in Budapest in December 1999 was devoted to "The future of geo-referenced information exchange in Eastern Europe and the NIS area". About 70 participants from more than 30 countries (mainly representatives of national Geological Surveys) were present, incl. president of ISPRS Commission VII. Established by EuroGeoSurveys, GEIXS has set up a new, harmonised metadata architecture for European environmental and natural resource information. The follow-on actions (year 2000-2002) focus on environmental data such as natural hazards, pollution and contaminated land. GEIXS put the weight on a public-access one-stop shop of interlinked information catalogues and indexes, which are accessible on-line and based on a pan-European GIS and a multilingual keyword index (www.eurogeosurveys.org/en/geodata). The geo-science community now uses the momentum provided by EU support for the topic: Remote Sensing of Environment. Main conclusion was the call for co-operation, standardisation and patience.

- *Preparation for the ISPRS Congress.*

The officers of Commission VII evaluated more than threehundred incoming proposals for the ISPRS Congress 2000. The well-organised schemes and procedures applied by Congrex and Internet worldwide communication enabled the Commission to fulfill the enormous task in due time.

- *ISPRS Council Meeting Budapest.*

Hosted by the Hungarian Society of Surveying, Mapping and Remote Sensing Conference venue: FÖMI RSC, April 5-6 and 11, 2000

- *ISPRS Seminar on Photogrammetry and Remote Sensing at the Millennium.*

Held in Budapest on April 7, 2000. Council and Technical Commission Presidents delivered lectures to an audience mainly of representatives of the Hungarian remote sensing community.

Links with Regional Organisations

Commission VII Secretary Peter Winkler, as member of the EARSeL Bureau, keeps daily contact with the European Association of Remote Sensing Laboratories. Commission VII President Gabor Remetej-Fülöpp, as a member of the Executive Committee of EUROGI, ensures links with the European Umbrella Organisation of Geographical-Information, which plays a leading role in the European GI policy making.

Working Group VII/1 - Fundamental Physics and Modelling

Chairman: Dr. Karl Staenz (since 1997), (Former: Dr. Gerald Guyot, INRA, France)

Co-Chair: Dr. Jan G.P.W.Clevers, AUW, The Netherlands (since 1997) (Former: Dr. Thierry Phulpin, France)

Secretary: Dr. Phil Teillet, CCRS, Canada (since 1997)

Terms of Reference

- Physical measurements and modelling related to remote sensing
- Studies of spectral measurements and calibration at different spatial scales
- Standardisation and harmonisation of experimental methods and procedures in remote sensing
- Remote sensing of minor constituents of the atmosphere
- Spectral, spatial and temporal radiation and polarisation properties of objects

Accomplishments of ISPRS WG VII/1 1996-2000

- The 7th International Symposium on Physical Measurements and Signatures in Remote Sensing took place in Courchevel from 7th to 11th April 1997. It was organised by the French Space Agency (CNES) and the Joint Research Centre (JRC/SAI) of the European Commission under the auspices of ISPRS, with the support of NASA, CNRS, INRA, DLR, ESA and NERC. The Symposium was also sponsored by the following scientific societies: European Association of Remote Sensing Laboratories (EARSeL), Association Québécoise de Télédétection (AQT), Canadian Remote Sensing Society (CRSS), The Remote Sensing Society (RSS) and the Société Française de Photogrammétrie et de Télédétection (SFPT).

This symposium was a continuation of the series of six symposia organised since 1981 by the Working Group VII/1.

It focused on the following topics: analysis of the relationships between the specific properties of a target (plant canopies, soils, rocks, water bodies, snow, ice) and its spectral characteristics in different spectral domains (from ultraviolet to microwaves), and determination of the factors affecting the spectral response of an object (atmospheric effects), measuring techniques, development of interpretation models. The success of these symposia was reflected by the gradual growth in the number of submitted papers, (more than 40 % of the papers were rejected for the last symposium held in Val d'Isère), while the number of participants increased from 220 to 316 (representing 24 countries). This Symposium has become during the past years one of the major international scientific meetings in the domain of the research in remote sensing and it provides a valuable overview of current research on earth resources

and environmental monitoring. However, the increasing audience was seen as limiting one of the specific characteristics of the first meetings, that was to facilitate exchanges and discussions among participants. Therefore, it has been decided to limit the number of participants to about two hundred, presumably leading to a more severe selection of the submitted papers. About 220 abstracts were received and selected by the International Scientific Committee. The number of participants was around 240. Publication: Abstracts of the 7th International Symposium on Physical Measurements and Signatures in Remote Sensing, 7-11 April 1997, Courchevel (France), G. Guyot Ed. CNES Toulouse (France), 434 pp.

Chair Karl Staenz personally participated in the preparation of the *International Symposium on Spectral Sensing Research* held in San Diego. A special issue of the journal *Remote Sensing of Environment* with refereed papers arising from this symposium went to the press. Emphasis in the future will be on the development of hyperspectral remote sensing with spaceborne sensors under construction, such as the US Navy's Naval Earth Map Observer (NEMO) and Orbimage's Warfighter, as well as sensor systems in a planning stage such as the Australian Resource Information and Environment Satellite (ARIES) and the German Smart SPECTRAL imaging spectrometer. The synergistic use of data from these sensors with other optical instruments and SAR is another WG priority. Other objectives include the validation and use of parameters derived from calibrated satellite sensor data in land process models, as well as the utilisation of the BRDF effect for the extraction of information as stipulated in ESA's Land-Surface Interactions Mission (LSPIM).

The major activity of WG VII/1 was the organisation of *two sessions at the ISPRS VII mid-term symposium "ECO BP'98 - International Symposium on Resource and Environmental Monitoring"* held in Budapest, September 1998. The topics of the sessions were as follows:

- Towards improved geometry and radiometry of remotely sensed data;
- Experimental methods and procedures in remote sensing.

Nine papers were presented during the sessions. Highlights included surface reflectance retrieval incorporating linear polarization and georadiometric effects, stereo-matching using neural networks, and signal-to-noise improvements involving multiple linear array CCDs. Additional topics covered the correction of airborne and satellite attitude platform fluctuation. A new hyperspectral airborne sensor system, APEX (Airborne PRISM Experiment), was presented. This system is currently under development by ESA for use with its spaceborne PRISM (Processes Research for Imaging Spectrometry Mission). Experimental results were presented on the retrieval of leaf area index (LAI) extracted from end-member fraction images with a new method.

Much of the research and development related to the WG topic has been reported in recent workshops and conferences. Progress in the fundamental development of imaging spectrometry (hyperspectral remote sensing) was presented at NASA's 6th Annual Geoscience and Airborne Workshop (Pasadena, January 1998), the International SPIE Conference on Imaging Spectrometry III (San Diego, July 1998), and the 1st EARSeL Workshop on Imaging Spectroscopy (Zurich, October 1998).

The main event in 1999 for the WG VII/1 was the involvement in the organisation together with the US Army Topographic Engineering Center (TEC) of the *International Symposium on Spectral Sensing Research (ISSSR)* held in Las Vegas in October. The theme of the symposium, was "Systems and Sensors for the New Millennium", emphasising the next generation of capability in data acquisition, analysis and product generation. This was the fifth symposium in a series of outstanding events covering both military and civilian research in the field of spectroscopy. Hyperspectral image simulation and the design of spectral libraries were featured at the symposium. There was also a mix of military and civilian applications, including minefield detection (including the detection of disturbed soils), military target detection, chemical and biological agent, and disaster mapping and monitoring. Special attention was paid to spectral mixture analysis (both linear and non-linear) and spectral matching techniques. Use is not only made of the reflective, optical part of the spectrum, but also of the thermal infrared and microwave parts.

ISPRS is now a CEOS affiliate. At the *14th meeting of the CEOS Working Group on Calibration and Validation (WGCV, Tokyo, July 1998)*, it was recommended that a special session on CEOS Cal/Val be proposed for the next ISPRS Congress in Amsterdam in 2000; the four most relevant ISPRS Working Groups, including WG VII/1, will be invited to help coordinate and participate in this session. The main WG VII/1 activity for 2000 will be involvement in the ISPRS Congress to be held in Amsterdam in July. Imaging spectrometry will continue to be of special interest to the WG. Apart from the ISPRS Congress, this topic will be featured at many conferences in 2000, most notably at NASA's 9th Annual AVIRIS Earth Sciences and Applications Workshop (Pasadena, February), the International SPIE Conference on Algorithms for Multispectral, Hyperspectral, and Ultraspectral Imagery VI (Orlando, April), and the International SPIE Conference on Imaging Spectrometry VI (San Diego, August).

Successful negotiations continued and concluded with CNES regarding the possibility of holding the 8th International Symposium on Physical Measurements and Signatures in Remote Sensing, which has traditionally been the main event of WG VII/1, at the beginning of 2001 in the French Alps. The ISPRS Commission VII Colloquium on "spectral signatures" organised by CNES will take place in Aussois, from January 8th to 12th and will be hosted in the Paul Langevin centre.

Working Group VII/2 - Application of Remote Sensing and GIS for Sustainable Development

Chair: Dr. Dasika P. Rao, NRSA, INDIA (Since 1996)

Co-Chair: Dr. Vernon Singhroy, CCRS, CANADA (Since 1996)

Terms of Reference

- Development of concepts for sustainability indicators
- Promotion of applications in environmental and natural resource management
- Monitoring and assessment of environmental hazards and disasters
- Monitoring environmental changes including socio-economic factors

State of Science and Technology of WG VII/2 Topics

The Rio Summit 1992 envisaged that Remote Sensing and GIS would have a prominent role in promoting efforts for sustainable development. The agricultural production in the Third World countries is not able to meet the needs of the growing population in these countries. This is because the advantages accruing from science and technology are not fully exploited and a holistic approach for development needs to be exercised. If the development of rural areas has to sustain a growing economy and ensure ecological balances, an integrated approach is required to make optimal use of land and water resources. The satellite remote sensing applications for agriculture, soil, water and land management offer ample scope for the preparation of an integrated plan for an action programme for achieving the sustainable development of renewable natural resources. The data from Indian Remote Sensing Satellite series, including the latest state-of-art technology satellites IRS 1C/1D which have 5.8 m resolution camera, 23.5 m multispectral camera and 188 m Wide field Camera with a re-visit period of 5 days, have provided valuable information at operational scale in this Project. This approach needs to be further refined taking into account the need to identify indicators for sustainability. The approach to improvement of the environmental conditions, monitoring of such improvements through remote sensing and the impact of the implementation activities on the social fabric at the grass root level will have a far reaching effect on the utility and acceptability of Remote Sensing and GIS techniques.

Activities and Accomplishments of WG VII/2

An International Workshop on Sustainable Rural Development using integrated GIS/Remote Sensing was conducted at the National Remote Sensing Agency, Hyderabad from 17th-21st, September 1996, where participants from thirteen developing countries participated, sponsored by UN-ESCAP. The Workshop unanimously resolved that the holistic approach to rural development using Remote Sensing and GIS is in the right direction and that it should be pursued in all developing countries where it is relevant.

The Indian Society of Remote Sensing (ISRS), which is a member of ISPRS, during its annual convention on 4th December, 1996 at Puna, India organised a *Special Session on ISPRS WG VII/2 activities* with the following topics: Application of Remote sensing in Sustainable Rural Development, Recent Advances in Remote Sensing Technology Data Processing and GIS and a Short course on "Environmental Modelling and GIS" which may address the activities requested in the Agenda 21, including: Strengthening the basis for sustainable development, Building up scientific capacity and capability, Improving the analytical and predictive tools required to better understand the environmental impacts of development and Expand predictive modelling of the Earth systems.

Preparation of the International Conference on Remote Sensing and GIS/GPS (ICORG-97) by Prof. Muralikrishna, March, 1997 at the Jawaharlal Nehru Technological University, Hyderabad, India. Focal themes: GIS/GPS for micro level planning; additional topics: GIS/GPS technology and applications, Applied Remote Sensing for Land Resources, Applied Remote Sensing for Water Resources, Applied Remote Sensing for Marine Resources, Integrated Surveys for Sustainable Development, Digital Image Processing,

Issues of Standardisation of Data, Data Formats and Business Geographics.

An International Workshop on Applications of Remote Sensing and GIS for Sustainable Development was organised by WG Chairman D. Rao from November 24th-25th, 1997, Hyderabad, India, sponsored by the Indian Space Research Organisation, Department of Space, Government of India. The Workshop was attended by Commission I President G. Joseph (SAC, Ahmedabad) and Commission VII Secretary P. Winkler (FÖMI RSC, Budapest).

The Workshop was attended by 125 experts from eight countries. Substantial outcomes of the Workshop were identified as follows:

- There is a need for more training and awareness programmes for users to effectively take advantage of remote sensing and GIS techniques.
- Need to work towards activities aimed at making the Sustainable Development process more effective.
- Dissemination of remote sensing and GIS technology up to end-user level is a critical need. Presently, it is not adequate. Algorithms and procedures / methodologies developed should be made available more openly to all the users.
- Functional relationships between CO₂ concentrations, photosynthesis and productivity levels need to be understood more thoroughly i.e., the studies related to the effect of green-house gases on total biomass production needs to be carried out.
- Under IMSD substantial work has been done by Department of Space, Govt. of India with the utilisation of Remote Sensing & GIS in Natural Resources Management and dissemination of this information to the end users. This can serve as an example for other developing countries working in these areas.
- Detailed scientific investigations into evolving procedures for estimating carrying capacity of the land need to be carried out.
- Involvement of private entrepreneurs should be encouraged.

In the *ECO-BP 98 international symposium on Resource and Environmental Monitoring* held at Budapest, Hungary from 1st-4th September, 1998, Working Group-II made a substantial contribution. There were six sessions under Working Group-II during this period and 22 papers were presented covering various aspects of Sustainable Development and Environmental Hazards and Disasters, including an Overview Paper on Remote Sensing & GIS for Sustainable Development by the Working Group Chairman, for which he also received ISPRS Best Oral Presentation Award at the end of the session.

An International Tutorial on Remote Sensing & GIS in Decision Making for Sustainable Rural Development was conducted at the Indian Institute of Remote Sensing (National Remote Sensing Agency), Dehradun, India from October 7th-9th, 1998. There was overwhelming response in attendance at the Tutorial by the experts from various developing countries, including India. Seventeen scientists from various disciplines of scientific workers, academicians and scholars from nine countries of the Asia Pacific region viz. Bangladesh, Fiji, India, Indonesia, Myanmar, Nepal, Phillipines, Srilanka and Vietnam participated in the course programme. The tutorial course was suitably designed, with twelve lectures and five demonstrations covering topics on

technology, its progress and on application areas which have relevance to the needs of sustainable development. The course started with a Keynote Address on Space Technology and Sustainable Development by Dr.D.P.Rao, Chair, WG-VII/2. The Tutorial lectures were delivered by senior scientists of the Department of Space from various sub-units viz. Indian Space Research Organisation, Space Applications Centre, National Remote Sensing Agency, Regional Remote Sensing Service Centres, Advanced Data Processing Research Institute and the Indian Council of Agricultural Research. The Central Soil, Water Conservation and Research Institute, as well as scientists from Centre of Space Science Technology & Education for the Asia-Pacific Region affiliated to the United Nations were also involved in delivering the lectures. The various topics covered were "Overview of Remote Sensing Technology", Profile of Indian Satellites catering to the Developmental Needs", Satellite Data Products, Information Extraction Techniques, Application of Remote Sensing in Geoscientific studies, Land, Soil-Water, Vegetation Resources, Biodiversity and Environmental Aspects, as well as Socio-Economic Aspects. The demonstrations through computers, slides and an LCD projector were used to cover the topics on satellite data products, digital image processing and analysis, ground water & mineral investigation and land hazard mapping. Hands-on experience of the use of software (Geosmart, GELAP, Decision Space etc.) and Watershed Development & Management were demonstrated. The course ended with the distribution of certificates to course participants.

The major activity of WG VII/2 was the organisation of a *Workshop on "Environmental Modelling using Remote Sensing and GIS for Sustainable Development"* at the Indian Institute of Remote Sensing (NRSA), Dehra Dun, India on March 11th, 1999. The Workshop was organised as a part of a post-International Conference on "Geoinformatics for Natural Resources Assessment, Monitoring and Management" entitled "GEOINFORMATICS BEYOND 2000". While releasing the Abstract volume of the Workshop, Prof. Shunji Murai, 1st Vice President of ISPRS Council, gave a brief account of the activities of the ISPRS and Working Groups. He appreciated the work being done under ISPRS in India. There were 69 participants in the Workshop, from different countries including The Netherlands, Sri Lanka, Belgium, USA, Nepal and Thailand, apart from the host country, India. The Chair WG VII/2, Dr. D.P. Rao, presented an overview of the applications of space technology for sustainable development, including the next millenium's high resolution sensors like IRS-P5, Quickbird and IRS-P6. Other invited papers were presented by the senior scientists of various centres of the Dept. of Space, namely, the Indian Space Research Organisation (ISRO), the National Remote Sensing Agency (NRSA), Regional Remote Sensing Service Centres (RRSSCs), the Indian Institute of Remote Sensing (IIRS), the Space Applications Centre (SAC) and Advanced Date Processing Research Institute (ADRIN), and the Indian Institute of Science. Workshop topics covered were: Ecological analysis and modelling: Issues and challenges, present and alternate land use based on natural resource; National soil and land degradation mapping: Remote sensing perspective; Geoinformatics for forest ecosystem management: Remote sensing and GIS for modelling; Land degradation due to mining: Concepts and case studies; Remote sensing and GIS for agricultural crop acreage and yield estimation; Integrated watershed developmental planning using remote

sensing and GIS; Ground water modelling for sustainable development using GIS techniques and hydrogeomorphic criteria in ground water modelling. The proceedings of the Workshop have been published as ISPRS Archive Vol. XXXII Part 7-W9.

Dr. D.P. Rao attended the *UNISPACE-III* at Vienna in September, 1999 and presented a paper on "Sustainable Development and Remote Sensing" in the ISPRS Workshop on Resource Mapping from Space. He also discussed the future activities of the Working Group VII/2 with the Council President Prof. L.W. Fritz, Secretary General Prof. John C. Trinder and Commission President Gabor Remetej.

Commission VII has invited Dr. D.P. Rao to deliver a lecture in the "Flagship" session of the Commission VII on the "*Role of Remote Sensing and Geographical Information System in Sustainable Development*" at the ISPRS Congress "Geoinformation for All". In addition to the above, the topics of the Technical Session at ISPRS Congress 2000 in Amsterdam will include "Remote Sensing and GIS techniques for sustainable development" (in two parts) and "Mapping and monitoring natural and environmental hazards". A pre-congress workshop is also planned on the theme "Disaster Mitigation".

Working Group VII/3 - Thematic Applications of High Spatial Resolution Satellite Imagery

Chair: Prof. Bruce Forster, UNSW, AUSTRALIA (Since August 1996)

Co-Chair: vacant (Former: Dr. Tina K.Cary, EOSAT, USA till 1997)

Terms of Reference

- Data integration for urban planning and management
- Applications for improved rural management, including precision farming
- Support of local environmental impact studies

Accomplishments of the WG VII/3

This is a new Working Group for Commission VII and so has no history of previous activities. It was considered that the proposed launch, from 1997 and onwards, of a number of commercially operated satellite systems carrying sensors with resolutions of less than 1 metre would have a major impact on the spatial information sciences and industries, and it was critical that a new working group address the thematic applications of this new data. This was highlighted at the Vienna Congress in a paper by Dr Lawrence Fritz, the now President of ISPRS. It was anticipated that the first of several commercially owned and operated, very high resolution, digital Earth observing satellite systems would be launched into polar orbit in January 1997. It was considered that such an event would initiate a new era of commercial Earth observation satellites which may well revolutionise the infrastructure, processes and products of the entire photogrammetric/remote sensing/GIS community. It was proposed that "high resolution" should encompass all satellite imagery of 30 metre or less resolution, although greatest. Resolution is taken to be the picture element (pixel) size and not the IFOV (instantaneous field of view) nor the EIFOV (effective IFOV).

It was intended that the working group provide a series of scientific forums to demonstrate the applicability of the data in urban planning, precision farming, rural development and

thematic mapping. It was considered that water, forestry and civil engineering applications were also consistent with the terms of reference. In the first part of the period seven companies; Earth Watch, Space Imaging, Orbital Sciences, GDE, Resource 21 and Israeli Aircraft Industries have imaging systems under development and are establishing international strategic partnerships for reception, value-added processing, distribution and sales. In addition, there are the existing 5 metre resolution Indian IRS-1 system, now providing data in association with EOSAT, Landsat TM (30 metre), SPOT P and XS (10 and 20 metres), and a number of other government-proposed high resolution satellite systems planned by China, France, Germany, India, Japan, Russia, South Africa and Spain. The highest resolution systems proposed were by Earth Watch and GDE at 0.8 metres.

The Chair and Co-Chair of the working group proposed to contact a number of interested scientists, users and satellite operators to join the working group, to provide advice on possible research programmes, potential applications, and technical advice and launch information. This matter is now being actively progressed. It was also proposed to hold three international seminars in association with planned remote sensing conferences.

The major activity of the WG VII/3, was the organisation and conduct of a special session on high spatial resolution data at the Asian Remote Sensing Conference, held in Kuala Lumpur, Malaysia in October 1997. Approximately 280 delegates were in attendance at the conference and 192 abstracts were submitted for presentation. Papers were presented in parallel and poster sessions. Session topics included agriculture/soils, water resources, disaster monitoring, education and training, forestry, mapping from space, land use, coastal zone, oceanography and meteorology, digital image processing, geology, GIS, and global environments. In addition, three special sessions were conducted under the auspices of the International Society for Photogrammetry and Remote Sensing as part of the activities of ISPRS Working Groups (WG). The special session for WG3 had the following programme and was attended by approximately fifty persons. The agenda of the Special Session "High Spatial Resolution Image Data", under the auspices of ISPRS WG VII/3 and Chaired by Prof. Bruce Forster (WG VII/3 Chairman) at the 18th Asian Conference on Remote Sensing was as follows: "Current and Future High Spatial Resolution Satellites." (Prof. Shunji Murai), "Earth Observation Programme - Indian Scenario" Representative of the Indian Space Research Organisation. "Future SPOT High Resolution Satellite Systems." (Mr Yves Bechacq, Spot Asia). "Comparative Analysis of the Resolution of Air Photo and Satellite Digital Images." (Prof. Bruce Forster) "Space Imaging Satellite Systems and their Applications." Speaker: Susan Sinclair, Managing Director, Worldwide Distribution, Space Imaging EOSAT. "Earthwatch Satellite Systems and their Applications." (Representative of Earthwatch Incorporated, John Douglas) "Potential Market for High Spatial Resolution Data in the Asian Region." (Prof. Bruce Forster). The Session closed with an open forum.

On December 24th, 1997 Earthwatch launched the first of their high spatial resolution systems. Unfortunately, it was understood that contact failed to be made with the satellite, and according to a late January announcement, it has been lost.

The advent of high spatial resolution remote sensing image data from space means that the fields of feature extraction

from digitised air photos as undertaken by photogrammetrists, and that of image classification as carried out by remote sensing specialists, must increasingly be seen as the one activity: extraction of information from images. Both groups can learn from one another, and the Budapest conference in September 1998 has assisted in this process.

The major activities of WG VII/3 during 1998 were the organisation and conduct of a special workshop on high spatial resolution in collaboration with the *Australasian Conference on Remote Sensing and Photogrammetry*, held in Sydney, Australia in July 1998, and support of *Commission VII's Mid-term Symposium, ECO BP'98* held in Budapest in September, 1998. Professor Forster chaired the three sessions allocated to WG 3, and a number of excellent papers were presented. More details of the conference can be found in the Commission VII's Inter Congress Symposium Report published by the ISPRS Highlights Vol. 3, No 4 p-13-17, December, 1998. The major aim of the workshop was to increase both the scientific and user communities' awareness of the new data and of both the potential and problems associated with it. This was a follow-on to a similar workshop held in Association with the Asian Remote Sensing Conference in Kuala Lumpur, Malaysia, in 1997.

The themes of these workshops were directly related to the aims of the working group. Both workshops covered similar topic areas, with speakers and representatives from most of the potential system operators. The programme and speakers for the Sydney workshop were as follows:

Introduction, Professor Bruce Forster, School of Geomatic Engineering, University of New South Wales, Australia, "Current and future high spatial resolution satellites." Speaker: Larry Fritz, President, ISPRS. "Comparative analysis of the resolution of air photo and satellite digital images." Speaker: Professor Bruce Forster "Future Spot high resolution satellite systems." Speakers: Carl McMaster, Spot Imaging Services, Sydney, and Rob Lee, Spot Image.

"Bridging photogrammetric feature extraction and remote sensing image classification" Speaker: Professor Bruce Forster, "Urban and regional applications of high resolution imagery" Speaker: Professor Bruce Forster, "Space imaging satellite systems and their applications." Speaker: Mark Judd, Managing Director, Geomatics Technology, Melbourne, Australia. "Earthwatch satellite systems and their applications." Speaker: Larry Fritz, on behalf of Earthwatch Incorporated "Orbimage satellite systems and their applications." Speaker: Timothy Puckorius, Representative of Orbimage. "Analysis of market for high resolution image data" Speaker: Professor Bruce Forster.

The presentations were followed by an open forum. One of the major questions asked related to data cost. It was generally agreed that the cost would be about the same as for acquisition of aerial photography. In addition, in Malaysia, a representative of the Indian Space Program also spoke to the applications of their current and future systems. Approximately thirty people attended the workshop.

It was proposed to conduct a workshop on specific applications of high spatial resolution data in late 1999. Application areas to be addressed were considered to include:

- precision farming and high value crop monitoring
- civil and other engineering applications
- detailed urban planning and monitoring
- tourism planning and products

- large scale thematic and topographic mapping
- environmental impact assessment
- innovative incorporation into secondary school education and training in biology, geography, history & sciences

While a range of workshops were organised in 1998 as Working Group activities to provide prior-launch-information, with a view to conducting further application workshops in 1999 with real data, these did not eventuate due to lack of data resulting from unsuccessful system launches. However the year was not without success for high spatial resolution image data, as the following highlights illustrate.

September 1999 saw the launch of the first commercial, high resolution imaging satellite - IKONOS. Space Imaging began selling and distributing imagery to customers after system testing and calibration had taken place. The system has 0.82 m panchromatic resolution and 3.28 m multispectral resolution in the blue, green, red and near infrared spectral bands. It also allows for both in and cross-track stereoscopic viewing. The IKONOS sensor revisit time is 3 days, with turnaround of product delivery of the order of 2 weeks. It is expected, that the high spatial resolution image data will open up a range of new applications for remote sensing. However, it should be remembered that the highest spatial resolution satellite imagery commercially available is approximately equivalent to a 1:100,000 aerial photograph and so potential users will need to weigh up the benefits based on considerations of other factors, such as cost, radiometric resolution and availability ease of digital processing. It is hoped that these issues will be raised in the papers presented to the Congress in Amsterdam.

So far, two papers of importance to the WG have been published in the ISPRS Highlights, and are recommended reading for application scientists and potential users of high resolution image data. These were in the June and September, 1999 issues:

HIGH RESOLUTION COMMERCIAL REMOTE SENSING SATELLITES AND SPATIAL INFORMATION SYSTEMS by Lawrence W. Fritz (Vol 4, No. 2, pp 19-30, June 1999).

HIGH RESOLUTION EARTH IMAGING FROM SPACE by John Neer (Vol 4, No. 2, pp 20-27, September 1999).

These highlights illustrate the future strength of the "high resolution industry" and it is hoped that some papers relating to data from IKONOS and other systems that may be launched before the Congress date of July 2000 will be presented at the Congress. However, one can be assured that there will be plenty of papers on high resolution applications for the 2004 Congress.

Working Group VII/4 - Computer Assisted Image Interpretation and Analysis

Chair: Prof. Dr. Barbara Koch, University of Freiburg, GERMANY (Since August 1996)

Co-Chair: Dr. Alois Sieber, EC JRC, ITALY (Since August 1996)

Terms of Reference

- Integration of remote sensing with geospatial data
- Multi-spectral, multi-resolution and multi-sensor data for image interpretation
- Knowledge encapsulation for purposes of automatic image analysis
- Investigation of performance of advanced classification techniques

Objectives

The main field of interest of the WG VII/4 is the development of data fusion and combination techniques for multisensor data analysis and the development of algorithms to analyse spatial structure diversity. With the availability of low to very high spatial resolution satellite data with different spectral characteristics and the disposition of several radar satellites, the use of information from different data types for a certain application becomes more and more attractive. In order to extract the needed information, data fusion and combination techniques will be of increasing importance. The issue will undoubtedly continue to challenge researchers in years to come. Along with the disposition of many very high spatial resolution satellites within the next decade, the structure information in satellite data will become most important for many applications. Even though there are some texture algorithms already available, the development in this direction is still a challenge, especially for the very high resolution datasets, which will have a different statistical behaviour from data with 20m and 30m spatial resolution. The subject provides a wide range of activities to be undertaken in different application fields or interrelated techniques, like digital photogrammetry.

The main objective of the working group is to co-ordinate the efforts of researchers and developers in the aforementioned fields and support the interaction between algorithm developer and the application side. This should be supported by exchanging ideas in the form of working group meetings and circular letters. It is also planned to co-ordinate meetings between working groups of different organisations, like EARSeL and IUFRO.

The discussion during the *WG VII/3 Workshop 'Sensor fusion and advanced classification algorithms'* was focused mainly on the sensor fusion topic. After the DLR presentation entitled "Overview of DLR-forest projects and future perspectives" delivered by Wolfgang Steinborn, the following topics were discussed:

Sensor Fusion:

"Operational issues of multisensor data fusion for visual image exploitation" Werner Schneider, University of Vienna, Austria, "Image information fusion in remote sensing: towards a framework and a consistent terminology" Roland Fritz, FeLis, University of Freiburg, Germany, "Practical Application of Multisensor Data Fusion for Forest Inventory Mapping" Mathias Schardt, Joanneum Research, Austria, "Combining Satellite data and auxiliary GIS data".

Advanced Classification Algorithms and Procedures "Evaluation of the kNN method for combining NFI sample plot data and satellite data" Matthias Dees, FeLis, University of Freiburg, Germany, "Integrating satellite and GIS data into a large scale sample-based forest inventory - the classical sample-based approach" Klaus Steinnocher, Department of Environmental Planning, Austria, "Feature-based image fusion" Alois J. Sieber, JRC, Italy, "Needs for data fusion in the area of landmine survey and detection" Silvana Dellepiane, University of Genova, Italy and Gianni Vernazza, University of Cagliari, Italy and "Model regularisation in remote-sensing image analysis" Tobias W. Kellenberger, RSL, Switzerland.

The discussion showed that all participants agreed that sensor/data fusion will be one of the important topics within the next years. According to the amount of earth observation

satellites already in orbit and to the future satellite programme the topic of fusing the information from different satellites will gain increasing relevance. It was agreed that until now the remote sensing society is missing a standardisation of definitions in the field of data fusion. For example:

- what kind of data are included in the topic data fusion,
- outline of the benefits of sensor and data fusion techniques
- outline of examples for educational purposes

It was pointed out that there is still a gap between developer of fusion algorithms and users. In order to improve the contact

- there should be more joint meetings between developer of fusion algorithms and users.
- new algorithms of the developer community should be implemented in standard software and be available as public domain software.

Only if the algorithms are provided to the large group of users they will be used and verified. The algorithms must be transparent to the users to estimate the reliability of the results. The developer is the algorithm developer, the scientific users are defined as the scientists working in the field of remote sensing applications and the end-user is from the application side, which wants to use the information from remote sensing without being involved in remote sensing.

The final proposal of the working group meeting was:

- There is a need for the working group to address the topic data fusion also in the future

The approach of the working group to the topic should be a scientific user stand-point, complementary to the algorithm developer groups

The ISPRS WG VII/4 participated in the *ECO BP'98 Symposium* from 1st – 4th of September in Budapest. WG VII/4 had two sessions, one under the topic of advanced classification techniques and one under the topic of automatic image analysis. Altogether, nine proposals were submitted. There was some emphasis on presentations dealing with neural network classifiers and spectral unmixing. During the meeting, the first call of the planned Joint ISPRS and EARSeL workshop which took place from the 3rd to 4th of June 98 in Valladolid, in Spain was presented.

The working group was active in setting up the above mentioned joint workshop on "Fusion of sensor data, knowledge sources and algorithms for extraction and classification of topographic objects". The programme and content was circulated around by e-mail and mail. The workshop was in co-operation with WG III/5, WG IV/III.2 and the EARSeL SIG Group on 'Data Fusion' which is a continuation of the workshop on 'New classification algorithms and data fusion' which took place in Freiburg in 1997. This was a joint meeting between WG VII/4 and the EARSeL SIG group 'Forestry and Land use Planning'. The Proceedings are available at the Dept. of Remote Sensing and Landscape Information Systems, University Freiburg.

The EARSeL/ISPRS workshop on "Fusion Sensor Data, Knowledge Resources and Algorithms for Extraction and Classification of Topographic Objects" took place from 3rd-4th of June in Valladolid, Spain. The workshop was organised from ISPRS WG III/5 "Remote Sensing and Vision Theories for Automatic Scene Interpretation", WG IV/3 "Integration of Image Analysis and GIS" and WG VII/4 "Computer Assisted Image Interpretation and Analysis"

together with EARSeL SIG "Data Fusion". The workshop was sponsored by the Space Application Institute of JRC and the University of Valladolid. The workshop lasted two days and there were seven different technical sessions. The objectives were:

- overview of image, data, information fusion and integration
- prerequisites for fusion/integration: image to image/map registration
- object and image classification
- fusion of sensor-derived products
- fusion of variable spatial/spectral resolution images
- integration of image analysis and GIS
- applications

There were provided presentations within the topic of data fusion from algorithm developing to applications. There were thirty presentations of very high quality. The workshop closed with an intensive discussion on data and sensor fusion and highlighted needed future developments. There was an excellent social programme where the participants from different European countries and the States had the opportunity to enjoy the Spanish lifestyle and food. The printed publication of the presentations will be available soon. The papers and the conclusions are already presented on www.datafusion.cma.fr/sig.

The *IUFRO/ISPRS/EARSeL workshop on Remote Sensing and Forest Monitoring* was held from 1st-3rd June 1999, in Rogow, Poland. The Conference was organised under auspices of the Polish Minister of Environmental Protection, Natural Resources and Forestry. The objectives were to:

- Review the state-of-the-art of remote sensing as a tool of forest monitoring and inventory
- Review the research and application problems of the use of remote sensing in forestry
- Review the present and future remote sensing systems in relation to forestry-oriented applications
- Discuss the recommendations concerning future activity of the IUFRO remote sensing society in relation to the IUFRO-2000 Congress
- Produce conference proceedings summarising the use of remote sensing in forestry

A total of 130 people from nineteen countries (America, Asia, Australia, Europe) participated the Conference, where ISPRS WG VII/4 Chair Prof. Koch delivered a keynote speech on the subject "The contribution of Remote Sensing for Afforestation and Forest Biodiversity Studies". Another relevant paper on applied photogrammetry and remote sensing was delivered by P. Adler and B.Koch discussing the subject "Digital Photogrammetry for Forest Ecosystem Monitoring". The conference proceedings will be printed by the Joint Research Centre in Ispra. Papers and conclusions are available at: <http://giswitch.sggw.waw.pl/rogow99>.

Under the personal guidance of WG Chair Prof. Koch the following fields of interest were investigated in 1999:

- Monitoring and Assessment of Resources in Europe-Forest (MARIE-F)
- Satellite-based Environmental Monitoring of European Forests (SEMEFOR)
- Model for a monitoring system of the Alps (ALPMON)
- Thematic mapping using Smart SAR for regional or supraregional forest inventory (ZUFORST)
- 3D Landscape simulation for visual inspection of the

- environmental impact of high-voltage wires
- Development of a remote sensing-aided area-based Agro-informationsystem (AGRO)
- Intensive observation of forest ecosystems Tree Resources Outside the Forest (TROF)
- Assessing forest stand attributes by integrated use of high-resolution satellite imagery and laserscanner (HIGH-SCAN)

The results of expert studies and projects have been and are to be utilised by supranational institutions (EU, FAO), the space industry (Dornier), central government and utility companies.

Working Group VII.5 - Global Monitoring in Collaboration with WG IV/6 (Global Databases)

Chair: Dr. Ake Rosenqvist DG JRC SAI (Since 1998) (Former: Dr. Shintaro Goto, Kanazawa Institute of Technology, JAPAN)

Co-Chair: Dr. Mark Imhoff, NASA Goddard Space Flight Center, USA (Since August 1996)

Secretary: Dr. Shintaro Goto, Kanazawa Institute of Technology, JAPAN (Former: Dr. Ake Rosenqvist, NASDA, JAPAN)

Terms of Reference

- Identification of the remote sensing data requirements for models to support global change studies.
- Seek affiliations with organisations and programmes involved in global change studies such as the IGBP/HDP (International Geosphere Biosphere Program/Human Dimension Program) programmes for: land use cover change (LUCC); biospheric aspects of the hydrological cycle (BAHC); global change and terrestrial ecosystems (GCTE); International global change atmospheric chemistry programme (IGAC); global terrestrial observing system (GTOS); and global ocean observing system (GOOS).
- Modelling of global change processes from long-term data and indicators

Accomplishments of WG VII/5

WG VII/5 Chairperson Dr. Goto attended *the PORSEC'96* in Victoria, Canada, from 12nd-17th August 1996 as well as the *International Geosphere-Biosphere Programme BAHC-LUCC Joint Inter-Core Projects Symposium* held in Kyoto, Japan

- Organising the session "Current, Waves and Nearshore Processes" at the 4th International Conference on Remote Sensing for Marine and Coastal Environments, Orlando, USA, 17th-19th March 1997.
- Organising the "Research on RS and GIS for the Oil Spill Disaster" after the Nakhodka oil spill accidents in JSPRS. And held two workshop, in Japan.
- Organising an International Workshop on "Remote Sensing and GIS in support of HDP (Human Dimensions Program)", IIASA, Laxenburg, Austria, on 13th June 1997. (Attendance: 25 participants from ten countries.)

The contents of the the workshop and the session were as follow:

- The examples of the use of RS and GIS assimilation to socio-economic model for global environmental change were shown.
- The sensors were classified from the view point of the application to global monitoring, especially on the

LUC (Land Use Cover Change), and showed the direction of the use of RS data for HDP.

- The use of night-time DMSP satellite data was shown and how it can detect the effect of urbanisation on agriculture.
- Land cover mapping and monitoring of the whole of Asia and the present status of development of the Global Data Base were given.

The results can be summarised as follow: RS and GIS is effective in the analysis of global environmental change.

Because RS and GIS comes to be used more on HDP, the polygon or mesh used in GIS should get to know the human factor (Driving force on LUC, etc) more. For example, if the socio-economist wants to know the driving force on LUC, he must deal with much spatio-temporal LUC (Land Use Cover) data. In such a case, GIS is sure to become the efficient tool. In order to include the human factor in GIS, RS, GIS and HDP scientists must co-operate with each other.

Recognising the significance of the 1997 Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC) and the 1998 Buenos Aires Amendment, and the importance of remote sensing technology in this context, the WG has modified its Terms of References: *WG VII/5 - revised terms of reference*

The Kyoto Protocol stipulates quantified and legally binding national commitments on greenhouse gas emissions. A principal aim of WG VII/5 is to assess the potential and limitations of global scale remote sensing in the context of the Protocol, with particular emphasis on inventories and change monitoring of global carbon stocks. Acknowledging the importance of microwave sensors and their inherent sensitivity to above ground biomass, the potential of Synthetic Aperture Radar for global scale biomass inventories should be investigated (joint activity with WG VII/6 Radar Applications).

WG VII/5 also aims to identify remote sensing sensor and data requirements to support the retrieval of other parameters relevant to global change, by strengthening collaboration with organisations and programmes involved in global change research. The significance of human activities and monitoring of such - in the global change context - will also be accounted for.

The availability of global scale data and the handling of global databases will be addressed as a joint activity with WG IV/6 (Global databases supporting environmental monitoring).

Accomplishments of ISPRS WG VII/ during 1998

The activities of the WG during 1998 were focused on the *Commission VII Mid-term Symposium* in Budapest, where 5 sessions were arranged under the leadership of former Chair Dr. Shintaro Goto. Sessions on "Global change and monitoring" and "Regional monitoring" highlighted global change issues and monitoring of related parameters at global and regional scales. A session on "Studies on urbanisation" focused on the use of remote sensing techniques for monitoring of human activities, while a session on "Forestry and agriculture" presented on-going global/regional scale programmes and projects (LBA, GRFM/GBFM, L-Pathfinder, TREES and SIBERIA) where remote sensing data constitute important sources of information.

After a change in the chairmanship, the work of WG VII-5 for Global Monitoring was focused on the organisation of *the workshop "Remote Sensing and the Kyoto Protocol"*

In collaboration with WG VII/6 (Radar Applications) and the University of Michigan (MI, USA), a 3-day workshop was held in Ann Arbor, Michigan, from October 20th-22nd 1999, hosted by the University of Michigan. The objective of the workshop, "Remote Sensing and the Kyoto Protocol: A Review of Available and Future Technology for Monitoring Treaty Compliance", was to examine how the remote sensing community can contribute to the information requirements raised by the implementation of - and compliance with - the Kyoto Protocol. The meeting featured invited panel speakers addressing three principal themes; remote sensing implications of the Kyoto Protocol, the potential for contemporary remote sensing platforms, and direct mapping of biomass by low frequency radar systems.

The programme - opened by Fawwaz Ulaby, Vice President for Research, University of Michigan - featured the following presentation topics and panel speakers:

Theme 1: "Remote Sensing Implications of the Kyoto Protocol"

Global Land Cover and Biomass Assessment by Remote Sensing - Implications of the Kyoto Protocol Alan Belward (European Commission).

The Kyoto Protocol Viewed from the US signatory Dan Reifsnyder (US State Department).

Biomass and The Kyoto Protocol: A Canadian Perspective David Goodenough (Natural Resources Canada).

Ground Measurements, Remote Sensing and Biomass Estimation in the Australian Context. Richard Lucas (Univ. of New South Wales).

International Legal Implications of Trans-border Monitoring of Kyoto Protocol Treaty Compliance Using Remote Sensing, Steven Mirmina (Office of General Council, NASA HQ).

The Integrated Global Observation Strategy - IGOS John Townshend (Univ. of Maryland).

The role of Spaceborne Low Frequency SAR in Providing Forest Biomass for the CEOS GOF C Project. Frank Ahern (Canadian Centre Remote Sensing).

Theme 2: "The Potential for Contemporary Platforms"

The Use of Optical Remote Sensing Systems for Monitoring Land Use and Biomass Bill Salas (Univ. of New Hampshire). Capabilities of today's SAR Systems for Biomass Monitoring. Craig Dobson (Univ. of Michigan).

Potential of the NASA Vegetation Canopy LIDAR for Mapping Biomass Panel speaker: Robert Knox (NASA GSFC).

Future Platforms and Science Partnerships Relevant to the Kyoto Protocol: A NASA Perspective Diane E. Wickland (Manager Terrestrial Ecology, NASA HQ).

Theme 3: "Direct Mapping of Biomass - Airborne Low Frequency Radar Systems"

Monitoring Biomass by Airborne Polarimetric Multi-Frequency SAR - AIRSAR Tony Milne (Univ. of New South Wales).

The Vertical Structure of Vegetated Surfaces from Interferometric and Polarimetric Data. Robert Treuhaff (NASA JPL).

Penetration of Very Dense Forest Biomass Using VHF Airborne SAR systems: CARABAS and BioSAR Panel speakers: Lars Ulander (Swedish Defence Research Establ.) Marc Imhoff (NASA GSFC).

Theme 4: "Spaceborne Low Frequency Radar Systems"

Space-Borne VHF SAR for Biomass Assessment: Challenges and Prospects S. Carson (SAIC).

Opportunities and Challenges associated with spaceborne

Low-Frequency SAR systems. Anthony Freeman (NASA JPL).

The Need for a Spaceborne LF SAR - User Pull or Technology Push? Bob Harriss (Texas A&M University).

A selection of the major findings can be summarised very briefly as follows:

- Out of the six greenhouse gases covered by the Kyoto Protocol, it is recognised that the information Earth Observation can provide focuses on CO₂ and CH₄.
- EO contributions can be made to provide systematic observations and data archives in order to reduce uncertainties in the global terrestrial carbon budget; supporting national and international networks and observation programmes - especially for above-ground biomass and trends and shifts in land cover; as well as help support national accounting of Afforestation, Reforestation and Deforestation (A.R.D.).
- The review of state-of-the-art EO technology in the context of the Kyoto Protocol revealed the capabilities - but also the limitations - of each of today's operational optical and microwave sensors.
- Although direct measurements of biomass is possible by contemporary spaceborne microwave platforms, the limitation to shorter wavelength radars (C- and L-band) restricts the sensitivity to biomass levels of less than 100 tons/ha. The usefulness of orbital lower frequency microwave sensors (P-band, VHF) was acknowledged, however more research in this field was recommended. A detailed workshop report is available on the Internet at <http://www.hegyi.com/isprsc7/wgroup5.html>.

Relevant to the WG activities is the *4th Global Rain Forest Mapping (GRFM) Science Meeting* that was organised by the Institute for Space Research of Brazil (INPE) and the National Space Development Agency of Japan (NASDA) in São Jose dos Campos (Brazil) from November 8th-12th 1999. The meeting demonstrated the usefulness of medium resolution (100 m) semi-continental scale (JERS-1) SAR mosaics for regional scale thematic analysis. It also showed how SAR data can constitute easy-to-use information, also for users not usually accustomed to microwave data, if presented in a user-friendly way. More information about the meeting and GRFM mosaics (distributed free of charge for scientific use) is available at <http://www.eorc.nasda.go.jp/JERS-1/> and at <http://southport.jpl.nasa.gov/GRFM/>.

Working Group Programme for 2000

Maintaining the thematic focus, WG VII-5 will be organising two sessions related to the Kyoto Protocol at the ISPRS Congress in Amsterdam, between 16th-23rd July 2000. "Global Remote Sensing and GIS in the service of the Kyoto protocol" (jointly with ISPRS WG IV-6 Global databases supporting environmental monitoring). It will provide an opportunity for a larger number of EO scientists to participate and discuss the importance of EO technology in the context of global treaties. The session "Spaceborne Low Frequency Microwave sensors - assessing user needs and technical limitations for global biomass estimations" (jointly with ISPRS WG VII-6 Radar Applications) will address particular issues related to a new generation of microwave systems for assessment of global terrestrial carbon stocks.

Recent publications and lectures by Chairperson Ake Rosenqvist well represent the areas where significant

achievements are expected using remote sensing technology:

Rosenqvist A. Temporal and Spatial Characteristics of Irrigated Rice in JERS-1 L-band SAR Data. *International Journal of Remote Sensing*, 1999, Vol., 20, No. 8, pp. 1567-1587.

Rosenqvist A., Birkett C., Bartholomé E. and De Grandi G. Using Satellite Altimetry and Historical Gauge Data for Validation of the Hydrological significance of the JERS-1 SAR (GRFM) Mosaics in Central Africa. *International Geoscience and Remote Sensing Symposium (IGARSS'99)*, Hamburg, Germany, 28th June - 2nd July, 1999. Proceedings. IEEE Catalogue No. 99CH36293C.

Rosenqvist A., Forsberg B.R., Pimentel T. and Richey J.E. GRFM Activities in the Jaú River Floodplain - Modelling of Methane Emissions and Flooding Dynamics. *JERS-1 Science Program '99 - PI Reports*, pp 118-122. National Space Development Agency of Japan, Earth Observation Research Center, March 1999.

Working Group VII/6 - Radar Applications

Chair: Prof. Dr. Tony Milne UNSW, AUSTRALIA (Since August 1996)

Co-Chair: Dr. Jürg Lichtenegger, European Space Agency ESRIN, ITALY (Since August 1996)

Terms of Reference

To extend the use of multiwavelength and multipolarimetric radar data in investigations in earth surface characterisation and environmental analysis.

Accomplishments of WG VII/6

In October/November 1996 a number of countries in the Asia-Pacific Region collaborated in the *NASA-Australia-Asean Pacific Rim AIRSAR Radar Mission*. Data, both POLSAR and TOPSAR, was collected from nine participating countries in the region.

The usefulness of radar in mapping land use land cover and in assessing environmental conditions depends on the optimisation of wavelength, polarisation and incidence of angle combinations available within each of the sensor systems. Much of the research involving single band satellite data has been reported in recent conferences (Canadian Space Agency GER, Ottawa, May 1997, ERS-1 Florence Symposium April 1997) and is the result of the work of Principal Investigators associated with these particular assessment programmes. The evaluation of multi-wavelength, multi-polarised radar imagery acquired from the SIR-C has also recently been published. Much of the work of this Working Group in Radar Applications has been involved with promoting radar technology and applications within the ASEAN region, thereby complementing the activities of ESA, (ERS 1/2), the Canadian Space Agency (GLOBESAR and RADARSAT) and NASDA CJERS-1 programmes, and has involved the Pacific Rim Deployment NASA airborne radar system (AIRSAR).

A *Science and Applications Workshop* was held in Pasadena, 24th-28th March 1997, which brought together more than sixty participants from the USA, Australia, New Zealand and several southeast Asian countries. The focus of the workshop was the evaluation of AIRSAR data acquired during the Pacific Rim (PACRIM) Mission, October-December 1996, when some 126 sites throughout the Asia-Australia region were flown. The first two days of the

meeting were taken up with the fundamentals of radar, AIRSAR standard data products, ordering procedures and data processing and analysis. The remainder of the workshop was concerned with reports on the objectives and planning for the various scientific applications of the data over the next two years.

A three day follow-up *PACRIM Applications Workshop* was held at the Malaysian Centre for Remote Sensing, Kuala Lumpur, 11th-13th August 1997, in which delegates broke into six application groups, namely, geology, vegetation, marine applications, interferometry and topography, regional analysis, and agriculture. These application groups were led by US and Australian investigators and sought to achieve an overview of the radar potential for the relative discipline area. Regional scientists also evaluated research objectives for individual projects and determined what was feasible from the available data. Each group then outlined an optimal approach to data analysis, identified processing requirements, determined what field information was required and undertook 'hands-on' image processing to demonstrate various processing applications. Further *radar applications workshops* were held in Bangkok, Thailand 4th-6th March 1998 and Manila, Philippines, 27th-29th April 1998.

A *PACRIM Significant Results Workshop* was held in Sydney, Australia, 26th-28th July 1998 in association with the *9th Australasian Remote Sensing and Photogrammetric Conference*

(www.geog.unsw.edu.au/arspc98).

Activities of the Working Group have been directed towards establishing effective networking between radar application scientists; conducting radar training workshops, particularly in the Asian-Pacific Region, and in providing input into developmental programmes for the next generation of radar instruments and platforms.

Strong linkages have been established with the members of the *Global Rainforest Mapping Mission (GRFM)* sponsored by NASDA and using JERS-1 data; with *NASA and the Jet Propulsion Laboratory AIRSAR program* and with proposals related to *ESA's Earth Explorer Opportunity Mission*.

Five workshops have been held in the Asian-Australian region in association with the NASA sponsored AIRSAR PACRIM Mission. These workshops were held in 1998 at, 4th-6th March Bangkok, 27th-29th April Manila, 26th-27th July Sydney, 9th-14th November Kuala Lumpur and 19th-20th November, Manila. Each workshop involved 'hands-on' image processing and was designed to assist in sharing skills and techniques necessary to address research in seven application areas. These are forestry and vegetation, geology and tectonic processes, interferometry, disaster management, coastal analysis, agriculture, and urban and regional development.

PACRIM2, the proposed AIRSAR Mission to the Pacific Rim countries scheduled for March-May 2000, was launched at a special session of the Asian Remote Sensing Conference held in Manila, 16th-20th November 1998.

Thirteen papers were presented by members of the Working Group at the *ISPRS Commission VII Symposium on Resource and Environmental Monitoring* held in Budapest, 1st-4th September 1998. Major themes presented related to vegetation and biomass estimation procedures and thematic extraction from single and multi-band radar imagery.

Working Group VII/6 is organising a *tutorial on Recent Developments in Radar Science* and is participating with

WG VII/2 in *Applications of Remote Sensing and GIS for Sustainable Development, Workshop on Disaster Monitoring*, in Amsterdam 2000. It is also co-sponsoring with WG VII/5 a *Workshop on Spaceborne Low Frequency Microwave Sensors for Global Biomass Estimation*. Technical Sessions at the main Congress will focus on radar applications in renewable resource monitoring. This WG collaborated with WG VII/5 (Global Monitoring) and the University of Michigan in the conduct of a three-day workshop on *"Remote Sensing and the Kyoto Protocol: A Review of Available and Future Technology for Monitoring Treaty Compliance"* (see report WG VII-5) and participated in the *4th Global Rainforest Mapping GRFM Science Meeting* held in Brazil, November 8th-12th, 1999. Members of this WG have been active in the organisation of PACRIM2, which will see the NASA-JPL Airborne SAR (AIRSAR) flown in sixteen countries in the Pacific, Australian and Asian region in the April-May 2000 time period. This collaborative science research mission provides the opportunity for environmental scientists in the region to acquire multi-polarimetric and interferometric SAR. In addition the Modis-Aster simulator MASTER will also be flown on this mission to acquire imagery in the visible NIR, SWIR and thermal portions of the electromagnetic spectrum.

The Working Group co-hosted a *Pacific-Rim Significant Results Workshop* in Maui, Hawaii from 24th-26th August 1999 attended by sixty people. Papers and information on this meeting can be obtained from <http://Southport.jpl.nasa.gov/AIRSAR/>

Working Group Programme for 2000

WG VII/6 will conduct a *Tutorial on 'Recent Developments in Radar Science and Applications'* given by Dr. Tony Freeman from the Radar Sciences Group at JPL. The WG will participate in an *Inter-Technical Commission, IC-22, on 'Global Remote Sensing and GIS in the Service of the Kyoto Protocol'*, in addition to organising two Technical Sessions. A *Workshop on Disaster Monitoring and Mitigation using remotely sensed data* is being co-hosted with WG VII/3.

Working Group VII/7 - Non-renewable Resources and Geotechnical Applications

Chair: Dr. Tsehaie Woldai ITC, The Netherlands (Since August 1996)

Co-Chair: Dr. James V. Taranik Desert Research Institute, USA (Since August 1996)

Terms of Reference

Application of remote sensing digital image processing and analysis techniques to mineral and petroleum exploration, geotechnical and geological applications. High spectral resolution sensor data from aerial photography and satellite sensors for earth resources surveys, with special emphasis on mineral classification and geotechnical characterisation of rocks and soils.

Multi data integration, including geophysical images.

Accomplishments of ISPRS WG VII/7

A *Scientific Workshop as joint action of the European Commission's European Scientific Research Network and ISPRS Working Group VII/7* was held in the Netherlands on the 17th and 18th of February 1997. Co-organised by J. L.

van Genderen and T. Woldai, the sixth and final synergy of Remotely Sensed Data Network Workshop under the title of Synergy of Remotely Sensed Data took place at the Auditorium of the International Institute for Aerospace Survey and Earth Sciences (ITC), Enschede. The following scientific papers were presented under the chairmanship of Dr T. Woldai:

Forest Area Mapping Based on Optical and Radar Data (B. Koch/ T. Kremmers, Institute of Forestry, University of Freiburg. Presented by F. Horlacher).

Analysis of Wavelet-Compressed ERS-PRI Imagery of Tropical Guyana (B. Triebfuerst, C. Schneider, IPG, Freiburg/ R. Verhoeven, Wageningen Radar Surveys). Synergy of Remotely Sensed Data - Network Contributions by the Department of Physical Geography of the University of Freiburg' (H. Gossmann, C. Schneider, H. Saurer).

Knowledge-Based Interpretation of Remotely Sensed Data' (K. Pazad, H.-J. Birkner, University of Hannover).

Compression of NOAA-AVHRR Data with a Wavelet Transform' (C. Schneider, B. Triebfuerst, IPG, University of Freiburg/ A. R. S. Marcal, R. A. Vaughan, University of Dundee).

Forestry Information from Microwave and Optical Remote Sensing'; 'The JRC Geophysical Processor (GPROC)' (T. Tares, JRC).

Synergy in Remote Sensing - What's in a Pixel?' (A. P. Cracknell, University of Dundee. Presented by C. Cassells, ITC).

Image Fusion Activities at the Western European Union' (D. Munro, WEU Satellite Centre).

Under the Chairmanship of Prof. J.L. van Genderen, ITC, the following topics were highlighted:

Geometric Aspects of Multisensor Image Fusion for Topographic Map Updating in the Humid Tropics (C. Pohl, Western European Union Satellite Centre).

Laboratory Modelling of Underground Coal Fires (C. Cassells, ITC).

Quality Assessment of Interferometric Data (R. Gens, ITC). Investigations on Synergy and Complementarity of Multi-spectral and Anisotropy Information from MOMS-02/D2 Mode 3 Data for Land Use Classification in the Sinaloa District of Mexico (T. Schneider, Dept. of Land Use Planning, University of Munich).

Geometrics Aspects of Multisensor Image Fusion for Topographic Map Updating in the Humid Tropics (C. Pohl, Western European Union Satellite Centre).

Laboratory Modelling of Underground Coal Fires (C. Cassells, ITC).

Besides, the network members spent considerable time in reviewing the past three years collaboration, proposing improvement for "Synergy II" and planning further bilateral and multilateral research co-operation between network members now that "Synergy I" research network has completed its tasks. This final workshop was co-hosted by the International Society of Photogrammetry and Remote Sensing (ISPRS), Commission 7, Working Group VII on Non-renewable Resources and Geotechnical applications. Working Group VII/7 arranged *two sessions at the ECO BP'98 Symposium* in Budapest. The first session was devoted to the topics related to data integration and geotechnical application of remote sensing, the second one focused more on geological application of remote sensing. The presentations covered assessments in valley areas, underground water exploration, landslide monitoring,

investigation of neotectonic and earthquakes activities, mineral exploitation etc.

Recommendations passed during the Workshops and meetings held by the ISPRS WG VII/2 and VII/7 clearly indicate the importance of this topic "Environmental impact analysis of mining areas", to be considered at the ISPRS 2000 Congress. Both the developed and developing countries are affected by mining-induced environmental problems; 130 million people by coal fires in China, 40 million by a similar problems in India. The impact of mining on the environment affects countries in Russia, Germany, Spain, Hungary, the Czech Republic, Slovakia, Philippines, USA, Canada and others.

A special conference of the NATO Advanced Studies held in Hungary, 6th-19th September 1998, managed to bring together about a hundred experts from 39 countries to discuss this topic under the chairmanship of dr. Péter Kardeván. The participants unanimously agreed that the impact of mining on the environment is too big to be disregarded lightly and recommended all participants to work on this problem. Major research and collaboration programmes were proposed on topics such as the impact of mining, environmental impact modelling and site assessment, RS, GIS, data fusion and integration, modelling, hazard zoning (seismic hazards, landslide hazards, mountain hazards), risk assessments, sensitivity analysis – topics which can be used as key-words. Ecological assessment of reclamation activities, monitoring of long-term development of these areas. Change in the socio-economical structure in an area, especially in open-cast mining region. Additional subjects to be covered: toxic waste and its impact on health, groundwater pollution, soil degradation, environmental geoindicators and geindices, air, water and soil pollution as a result of mining, mining-induced urbanisation, illegal mining, assessment of lowering the groundwater – influence on the ecosystems in the surroundings, mineralogical classification of the tailings and spoiled sediments, assessments of the acid mine drainage, influence on the surface waters, hydrochemical analysis of the lakes etc.

The main topics in the preparation of the WG VII/7 for the ISPRS Congress will be related to Remotely sensed data and GIS applications in non-renewable resources management; Field data capture techniques, data fusion and modelling; Risk assessment; Geological hazard zoning and mapping (volcanic, seismic); Mountain hazards; RS and GIS in environmental geological applications; Synergy of remotely sensed data; Predictive modelling in geomorphology for environmental impact analysis; Geo-environmental modelling; Integration of airborne and spaceborne RS data, including hyperspectral data; Geophysical and geochemical assessment in mineral exploration; Development of software dedicated to resources management; The role of the satellite industry, software developers etc. versus the end user in the year 2000. Invited co-operating ISPRS WGs: VII/2, VII/3 and VII/6. Co-operating organisations/institutions planned: ITC – Geological Survey Division, MAFI and others.

Additionally, special emphasis will be given to the theme mining and its impact on the environment i.e. the applicability of remote sensing and GIS to sustainable development in environmentally sensitive mining areas. This theme includes: modelling of mining impact and site assessment,

field data capture and fusion techniques in environmental impact assessment, mining-induced environmental problems (seismic, landslide, flood hazards, toxic wastes, tailings and spoiled sediments, soil degradation etc.), risk assessments, sensitivity analysis, toxic waste and its impact on health (Medical Geology), ecological assessment of reclamation activities and monitoring of long term development in mining areas, groundwater, soil and air pollution, mining-induced urbanisation, legal/illegal mining and its influence on the ecosystem, acid mine drainage and its influence on the surface waters.

Major activity of the WG VII/7 is planned for the *ISPRS 2000 Congress in Amsterdam*, where WG VII/7 is involved in TC VII-8, TU11 and WS5. In view of this, little was done in organising Symposium/ Workshop/seminars in Europe. Instead, the Chairman of the WG VII/7 (also in his capacity as Secretary General of the African Association of Remote Sensing of the Environment - AARSE) fully participated in various meetings and organisations in line with the activities of the Working Group.

- March 1999 - a three day meeting of the organising and scientific Committee in Cape Town, South Africa. The purpose was to prepare ground for the Cape Town 2000 Symposium of the 28th International Symposium on Remote Sensing of Environment and the 3rd African Association of Remote Sensing of the Environment (AARSE) on "Information for Sustainable Development". The Symposium covers several themes and is planned for March 27th-31st, 2000. So far, more than four hundred abstracts have been received. (For more information refer to: <http://www.isrse.co.za/>).
- Accra, 21st-25th June 1999. 4th Africa GIS Conference and exhibition on "Emergent Africa-GEO-Information and Globalisation" organised by the EIS Program, OACT, and AARSE in collaboration with the Ministry of Environment, Science & Technology and Ministry of Lands & Forestry. More than 140 participants attended the Conference.
- Enschede, 11th-13th July, 1999. Second EARSel Workshop on Imaging Spectroscopy, The Netherlands (<http://www.itc.nl/is2/>). Attended only.
- Vechta, Germany (October 28th-29th, 1999). Two days Workshop on "Integrated Modelling by favourability functions", held under the European Union GETS Project in Vechta, Germany. Woldai attended the GETS meeting of Team Leaders. Woldai's involvement in this meeting as Chairman of CVII/WG7 resulted in both financial and participatory support for the TU11 Work-

shop which will be held in Amsterdam. The EU-GETS Project will totally finance all speakers, students, and computers for the workshop, Workshop rooms at the Free University of Amsterdam, and the publication of the papers presented in a book form).

- Cotonou 6th - 9th December 1999. Conference on "Promoting Space Technology Transfer and Geomatics Education in Africa", Cotonou, Benin. The Conference dealt with several themes and more than 120 participants coming from twenty African and other countries attended the conference. The Conference was organised by the ISPRS Commission VI, AARSE and CENATEL (Benin). (<http://xerxes.sph.umich.edu:2000/confs/benin/>). The Proceedings of the Conference are given in ISPRS, Volume XXXII, part 6W7, edited by Luigi Mussio.

In 1998 (11-15 May), a scientific *Symposium on Operational Remote Sensing for Sustainable Development* was held at the International Institute for Aerospace Survey & Earth Sciences (ITC), Enschede, in The Netherlands. It was organised by the European Association of Remote Sensing Laboratories (EARSel), the Netherlands Society for Earth Observation and Geo-informatics (NSEOG) and co-sponsored by Rijkswaterstaat, Surveying Department, ESA/ESTEC and the European Union. At this Symposium, the ISPRS Commission VII/7 together with the Geological Survey Division of the ITC organised a half day workshop on May 14th, 1998 related to remote sensing and GIS for non-renewable resources and geotechnical applications. An outcome of the papers delivered during this Symposium is now published in the International Journal of Applied Earth Observation and Geoinformation, Vol. 1, issue, pp.2-78, ITC, The Netherlands (Special Editors: van der Meer, F., Molenaar, M., Nieuwenhuis, G., Woldai, T.).

Working Group Programme for 2000

Active participation in the 28th International Symposium on Remote Sensing of Environment and the 3rd African Association of Remote Sensing of the Environment (AARSE) on "Information for Sustainable Development", Cape Town, March 27th-31st, 2000. (For more information refer to: <http://www.isrse.co.za/>).

WG VII/7 is involved in TC VII-8, TU11 and WS5 of the ISPRS Congress in Amsterdam.

¹ International Council for Science

Outlook 2000-2004 of Incoming Technical Commission Presidents

ISPRS Technical Commission I Sensors, Platforms and Imagery

Incoming President: Stan Morain (USA)
Incoming Secretary: Amy Budge (USA)

Outlook by Incoming President

The United States has not hosted Commission I since Dr. M.B. Scher was President between 1968 and 1972.

In those days, the Commission was responsible for issues related to aerial photography and navigation. His Commission ended the very year and month that Landsat-1 inaugurated the satellite era for civilian Earth observations. Today, Commission-I focuses on sensors (cameras and scanners), platforms (airborne and spaceborne) and imagery (both film and raster-based). The mid-Congress symposium in 2002 will mark the 30th anniversary of the Landsat Program, and the United

States is pleased once again to host this very important Commission.

Seven resolutions were passed for Commission-I by the General Assembly in Amsterdam. Six Working Groups have been formed by combining elements from these. The first resolution recognised that collaboration between the Committee on Earth Observing Systems (CEOS) and ISPRS is a most important goal. It is therefore the responsibility of Commission-I to establish and maintain communication with CEOS, IGOS, ICORSE, and other relevant communities. It is also a priority to (1) funnel information to relevant Commissions and WGs in ISPRS, and (2) to serve as a conduit for information from ISPRS to other international communities. The overall aim is to participate in efforts that will improve international co-ordination of EO missions, and that will foster public/private collaboration of R&D activities.

The second resolution addresses the need for standardisation of sensor parameters. WG I/1 will focus on generating a common set of parameters for recommended use by manufacturers, and which image-processing analysts can use when fusing imagery from several sensors. The need for standardising parameters is most urgently felt by specialists whose work requires comparative data from a number of sensors; and will be felt most strongly by those who are creating the databases needed to compare systems.

A third resolution, addressing radiometric and geometric calibration, will be the primary responsibility of WG I/2. The proliferation of both aerial and satellite sensors, coupled with their finer spatial, spectral, radiometric, and temporal resolutions, means that data must be calibrated to ever finer degrees. This can be accomplished in part by inventoring the global set of ground calibration test sites, and by fostering inter-calibration studies between and among sensors whose data sets are the basis of multi-sensor studies of Earth resources. Among other activities, the WG will contribute to an inventory of test sites and help to populate a database with the defining physical, spectral, and radiometric attributes.

The fifth resolution addresses the very important topic of sensors for DTM data generation. There is a growing number of operational airborne LIDARs and planned satellite interferometric SARs designed to generate DEMs. WG I/3 will look at the accuracy and cost effectiveness of these various techniques and identify standard test sites where data from different sensors can be collected for inter-comparison.

Elements of resolutions 1, 2, and 7 form the basis for WG I/4, which addresses advanced sensor systems. The primary responsibilities of this group will be to track the development of small satellite systems, smart sensors, pollution monitors, laser altimeters, polarisation sensors, and hyperspectral sensors.

Resolution 6 (WG I/5) is focused on platform and orientation integration. The increasingly finer spatial resolution of sensor systems and the use of their data for detailed site studies demand better ability to integrate attitude and position information with image processing software. Also, there are growing needs for standardising data formats,

and for developing next generation data referencing, archiving, and data retrieval systems.

One of the urgent areas for inter-calibration is in wide swath sensors, many of which are used routinely for vegetation mapping and analysis. Sensors like AVHRR, SeaWiFS, TM, SPOT-Vegetation, MODIS, and IRS are developing historical data sets of land use and land cover changes, globally; so it is important that the fourth Commission-I resolution will address the effects of viewing geometry on radiometric accuracy. Among other activities WGII/5 will undertake studies and monitor the published literature to develop a catalogue of what is known about the effects of viewing geometry on spectral properties, and how these effects influence classification accuracies.

WG I/6 addresses airborne optical sensor systems and is based on elements of resolutions 2, 6, and 7. This all-important field of photogrammetry and remote sensing will focus on development of digital cameras, small format cameras, and video cameras and the methods of their employment.

The seventh resolution recognises the need for an electronic database of sensor and platform information. To be effective, this database should be accessible on the Internet, be searchable using key words, and be interactive. The vision is to create a one-stop database so that sensor and platforms design parameters can be compared and compiled into reports for various engineering, research, and application needs. The effort will require standardising the parameters drawn from a multitude of sources.

Working Groups of Technical Commission I for 2000-2004

WG I/1 Define Standards for Sensor Parameters

Chair: Charles Mondello (USA)

Co-chair: John C. Baker (USA)

WG I/1 Terms of Reference

- Identify and define a common set of sensor and sensor system parameters
- Promote adoption of standardised parameters among sensor manufacturers
- Design data model for, and populate, an electronic database of sensors, platforms, and launch status of new satellite sensors
- Collaborate with CEOS to develop a comprehensive database of sensor and platform specifications
- Pursue organisations to collaborate in support of data model and database maintenance
- Participate in ISO TC 172/SC1, SC9
- Liaise with CEOS member organisations to identify and appoint cross-over WG membership

WG I/2 Sensor Calibration and Testing

Chair: Manfred Schroeder (Germany)

Co-Chair: Veljko M. Jovanovic (USA)

WG I/2 Terms of Reference

- Radiometric and geometric calibration of wide-swath and multi-viewing angle sensors
- Techniques for laboratory calibration of sensors
- In-flight sensor calibration and development of calibra-

tion test sites

- Calibration and evaluation of image scanners
- Assess effects of viewing angle on spectral and radiometric data from wide-swath and multi-viewing angle satellite sensors
- Participate in CEOS WGCV, ISO TC 172/SC9, and ISO TC 42/WG3 and WG20 and other international organisations

WG I/3 Active Sensor Systems

Chair: Mike Renslow (USA)

Co-Chair: Mike Palmer (UK)

WG I/3 Terms of Reference

- Collaborate with CEOS to identify global test sites for evaluating SAR, LIDAR, and INSAR systems
- Assess precision and accuracy of active sensors that generate DEM data sets
- Evaluate data recording and pre-processing systems to generate optimal data sets for analysis and measurement
- Recommend best practices for integrating attitude and position information with data processing algorithms

WG I/4 Advanced Sensor Systems

Chair: Masanobu Shimada (Japan)

Co-Chair: Janio Kono (Brazil)

WG I/4 Terms of Reference

- Small satellites for Earth observation—complexity, reliability, and comparative costs
- Platform guidance, navigation and positioning, integration of GPS, and orientation systems
- Performance of high resolution and hyperspectral imaging systems for Earth system science
- Monitor and report developments of new sensors such as smart sensors, polarisation sensors, pollution monitors, laser altimeters, and precipitation radar

WG I/5 Platform and Sensor Integration

Chair: Karsten Jacobsen (Germany)

Co-Chair: Ismael Colomina (Spain)

WG I/5 Terms of Reference

- Define best practices for recording and presenting sensor data together with auxiliary platform data—GPS, INS, orbital definition
- Liaise with Commission III
- Capability of high resolution earth observation systems
- Relation and long-time stability of attitude and position information to sensor orientation

WG I/6 Airborne Optical Sensor Systems

Chair: Brian Huberty (USA)

Co-Chair: Brian Gorin (USA)

WG I/6 Terms of Reference

- Assess data quality for advanced aerial digital camera and video systems
- Integrate airborne digital camera and video systems into user applications
- Install, test, and calibrate airborne digital camera and video systems on aerial platforms
- Develop guidelines for designing aerial missions for small format and video data acquisitions

ISPRS Technical Commission II Systems for Spatial Data Processing, Analysis and Representation

Incoming President: Chen Jun (China)

Incoming Secretary: Jie Jiang (China)

Outlook by Incoming President

Under the presidency of Prof. Ian Dowman during the period of 1996-2000, Commission II continued to concentrate on systems based on the principles of digital photogrammetry and integration of data with GIS, with an emphasis on the integration of different types of data and handling of large volumes of data from satellite sensors and aircraft. The technological achievements, status, problems and consensus are reflected by the Commission II symposium in Cambridge, the Congress in Amsterdam and other workshops of Commission II. A working group structure is proposed for the period of 2000-2004 that is based on the terms of reference of Commission II and the resolution of Commission II at Amsterdam Congress.

It was recognised that systems for spatial data production from digital imageries are becoming more operational and easier to use. Modules of automatic interior and relative orientation as well as automatic aerial triangulation in Digital photogrammetric workstations (DPWs) are in daily use in practice. More image processing systems provide facilities for handling SAR. More advanced algorithms are being developed, particularly for DEM generation using interferometric and stereoscopic techniques. Mobile mapping concepts have been expanded from land-based platforms to airborne and even satellite platforms. Progresses have been made in GPS/INS integration, real time sensor orientation and intelligent processing of real-time mobile mapping data. In order to promote the development and exchanges in these fields, three working groups on spatial data production have been set up: one is a on real-time mapping technologies, the second one is on systems for SAR and Lidar processing, and the third one is on systems for automated geo-spatial data production and updating from imagery.

There has been increasing demands of the development of systems for spatial data custodian and delivery. Efforts have been devoted to the development of systems and tools for the integrated management of large-volume heterogeneous spatial data and for enabling users to access various EO and other spatial data at regional, national and global scales. The Working group on Information Systems and Services (WGISS) of the Committee on Earth Observation Satellites (CEOS) is one of such spatial data custodian organisations. Commercial systems have been developed by manufacturers for facilitating the spatial image-based product generation and archiving. Data integration and archiving, interoperability and distributed search, on-line spatial data dissemination as well as pricing policy are among the key issues related to the development of such systems. It is the consensus that a uniform standard for image format or even data format in general should be developed by the joint effort of users, manufacturers, data suppliers and researchers. Two working groups on spatial data custodian are established, one is the WG on integrated systems for information services and the other on image transfer standards.

While many organisations and companies are still concentrating on spatial database development and hard-copy maps, more and more attention is now paid to value-added products. The Amsterdam Congress recognised 'the need for efficient processing and presentation of such data in a value added form', and recommended 'the development and validation of end-to-end processing systems for specific applications, making use of a range of imaging systems, a range of components from the spatial information sciences and paying particular attention to techniques for the delivery and presentation of information'. Designing a spatial image-based decision support system for solving user's specific problems is one of tendencies now. The other direction is to develop spatial analysis systems for interpreting and mining the raw and historical data. Moreover, new visualisation platforms, interface devices and metaphors present more opportunities for scientists to explore and share complex remotely sensed datasets. Three working groups are proposed for enhancing the academic exchange and promoting the development in the field of value-added spatial data application, three working groups are proposed, one is the WG on the design and operation of spatial decision support systems, the second is on spatial analysis and visualisation systems.

Working Groups of Technical Commission II for 2000-2004

WG II/1 Real-time Mapping Technologies

Chair: Rongxing (Ron) Li (USA)
Co-Chair: Norbert Haala (Germany)

WG II/1 Terms of Reference

- Design and development of integrated real time mobile data collection systems and autonomous vehicle navigation systems
- Real and near-real time processing of mobile mapping data
- Systems aspects related to sensor calibration, data reduction and optimisation and sensor information processing
- Automation of information extraction from mobile mapping sensor data
- Integration of navigation and mapping sensors

WG II/2 Systems for SAR and LIDAR Processing

Chair: Bryan Mercer (Canada)
Co-Chair: Charles Toth (USA)

WG II/2 Terms of Reference

- Evaluation and assessment of systems for processing SAR and LIDAR data
- Systems for generation and editing of DEMs from InSAR and LIDAR
- Multi-frequency SAR, multi polarised SAR, reflectance data from LIDAR, multi-pulse and array sensor systems for applications
- Systems for integration of SAR, LIDAR and optical systems
- Data quality, calibration and standards of SAR and LIDAR
- Liaison with other groups such as CEOS and OEEPE

WG II/3 Integrated Systems for Information Services

Chair: Poul Frederiksen (Denmark)
Co-Chair: Chongjun Yang (China)

WG II/3 Terms of Reference

- Systems for integrating existing geo-spatial data and new acquired spatial information as well as administrative data for spatial data custodians
- Assessment and development of database archiving and maintenance strategies
- Integrated services involving economic, technical and political aspects
- Development of geo-spatial information distribution and accessibility systems using internet (including cost and pay models)
- Development and validation of end-to-end spatial data access systems
- Liaison with CEOS WGISS and other relevant organisations

WG II/4 Image Data Standards

Chair: Wolfgang Kresse (Germany)
Co-Chair: Liping Di (USA)

WG II/4 Terms of Reference

- Analysis of the requirements for standardised image data exchange formats
- Characterisation and evaluation of universal sensor models
- Development of a metadata standards which includes all necessary sensor parameters within their technical and their application environment
- Collaborate with WGI/1, OGC and ISO/TC211 on imagery and related standards

WG II/5 Design and Operation of Spatial Decision Support Systems

Chair: Wolfgang Kainz (Netherlands)
Co-Chair: Qiming Zhou (Hong Kong)

WG II/5 Terms of Reference

- Development of concepts, implementation techniques and tools of image-based spatial decision support systems (SDSS)s
- Integration of different types of data (field and object) and systems in SDSS
- Integration of knowledge-based system and artificial intelligence with SDSS for problem solving and decision-making support
- Co-operation between users, producers and system designers for integrated SDSS

WG II/6 Spatial Analysis and Visualisation Systems

Chair: Zhilin LI (Hong Kong)

WG II/6 Terms of Reference

- Web-based systems for mapping and value-added data analysis
- Mobile-based systems for visualisation and value-added analysis
- Systems for on-demand visualisation and value-added data analysis
- Image-based systems for visualisation and spatial analysis

- Integration of 3-D, temporal and dynamic aspects into spatial analysis and visualisation systems

WG IC II/IV Systems for Automated Geo-spatial Data Production and Updating from Imagery

Chair: Christian Heipke (Germany)

Co-Chair: Ammatzia Peled (Israel)

WG IC II/IV Terms of Reference

- Advancement of digital photogrammetric workstations
- Development of new functionality for digital airborne cameras and GPS/INS integration
- Evaluation and implementation of semi-automated systems for object capture and update
- Facilitate the integration and interfacing of photogrammetric, CAD, and GIS systems
- Transition of experimental systems for data acquisition and revision into operational and commercial solutions (co-operation between academia/ research and industry)
- GIS-driven change detection, spatial data capture and revision.
- Consistency estimation and quality control of spatial data.

Plans of Commission II

Commission II will be co-sponsoring the 3rd International Workshop on Dynamic and Multi-dimensional GIS, to be held in Bangkok in May 2001.

WG II/2 is planning a workshop in Banff from July 11th-13th, 2001 on 'Three Dimensional Mapping from LIDAR and InSAR'.

ISPRS Technical Commission III Theory and Algorithms

Incoming President: Franz Leberl (Austria)

Incoming Secretary: Rainer Kalliany, Scientific, (Austria)
Andrea Zunegg, Administrative,
(Austria)

Outlook by Incoming President

Positioning Photogrammetry vis-à-vis Computer Vision

A priority for the new Commission President is to revisit the definitions of the Commission's own terms of reference in light of a need to position photogrammetry as a whole and the Commission's field of interest vis-à-vis generic Computer Vision. Computer Science and Engineering have developed Computer Vision as a separate discipline. This has happened without a great deal of interaction with photogrammetry. Obviously, champions of Computer Vision were and are aware of the field of photogrammetry, but the interest has been and is limited. 'Photogrammetry' is seen as dealing with the Earth's surface. The 'close range' aspects of photogrammetry have never been perceived as a defining element of the field.

A Motto for the Inter-Congress Period 2000-2004: Photogrammetric Computer Vision

During 2000-2004 Commission III proposes to operate as the Commission for 'Photogrammetric Computer Vision' and to contribute more clearly to efforts of positioning the

field of photogrammetry vis-à-vis computer vision. The traditional view often defines photogrammetry in the context of the geo-sciences. Photogrammetry is seen as; modelling objects and scenes on the Earth's surface. But in light of a long tradition of non-topographic photogrammetry, this focus on 'geo-information' misses the mark. We need to answer the question: Is it photogrammetry when the goal of the vision task is to be 3-D and accurate? Photogrammetrists perceive the idea of a 'Photogrammetric Computer Vision' as a vague notion. However, in a delimitation of the field of photogrammetry vis-à-vis computer vision, such a notion will be very useful and create clarity. We will need to explain the concept and create meaningful definitions that work in the minds of both, the world of photogrammetry and the world of computer vision.

Is there Photogrammetric Computer Graphics?

The argument can be made that the ortho-photo is a computer graphics product, representing a method of visualising a scene of interest. Again one might argue that this is applicable only if it deals with the Earth's surface. But if we review typical computer graphics issues, namely, 'image based modelling' and 'image based rendering', we see many topics of photogrammetric interest, so that one might argue that there is a thing one could denote as 'photogrammetric computer graphics'.

Eight Working Groups

A total of eight Working Groups have been formed with a leadership that has its home partly in Photogrammetry, partly in Computer Vision. The new structure builds on many of the Working Groups that were in existence during the previous period 1996-2000. This structure covers various 'hot topics' of 'Photogrammetric Computer Vision'.

The Working Group on Sensor Pose Estimation has tradition and follows WG III/1 from the previous period 1996-2000. The traditional topographic motivation is hoped to be broadened into a generic 3-D vision motivation. If one accepts this concept, then triangulation needs to address also images looking at motion, and time series or image sequences other than those resulting from a standard aerial surveying flight.

The Working Group on Surface Reconstruction also derives from its predecessor in the previous period 1996-2000. The traditional focus of this Working Group was on 'stereo-matching'. It is proposed that other depth cues besides geometric stereo disparities be studied. The suggestion is to see the issue of image based shape reconstruction as a broad topic of interest, using the ideas of Shape-from-X, and broadening the application's focus from the Earth's surface to non-topographic objects. Since topography typically is looked at from only one side, and results in so-called 2.5D models, an additional issue is raised when a fully 3-dimensional model of an object needs to get constructed.

The Working Group on Laser Scanning is also concerned with the topic of 3-D reconstruction, but in this case not from images, but from direct distance measurements by lasers, and from point clouds from InSAR data, possibly augmenting the point clouds with imagery to better delineate regions and extract edges of objects. The range of

interests of this Working Group is rather broad. But one could broaden it even further if one were to consider surfaces from point clouds irrespective of their origin. This would include point clouds obtained from images, from underwater SONAR, from profiling techniques.

The Working Group on automated object modelling has three predecessors in the 1996-2000 period. At the time it was argued that the subject matter should be separated into some form of low-level, mid-level and high-level vision. We are abandoning this separation at this time in the WG-structure. Obviously, this represents the topic of 'automated image interpretation'. Considerable interest exists in photogrammetry since this has applications in the automated population of geographic data bases. Topographic objects such as roads, buildings, fences, bridges etc. need to be mapped. The question immediately comes to mind: 'Is there a photogrammetric automated object recognition?' Is it 'photogrammetry' when the objects are topographical? Probably not. But the question illustrates that we need to create an understanding where photogrammetry stands, and this Working Group can and should help in achieving this clarity.

A new Working Group on the Theory and Algorithms for industrial vision is being introduced, consistent with the Commission's charter to address and focus on theory and algorithms. A careful co-operation with Commission V is needed in this area. The new Working Group is interested in 3-D vision in industrial settings, in reconfigurable calibration and, most importantly, in the hot topic on 'uncalibrated vision', a concept that is counterintuitive to photogrammetrists, but makes a lot of sense in the proper context.

The Working Group on Fusion has a legacy in the preceding period. One might argue that 'fusion' of data, data structures and methods is everywhere, and therefore should not be a separate focus. But by having a separate working group on conceptual aspects of information fusion, or multi source vision, one demonstrates that the basic necessity of using multiplicity, where available and reasonable, needs more attention than it currently receives. InSAR is part of an integrated bundle of data including SAR-coherence, magnitude, polarisation and shape, and therefore aspects of InSAR will find a home in this WG.

Another new Working Group is to address Virtual Environments. Both Virtual Reality and Augmented Reality create a need for rapid modelling of the human habitat and environment. This issue is of course present in many Working Groups, even Commissions. But as far as 'Automation' is concerned, Commission III needs to become active, not only in the context WG on automated object modelling. Issues are the integrated analysis of both terrestrial and aerial imagery, the extraction of texture, automated generation of models with level-of-detail, the inferred attribution Rendering in real time and following a moving user presents its own complexities. This implies that tracking be very accurate and in real time. City modelling is the most often discussed application for photogrammetric Virtual Environments.

Very important is the concern for reliability and performance of algorithms, as reflected in a Working Group for this topic. The subject is or should be ubiquitous. But by cre-

ating a separate working group, we 'flag' the topic and expect it to create guidelines, test data, ideas, references and algorithms for the use by others in assessing the value of their creative algorithm work.

In order to better consider the world of computer vision, it is recommended that we seek to 'populate' computer vision conferences. Working Groups will organise workshops before, after or as part of those conferences. In this manner, there is reinforced attention being paid to the events and innovations in those vision conferences, and people attending those conferences learn better to appreciate what photogrammetry is. Again, the general motto could be 'Photogrammetric Computer Vision', and present session under this topic at EVVC, ICCV, CVPR, ICOPR, CAIP and the likes. This can be as illuminating for photogrammetrists as it can be good marketing in the vision communities.

Working Groups of Technical Commission III for 2000-2004

WG III/1 Sensor Pose Estimation

Chair: Henrik Haggrén (Finland)

Co-Chair: Ayman Habib (USA)

WG III/1 Terms of Reference

- Block adjustment: projective vs. perspective transformation
- Registration algorithms
- Orientation procedures for 3-D scene reconstruction
- Block triangulation for airborne digital sensors and cameras
- Use of features as entities in image orientation processes

WG III/2 Surface Reconstruction from Images As Information Source

Chair: Michel Roux (France)

Co-Chair: Amnon Krupnik (Israel)

WG III/2 Terms of Reference

- Stereo matching
- Shape from X
- 3-D versus 2.5D (in collaboration with WG III/3);
- Improvement provided by automated object identification and by image/scene understanding (in collaboration with WG III/4)

WG III/3 3-D Reconstruction from Airborne Laser Scanner and InSAR Data

Chair: George Vosselman (The Netherlands)

Co-Chair: Hans-Gerd Maas (Germany)

WG III/3 Terms of Reference

- Algorithms for point cloud processing (in collaboration with WG III/2 on surface reconstruction)
- Data fusion (in collaboration with WG III/6)
- Products: Digital surface models, digital elevation models, 3-D city and landscape models
- Applications: (in collaboration with WGs VII/3, VII/4, VII/5 on coastal mapping, flood prediction, urban planning, telecommunications planning, monitoring of power lines, noise and gas propagation, tax verification, real estate sales etc.)

WG III/4 Automated Object Extraction

Chair: Helmut Mayer (Germany)

Co-Chair: James Bethel (USA)

WG III/4 Terms of Reference

- Segmentation and aggregation/grouping of image features based on classification and computer vision approaches
- 3-D object extraction and image/scene understanding, (in collaboration with WG III/2)
- Knowledge representation and manipulation, control structures, management of uncertainty, and learning, i.e., automatic model generation
- Geometric, semantic and temporal modelling of man-made and natural objects including their relations in satellite, aerial and close-range imagery
- Utilisation of prior knowledge, especially in the form of CAD models, GIS, or results from digital surface model analysis
- Performance evaluation (quality control, test procedures) (in collaboration with WGs III/7 and III/8)
- Liaise with the Computer Vision community

WG III/5 Algorithms for Industrial Vision

Chair: Carsten Steger (Germany)

Co-Chair: Stefan Scherer (Austria)

WG III/5 Terms of Reference

- Calibration: Off-line versus on-line, geometric versus radiometric calibration; active versus passive systems, non-stereo and shape-from-X techniques
- Reconstruction: real-time versus non-real time, 2-D versus 2.5-D versus 3-D
- Recognition: object-centred versus viewer-centred, quantitative versus qualitative
- Model- and appearance based inspection
- Micro-surfaces: sensor models, active image acquisition, microscopic shape-from-X
- Performance and reliability: assessment of the investigated industrial vision algorithms, in collaboration with WG III/8 and WG V/1

WG III/6 Multi-source Vision

Chair: Olaf Hellwich (Germany)

Co-Chair: Beata Csatho (USA)

WG III/6 Terms of Reference

- Information fusion from multi-resolution multi-source data such as SAR, multi-spectral, hyper-spectral, panchromatic and laser scanner data
- Modelling of uncertainty in multi-source computer vision
- Using additional knowledge sources, such as GIS, to support object extraction
- Evaluation of the effectiveness and efficiency of multi-source information fusion

WG III/7 Modelling Large Scale Urban Environments

Chair: David M. McKeown, Jr. (USA)

Co-Chair: Seth Teller (USA)

WG III/7 Terms of Reference

- Integrated/simultaneous analysis of terrestrial and aerial imagery for urban model and texture extraction
- Automated generation of urban models with level-of-detail and inferred attribution

- Merging of information from remotely sensed imagery, traditional cartographic products, CAD models, and urban GIS
- Techniques for integration of GPS, automated image matching, and interactive construction of virtual environments
- Photo-realistic rendering for a moving user
- Optical tracking and navigation for augmented reality

WG III/8 Reliability and Performance of Algorithms

Chair: Nicolas Paparoditis (France)

WG III/8 Terms of Reference

- Data set: B&W and colour images, various stereo overlaps, airborne laser and InSAR reference data
- Digital airborne data source: test data sets
- Reference terrain models and digital map data
- Simulation: data sets for optical, SAR and laser sources for parameter tuning of algorithms
- Specifications: rules for the validation of algorithms and the tuning of algorithm parameters
- New quality criteria: surface shape rendering with discontinuities, slope breaks, surface roughness, quality versus compression rates of DSM triangulation techniques (in collaboration with WGs III/2 and III/7)
- Accuracy versus robustness: definition, evaluation and tradeoffs;
- Establishment of evaluation protocols and organisation of international algorithm comparisons.

Plans of Commission III

WGIII/6 will be holding sessions at the IEEE/IGARSS 2001 International Geoscience and Remote Sensing Symposium in Sydney, Australia in June and is also organising a IEEE/ISPRS Joint Workshop on Remote Sensing and Data Fusion Over Urban Areas in Rome in November 2001.

ISPRS Technical Commission IV**Spatial Information Systems and Digital Mapping**

Incoming President: Costas Armenakis (Canada)

Incoming Secretary: Yuk-Cheung Lee, Scientific (Canada)

Francine Cusson, Administrative (Canada)

Outlook by Incoming President

The ISPRS Commission IV on Spatial Information Systems and Digital Mapping covers a wide spectrum of scientific, technical and application fields. During 1996-2000, under the successful presidency of Prof. Dr. Dieter Fritsch of Germany, Commission IV has evolved to emphasise the need for investigating the spatial information systems and databases theory, modelling, development and applications. We intend to continue and expand these efforts by stimulating further activities towards the integration of remotely sensed imagery in spatial information systems.

The theme of the Commission will be 'New Solutions for Spatial Understanding'.

The temporal and dynamic aspects of geo-data, spatial databases, modelling and analysis will continue as active research areas. Interest in the fourth dimension facilitates the understanding of the evolution of spatial elements. Research will be oriented towards the determination and representa-

tion of interaction among space, time, attributes and procedures. The use of multi-source data in a synergetic approach will require reliable measures on the consistency and quality of data and will stimulate further work on the modelling and propagation of uncertainty in data.

The need for connectivity, data sharing, open models, and transparency to the user for effective geo-processing and accessing non-homogeneous databases, will require the scientific community to address problems of designing, modelling, organising and accessing distributed and heterogeneous databases over networks, including the Internet. Internet and web-based developments will go beyond just data accessing to address queries, analysis, processing and visualisation, including mobile and wireless environments. With respect to the acquisition of geo-data, the idea that "one collects and many use" will continue to spread with the establishment of local, national and regional data frameworks. Therefore, the design and implementation of geo-spatial data infrastructures in the form of large databases, distributed databases, and clearinghouses along with data catalogues, metadata and metadata tools will also be studied. The related issues of vertical and horizontal data integration for data aggregation, multi-scale representation and knowledge extraction and discovery will be dealt with in the work on data generalisation and data mining.

The populating of spatial databases from new airborne and spaceborne sensors will continue with the investigation of their potential in providing geometric and thematic data. The evolving role of digital imagery in modern geospatial databases, due to its high information content and high degree of understanding will be investigated. At the same time, we anticipate a shift towards the maintenance of these databases through the use of enhanced updating approaches involving multi-resolution, multi-spectral and multi-temporal imagery. The work on automated change detection, feature extraction and feature classification from imagery for mapping purposes will continue. The existing spatial databases will play the role of 'prior' knowledge to provide cues and guidance in the (semi-) automated processes. Existing algorithmic and image segmentation techniques will be tested and transferred to operational environments.

To generate enhanced data sets and expand the use of image analysis and processing techniques, data fusion techniques employing multi-source actual sensors and complementary virtual sensor-like data will be investigated. The use of InSAR and LIDAR technologies for DEM generation will expand including their integration with optical video and frame sensors. To serve decision-making and societal needs, digital mapping operations will integrate both topographic and thematic aspects, with expansion to 3-D and even near real-time and 4D applications. The enhancement of extraterrestrial mapping will continue along with the space exploration activities. Landscape modelling and advanced visualisation and multimedia methods will further support the data exploration and understanding process. Reconstruction of reality in virtual reality environments from abstract and symbolic data representations, in conjunction with the cognitive pattern recognition process, will emulate certain functions of the human brain's synthetic process and will significantly improve the interpretation capabilities.

As environment and sustainable development will continue to be high in the international forums, contributions will be made also towards the advancement and dissemination of

knowledge on global environmental databases and mapping. Together with this will be the advancement of techniques, such as monitoring of landscape changes, for sustainable development.

We plan to put emphasis on the synergy and collaborative operation of the working groups and the activities of Commission IV to integrate theories, concepts, technologies, data, products, and systems for the better understanding and management of the space and our environment. To complete our holistic approach we will seek inter-commission co-operation through joint working groups and initiatives, while at the same time we will actively pursue co-operation and contacts with other related organisations, such as SDH, ICA, FIG, OGC and ISO/TC211.

The proposed theme for the Commission is "New Solutions for Spatial Understanding". This is to underline the pursue of innovative approaches by the Commission at the threshold of the 21st century as we move from data, through information, to knowledge for the better understanding of and interaction with our space and environment.

The upcoming quadrennial period 2000-2004 is going to be scientifically and technically challenging for Commission IV. The working groups of Commission IV will address the presented topics, trends, and developments as well as their impact on geo-information systems and digital mapping in accordance with the Terms of Reference and the resolutions approved at the ISPRS Amsterdam Congress.

Working Groups of Technical Commission IV for 2000-2004

WG IV/1 Spatial and Temporal Data Modelling and Analysis

Chair: Yvan Bédard (Canada)

Co-Chair: Wenzhong (John) Shi (Hong Kong)

WG IV/1 Terms of Reference

- Fundamentals of spatio-temporal spaces
- Spatio-temporal database design and development
- Spatio-temporal query and analysis
- Three-dimensional GIS modelling
- Multi-dimension and multi-scale models in GIS
- Spatial data quality and spatial model quality in the context of spatio-temporal GIS

WG IV/2 Federated Databases and Interoperability

Chair: Jianya Gong (China)

Co-Chair: Rolf A. de By (The Netherlands)

WG IV/2 Terms of Reference

- Conceptual aspects of inter-operable database environments
- Distributed spatial data models
- Connectivity, data sharing, open models and transparent geo-processing
- Link and integration of imagery, DEM, attribute and vector data from federated databases
- Generic access, search and retrieval methods for heterogeneous databases
- Concurrence control and data security for federated databases

- Spatial data standardisation (OGC, ISO/TC211)
- Inter-operation specifications for spatial data
- Internet GIS, based on heterogeneous databases
- Collaboration with Commission II (WG II/3, II/4)

WG IV/3 Data Generalisation and Data Mining

Chair: Monika Sester (China)

Co-Chair: Dianne Richardson (Canada)

WG IV/3 Terms of Reference

- Methods for the generalisation, aggregation and abstraction of image and vector data
- Data structures for the representation, processing and integration of multi-source and multi-scale data
- Concepts and techniques for hierarchical data analysis related to image and map object classification
- Methods and algorithms for the cartographic presentation of spatial objects with special focus on real-time, integrated approaches
- Enhancement of spatial data mining through inference using hierarchical classification and aggregation techniques, and synergy between image and map objects
- Co-operation with the ICA Commission on Map Generalisation

WG IV/4 Spatial Data Infrastructures

Chair: Parth Sarathi Roy (India)

Co-Chair: David Holland (UK)

WG IV/4 Terms of Reference

- Design and access of large spatial databases
- Development of comprehensive metadata, quality evaluation procedures and their standardisation
- Development of techniques for data integration in spatial information systems
- Logical and mathematical data modelling for mapping of spatial data infrastructures
- Development of basic framework concepts for the selection, aggregation and integration of fundamental data

WG IV/5 Image-based Geospatial Databases

Chair: Peggy Agouris (USA)

Co-Chair: Dimitris Papadias (Hong Kong)

WG IV/5 Terms of Reference

- Design aspects and characteristics of image-based geospatial databases
- Image queries and content-based geospatial information retrieval methods
- Geospatial knowledge management, synthesis, propagation, and communication in image databases
- Integration of digital images and GIS for spatial reasoning
- Imagery in digital libraries and web-based GIS environments
- Multimedia in integrated spatial information systems
- Co-operation with WG II/5

WG IV/6 Landscape Modeling and Visualisation

Chair: Marguerite Madden (USA)

Co-Chair: Jochen Schiewe (Germany)

WG IV/6 Terms of Reference

- Assessment of traditional and new remote sensing data for generating and visualising landscape models

- (e.g., orthoimages, DSMs, DEMs and 3-D city models)
- Integration of multi-source and multi-scale data in local and regional landscape modelling and visualisation applications
- Application and examination of dynamic and kinematic models for integrating multi-temporal landscape data sets and revising spatial databases
- Application and assessment of advanced visualisation, virtual reality and multimedia methods for 2-D, 3-D and 4-D mapping tasks in stand-alone or web-based environments
- Collaboration WG III/7

WG IV/7 Data Integration and Digital Mapping

Chair: Michael Hahn (Germany)

Co-Chair: Ryosuke Shibasaki (Japan)

WG IV/7 Terms of Reference

- Determination of the characteristics and issues related to data fusion at image, feature and information level in collaboration with WG III/6
- Integration of multi-type air- and space borne imagery as well as GIS and map data for the enhancement of spatial databases
- Techniques for high quality topographic, thematic and 3-D urban mapping requirements and applications using multi-source data
- Mapping from high resolution satellite imagery
- Quality estimation and evaluation of the fused spatial data
- Monitoring of object changes from multi-source and multi-temporal data
- Integration of 3-D spatial databases with simulation models for event representation

WG IV/8 Global Environmental Databases

Chair: Ryutaro Tateishi (Japan)

Co-Chair: David Hastings (USA)

WG IV/8 Terms of Reference

- Collection and dissemination of state-of-the-art information and knowledge on development of global environmental databases
- Evaluation, characterisation and assessment of global environmental databases
- Promotion of integrated global environmental databases
- Co-operation with related initiatives -Kyoto Protocol, Global Mapping, UN Cartographic Initiative addressing environmental global databases management
- Publication of the second volume of the book "Global Environmental Databases"
- Co-operation with WG VI/4 and VII/6

WG IV/9 Extraterrestrial Mapping

Chair: Randy L. Kirk (USA)

Co-Chair: Jan-Peter Muller (UK)

WG IV/9 Terms of Reference

- Status and technical definition of coordinate systems and geodetic control networks for mapping of planets and satellites
- Documentation of basic spacecraft data-sets for extraterrestrial mapping, current and planned extraterrestrial

- map-making activities, and planetary cartographic products
- Development and documentation of new techniques for data acquisition and extraterrestrial mapping
 - Development of GIS applications to support extraterrestrial exploration and science
 - Web-based delivery of extraterrestrial map products and GIS data
 - Co-operation with related working groups from ICA, IAU, NASA and ESA

Plans of Commission IV

Working Group IV/6, Landscape Modelling and Visualisation is planning a workshop at The University of Georgia from October 29 – 31, 2001.

ISPRS Technical Commission V

Close-range Techniques and Machine Vision

Incoming President: Petros Patias (Greece)
 Incoming Secretary: Alexandra Koussoulakou (Greece)

Outlook by Incoming President

Traditionally Commission V was the focal point for close-range photogrammetric applications. Unlike other Commissions, Commission V followed a vertical approach developing theories, pursuing research and implementing it all to a wide scientific spectrum of close-range Photogrammetry applications and real-world problems, with close co-operation to the other ISPRS Commissions.

This approach attracted the interest of many researchers, coming from disciplines other than Photogrammetry, thus offering Commission V a significant opportunity to broaden its focus and become more interdisciplinary in its activities. Commission V can serve as a focal point within both ISPRS and associated organisations, for the communication of ideas and research progress in interdisciplinary areas where close-range imaging is used for 3-D scene reconstruction and visualisation.

Further pursuing this goal, we plan to enhance the interdisciplinary nature of Commission V, as close-range imaging applications, has become a more widely adopted measurement tool in fields such as industrial metrology, machine and robot vision, medical and sports science, archaeology, architecture and construction management.

Automation in Vision Metrology Systems and Industrial Applications remain a main issue and involves the further realisation of many research goals related to existing theories and technologies. These include the development of off-line and on-line systems and solutions for metrology and robot visions, and the evaluation of systems' performance in theoretical and practical aspects. Further, the use of new sensors call for new developments in data fusion, automated sensor orientation and calibration, and new algorithmic advances. Virtual Reality is an active research area with very interesting applications. It attracts the interest of many discipline, within which close-range Photogrammetry has a distinct role in contributing to creation of geometrically accurate and realistically looking real scene and object modelling. This points at least to three research routes: (a) Development of knowledge-assisted 3-D scene understanding and reconstruction, (b) Integration of computer graphics and VR technology, and

(c) Design strategies for multi-sensor data collection and integration for complex scenes and environments.

Medical applications of close-range Photogrammetry are currently characterised by real-time requirements, high geometric accuracy for surgery and anthropometry, monitor and reconstruction of dynamic events like human motion. There is a vast amount of useful applications of such research, and Commission V plans to actively support research and development in this area.

Architecture and Archaeology is another big area of photogrammetric applications. Although the contribution of photogrammetric techniques is widely acknowledged and used, the new generation of architects and archaeologists, becoming more accustomed to digital technology and Information Systems, demand more complex solutions. This calls for further research and development from ISPRS side in areas like innovative technologies and development of new products, development of low-cost and rapid techniques, use of Internet and VR technology, integration of close-range vision techniques and spatial information systems and finally the development of standard procedures and products.

The previous collaboration with the computer animation community for the exchange of knowledge, techniques and applications is reaching to more maturity. Much study and research is still required in the areas of integration of live figures and environment generation tasks into the animation process and procedures, as well as on the interaction of real and virtual objects.

As wireless field computing applications for close-range acquisition and processing earn more ground, a new wide area of research and applications is opening up. New issues like (a) the integration of office-to-field solutions for data collection, remote data access, and mobile management, (b) methodologies and applications of integrating close range and high-resolution air-/space-borne imagery, (c) distributed multimedia geospatial databases incorporating close range imagery are coming up.

Finally, the area of Image Sequence Analysis, needs the co-operation of both Commission V and Commission III in pursuing issues like image sequence analysis, temporal analysis, time-constrained solutions, dynamic analysis and tracking, integration of image data with navigation sensor data and multi-sensor information.

Working Groups of Technical Commission V for 2000-2004

WG V/1 Automation for Vision Metrology Systems and Industrial Applications

Chair: Stuart Robson (UK)
 Co-Chair: Thomas Luhmann (Germany)

WG V/1 Terms of Reference

- Development of off-line and on-line systems, digital imaging systems and solutions for metrology and robot vision
- Development of algorithms and procedures for automated sensor orientation and system calibration

- Mathematical models and algorithms for vision metrology with emphasis in automation
- System performance evaluation in theoretical and practical aspects in collaboration with WG III/8
- Sensor fusion and the integration of disparate data types
- Target and feature recognition in multi-image correspondence
- Range image acquisition, localisation and segmentation
- New sensors and areas of application for vision metrology
- Co-operation with CMSC

WG V/2 Scene Modelling and Virtual Reality

Chair: Sabry El-Hakim (Canada)
Co-Chair: George Karras (Greece)

WG V/2 Terms of Reference

- Creation of accurate and realistic looking virtual reality (VR) models from real scenes and objects
- Knowledge-assisted 3-D scene understanding and reconstruction for VR applications
- Integration of computer graphics and VR technology with close-range vision techniques
- Improvement of performance aspects, such as speed and automation, of all procedures of 3-D scene reconstruction
- Design strategies for multi-sensor data collection and integration for complex scenes and environments
- Identifying new VR applications requiring high precision 3-D models created with photogrammetric techniques
- Increasing the collaboration between ISPRS and computer graphics, computer vision, and computational geometry groups

WG V/3 Medical Image Analysis and Human Motion

Chair: Frank van den Heuvel (The Netherlands)
Co-Chair: Hans-Peter Meinzer (Germany)

WG V/3 Terms of Reference

- Development of real-time medical imaging systems
- Use of photogrammetric and computer vision techniques for data analysis in medical imagery
- Dynamic analysis of human motion
- 3-D medical imaging for anthropometry and expression analysis
- 3-D representation and visualisation and medical VR, including support to tele-medicine
- Fostering co-operation between ISPRS and the communities of medical/biomedical engineering, sports science and human/apparel engineering

WG V/4 Image Analysis and Spatial Information Systems for Applications in Cultural Heritage

Chair: Hirofumi Chikatsu (Japan)
Co-Chair: Gabriele Fangi (Italy)

WG V/4 Terms of Reference

- Development and integration of close-range vision techniques and spatial information systems for recording, 3-D reconstruction, modelling and visualisation of structures and items of Cultural Heritage
- Incorporation of innovative technologies and development of new products
- Development of low-cost and rapid techniques in documentation and monitoring of the cultural heritage
- Development of standard procedures and products in

- co-operation with related disciplines
- Use of Internet and VR techniques to facilitate promotion of cultural heritage
- Close co-operation with national and international groups (e.g. CIPA), as well as ISPRS WGs VII / 4 and VII /5

WG V/5 Quick Response and Distributed Computing for Close-range Applications

Chair: Antony Stefanidis (USA)
Co-Chair: Vincent Tao (Canada)

WG V/5 Terms of Reference

- Methodologies and applications of integrating close range and air-/space-borne imagery.
- Integration of office-to-field solutions for data collection, remote data access, and mobile management
- Integration of indoor and outdoor 3-D models in urban and industrial areas
- Distributed multimedia geospatial databases incorporating close range imagery and other types of geospatial information
- Wireless field computing applications for geodata acquisition and processing

WG V/6 Visualisation and Animation

Chair: Armin Gruen (Switzerland)
Co-Chair: Shunji Murai (Japan)

WG V/6 Terms of Reference

- Development of image-based techniques for integration of live figures and environment generation tasks into the animation process and procedures
- Study of methods and techniques to support the interaction of real and virtual objects
- Encouragement of collaboration with the computer animation community for the exchange of knowledge, techniques and applications
- Promotion of application-specific photogrammetric technology through collaboration with related ISPRS Working Groups and through presentations at technical meetings of the animation community

IC WG V/III Image Sequence Analysis

Chair: Marc Pollefeys (Belgium)
Co-Chair: Guoqing Zhou (USA)

IC WG V/III Terms of Reference

- Algorithms and processes in image sequence analysis, temporal analysis, time-constrained solutions and dynamic analysis and tracking
- Integration of image data with navigation sensor data and multi-sensor information
- Devices for image sequence acquisition and storage
- Systems and applications in robot vision, machine vision, medical imaging, autonomous navigation, motion analysis, deformation analysis and data capture for VR

Plans of Commission V

The following conferences are being organised by WGs under the auspices of Commission V:

- Videometrics and Optical Methods for 3-D Shape Measurement VII, SanJose, USA, January 24-26, 2001
- International Workshop on Recreating the Past "Visualisation and Animation of Cultural Heritage", Ayut-

thaya/Thailand, February 26- March 1, 2001

- 5th Conference on Optical 3-D Measurement Techniques, Vienna/Austria, October 1-3, 2001

ISPRS Technical Commission VI Education and Communication

Incoming President: Tania Maria Sausen, (Brazil)

Incoming Secretary: João Ávila, (Brazil)

Outlook by Incoming President

In order to fulfil the terms of reference, Commission VI will, during the coming 4 years, encourage the participation of developing countries in Commission VI activities. This will promote education and training in Photogrammetry, Remote Sensing, and GIS in their own countries. We will also stimulate the UN Centre for Space Science and Technology Education and other Training Centres to participate in the ISPRS Educational activities, through grants, fellowships, and scholarships. It will also be necessary to encourage the dissemination of ISPRS training activities and opportunities through Ordinary, Associate, and Regional members, within their area of influence and to promote the relationship with international organisations in order to promote ISPRS educational activities. In order to reach a large number of professionals in all continents, Commission will encourage the use of Internet and computer resources in ISPRS Educational activities and attempt to stimulate the development of material for promoting the scientific and professional profiles of ISPRS areas in elementary and secondary education. As well as stimulating the Working Groups to organise Seminars, Workshops, and Training in their areas of expertise, it is also necessary to do this in co-operation with regional members of ISPRS and sister societies, who should endeavour to organise workshops for education in the developing world.

The Commission also has specific tasks:

- To maintain and update, at least annually, the Directory "Education, Training, Research and Fellowship Opportunities in the Remote Sensing and GIS and its Applications";
- To develop a directory about tutorials on Remote Sensing and GIS and to make it available on the Web;
- To encourage the development of similar Directories on Educational Photogrammetry activities;
- To increase the number of subscribers and stimulate the use of the Network Educators, for educational announcements.

The Commission has already started on its programme of work. During the period 1996-2000 TCP Tania Maria Sausen was Chair of WGVI/4, Education and she has created an EDUCATOR NETWORK, with the objective to identify people involved with education in photogrammetry, remote sensing and SIS throughout the world in order to exchange information about projects, seminars, courses, tutorials, symposia and congresses. This database has subscriptions of 100 institutions of 51 different countries. In order to enhance this an EDUCATORS NETWORK subscriber's list has been created. People who take part in this network will be directly linked to the ISPRS TC VI - Education and Communication WG and be able to receive and send information about education to all subscribers.

WG VI/1 has also done some preparatory work to set-up and start its work. A web page was established with various use-

ful information on educational resources (especially free web sites giving information on such as courses, tutorials, glossaries and dictionaries), software, lists of educational institutions, bibliographic information (books, journals etc.), conference proceedings and other links. Tutorials at ISPRS events will also be placed at our WEB page and we have already contacted all convenors of the Amsterdam tutorials to send us their notes. This web page is planned to be updated continuously with aim to be a major digital and freely accessible database on education and training. Addresses of people interested in education and training from all continents have been collected and a first circular letter has been sent out.

Working Groups of Technical Commission VI for 2000-2004

WG VI/1 Education and Training

Chair: Emmanuel P. Baltasvias (Switzerland)

Co-Chair: Theodore Bouloucos (The Netherlands)

4WG VI/1 Terms of Reference

- Identification and promotion of educational and training opportunities, taking into account regional needs
- Identification, promotion and organisation (in co-operation with educational and research institutions) of educational material (courses, tutorials, glossaries etc.), especially in electronic form
- Collection and dissemination of information on higher level education;
- Organisation of educational and training activities, especially at ISPRS events and with the co-operation of ISPRS members
- Promotion of scientific publications in our fields and collection and dissemination of respective bibliographic information
- Co-operation with firms, esp. Sustaining Members, for training at technical level (e.g. operators) and support of educational and training activities in developing countries
- Co-operation with International Spatial Information Societies, UM and other relevant organisations on education and training
- Stimulating the development of materials for promoting ISPRS scientific and professional activities in elementary and secondary education

WG VI/2 Computer Assisted Teaching

Chair: Mark R. Shortis (Australia)

Co-Chair: Pierre Grussenmeyer (France)

WG VI/2 Terms of Reference

- Collection, analysis, dissemination and promotion of materials, software and data (hard copy and/or soft copy) for computer assisted teaching
- Investigation of the role of computer assisted teaching in modern education and training such as material, methodologies, and tools
- Assessment and evaluation of highly interactive multimedia materials and the transformation of tertiary level courses in remote sensing, photogrammetry, SIS

WG VI/3 International Co-operation and Technology Transfer

Chair: Mojca Kosmatin Fras (Slovenia)

Co-Chair: Ulrike Karin Rivett (South Africa)

WG VI/3 Terms of Reference

- Development of matrices of joint activities with ISPRS Regional Members and other international organisations
- Development of activities to foster relationships between Regional Member organisations and the relevant WG
- Development of connections with international organisations to urge the wider promotion and use of photogrammetry, remote sensing, GIS and related disciplines
- Further development of international co-operation and public relations for ISPRS professions and stimulation of young professionals for co-operation in ISPRS activities
- Identification of channels for international co-operation in education and stimulation of international and regional organisations to support and fund activities promoted by ISPRS (in co-operation with the Council)
- Identification and use of support mechanism addressing needs for technology transfer, i.e. knowledge transfer and improvement of the infrastructure, especially in developing countries
- Establish links and liaise with ISU

WG VI/4 Internet Resources and Distance Learning

Chair: Sanjay Kumar (India)

Co-Chair: Carlos G. Patillo (Chile)

WG VI/4 Terms of Reference

- Development of Education Forum through Internet about remote sensing, SIS and photogrammetry in co-operation with WG VI/1
- Identification and provide links to sources of geospatial data and accessibility through Internet Map Server Applications
- Development and maintenance Web Directory about Tutorials on Remote Sensing, SIS and Photogrammetry
- Development of Technical Guides for Distance Learning implementation through Internet
- Maintenance of ISPRS Internet guidelines
- Identification and dissemination of RS, SIS and photogrammetry applications provided in Internet
- Collaboration with WG IV/8, WGII/3 and WGII/6

Plans for Commission VI

A number of workshops and seminars are planned:

- WG VI/4 is organising a session at the 4th Annual International Conference and Exhibition on Geographic Information Science in New Delhi, India, 7-9th February 2001.
- Seminar: "Education and technology transfer in Photogrammetry, Remote Sensing and Spatial Information Sciences in Latin America", Porto Alegre, Brazil, 9-10 October, 2001 (in co-operation with WG VI/3).
- Workshop "Photogrammetry, RS and SIS technologies for human settlements", Dar es Salaam, Tanzania, March, 2002 (in co-operation with WG VI/3 and a local host).
- Workshop within the frame of an Asian Conference on Remote Sensing possibly on RS, GIS and GPS technologies for environmental monitoring, agriculture and disaster management. Date and place have not been fixed yet.

**ISPRS Technical Commission VII
Resource and Environmental Monitoring**

Incoming President: Rangnath Navalgund (India)

Incoming Secretary: Shailesh Nayak (India)

Outlook by Incoming President

In a relatively short span of three decades since the launch of LANDSAT-I in 1972, space borne remote sensing has proved itself to be an indispensable tool for resource inventory and environmental monitoring at global, regional and local scales. Integrated use of RS and GIS techniques coupled with advancements in communication and information technologies are providing solutions to facilitate sustainable development of natural resources, environmental protection and disaster management. Launch of space missions carrying advanced sensors operating in very high spatial, spectral and temporal resolution mode both in optical and microwave regions provide additional dimensions to earth observation and demand better calibration, data analysis, fusion and integration techniques. While applications-oriented research in some of the countries has lead to operational and commercial use of this technology in many fields, many countries particularly in the developing world are yet to harness the benefit of technology fully. Major effort is required in development of international co-operation for promoting the use of RS & GIS in meeting challenges in the field of food security, environmental monitoring, urban sustainability, disaster mitigation, development of integrated monitoring systems for optimal management of resources, etc. Effective use of global data sets to understand geosphere –biosphere interaction and development of techniques to assimilate satellite derived parameters in models to understand global change need attention. The nine resolutions passed for Commission VII by the General Assembly in Amsterdam reflect these developments and provide directions to further work. Trends and challenges in some of these areas are briefly summarised.

Understanding and modelling spectral response of targets at different wavelengths and under different viewing geometry is basic to remote sensing. Development of methods for inverting spectral measurements to derive geophysical and biophysical parameters for their further use in process based models is needed. Some of the parameters are emissivity, aerosol optical depth profile, LAI, FAPAR, ocean colour etc. In view of the launch of many large swath sensors such as IRS-WiFS, SPOT-Vegetation, understanding effect of viewing geometry on spectral signatures will be important. Hyperspectral imaging data will contain the inherent problem of mixed classes because of low spatial resolution. Hence, extraction of end members from spectral mixtures using various methods like principal component analysis, fuzzy algorithms or parallel co-ordinate representation techniques will need attention. Increasing availability of multi-dimensional (multi-frequency, multi-polarised, multi-date, multi-look angles) digital radar data opens up many areas of research to understand microwave signatures. Availability of very high spatial resolution, hyper-spectral, multi-temporal optical data along with thermal and microwave data is opening up new field of data fusion and integration techniques. Standardisation of various procedures for data fusion needs to be developed.

Sustainable agricultural production is of utmost importance in ensuring food security to the increasing population. It calls for identification of problems and optimal land use planning at watershed level, and adoption of proper soil and water conservation measures. RS and GIS have a major role to play in developing methods for ensuring sustainable development of renewable land and water resources. Study

of cropping system which addresses crop-crop interaction, the long term effects of various cropping sequences on productivity, soil and environmental health is important. Research needs to be focused to identify indicators of sustainability, effect of green house gases on biomass production and carrying capacity. Application of high spatial resolution multi-spectral data for precision farming is another important area of research. While remotely sensed data has demonstrated its usefulness in crop monitoring and yield prediction, there is need for development of national level integrated systems for crop production forecasting and further research in improving yield models. FASAL (Forecasting Agricultural Output using Space, Agrometeorology and Land based Observation) programme being evolved in India is an interesting concept.

Advances made in the information and telecommunication technology have led to conceptualising resource monitoring systems by integrating remote sensing and in situ observations in GIS environment. Development of spatial information systems to support optimal resource management models and decision support to help e-governance should be gaining momentum. Standards for such databases and their inter-operability need to be identified. Availability of high spatial resolution optical as well as radar data, advances in GIS and GPS technology should provide impetus. Major research programmes need to be developed for environmental impact analysis, risk assessment, integrated coastal zone management, ecological assessment of reclamation, groundwater pollution, etc. Networking between information provider and end-user, standardisation of data-exchange format, etc. need to be developed.

A large number of cities all over the world are already using satellite and aerial data with GIS for preparation of development plans, transport network optimisation, utility management etc. Availability of high spatial resolution remote sensing data shall enhance one's ability to monitor urbanisation, study its impact on environment and to help planning rural infrastructure. Delineation and monitoring of environmentally sensitive areas would require attention. Research will also be focused on the use of high resolution SAR data, and its DEM likely to be available from RADARSAT-II, ENVISAT, SRTM etc. Recently, there has been emphasis on the conservation and management of natural heritage sites and cultural landscapes. The role of remote sensing (aerial photographs, high resolution multi-spectral data, radar data, etc.) in GIS environment for restoration of some such sites has been demonstrated. Standard procedures to routinely monitor such sites and conservation and preservation practices need to be evolved in close co-operation with CIPA and other international bodies.

Earthquakes, landslides, volcanic eruption, fires and floods are natural hazards that kill thousands of people and destroy billions of dollars of habitat and property each year. Floods are the most serious disasters followed by earthquakes, (man-made) accidents and landslides. Disaster management comprehends the aspects of risk analysis (assessing vulnerability or hazard analysis) and preparedness, prevention (disaster warning or early warning), disaster relief (rescue), and disaster mitigation and planning. Remote sensing has made significant contributions in identification of risk zones. However further efforts are required in providing

warning and alert. Development of systems which integrate space observations, modelling and space communication are important. Post-disaster management comprises rescue, relief, and rehabilitation / reconstruction. Remote sensing play its most spectacular role in disaster damage assessment. The various technologies, which would be of significant use in disaster management, are rainfall measurement for flood and landslide warning, soil moisture measurements for flood, landslide and drought warning, application of high spatial resolution imagery for damage assessment, SAR data for timely damage assessment (in an operational phase, by using many satellites to enhance the repetition cycle), slope analysis for landslide vulnerability, determination of tectonic motion for earthquake prediction as a trigger for landslides.

SAR Interferometry technique shows promising results for topographic mapping and change detection, especially, where the detection of height differences in terrain is necessary, e.g., in risk analysis with respect to earthquakes, mass movement and volcanic outbreaks. Through use of differential SAR Interferometry (DInSAR) it is possible to monitor minute surface movements which accompany a range of natural disasters. This technique is in rapid development and operational applications are starting to emerge.

Space observations are an important step toward recording and understanding Earth changes, both natural and man-made. As remote sensing affords the opportunity to view the earth synoptically as an entity, it has been possible to create long-term data sets on various aspects of global change, such as, radiation budget, atmospheric chemistry, ocean surface topography and circulation, sea surface temperature, oceanic biological productivity, ocean/atmosphere coupling, global vegetation, desertification, coastal change, volcanoes, snow cover, human induced changes. Among the complications in producing time series of remotely sensed data for large areas are the problems of storing data and processing them in a consistent and timely fashion. Also, many of the derived data sets from remote sensing should be checked for consistency using physical principles. Complementing the advances made in the understanding of the Earth system from remote sensing has been the advances made from numerical models. Models of the Earth's atmosphere and oceans are being used to predict global changes and particularly the likelihood of global warming and its consequences. Efforts are put into modifying or designing these models to be able to accept remote sensing data as inputs. Considering the huge nature of this data and the analysis methodologies, there is strong need for international co-operation among the space technology providing countries for creating global database and co-operating in the large scale validation of numerical predictions. Organisations like IGBP and CEOS are a step towards that. Close co-operation with TC-IV is envisaged.

Working Groups of Technical Commission VII for 2000-2004

WG VII/1 Fundamental Physics and Modelling

Chair: Karl Staenz (Canada)

Co-chair: Marc Leroy (France)

WG VII/1 Terms of Reference

- Study of spectral, spatial and temporal signatures of various earth surface features (land and ocean) with special reference to hyper spectral and microwave aspects
- Studies to understand view angle effects on spectral signatures
- System studies to define a set of sensors / constellation of satellites for theme applications and radiometric and geometric calibration requirements; in conjunction with WG I / 2
- Investigations in the area of retrieval of geophysical parameters
- Co-operation with WG III/5 on advance information extraction techniques : classifiers, data fusion techniques
- Co-operation with institutions maintaining data bases on spectral signatures, CEOS CalVal WG and EARSeL SIG on Imaging Spectrometry

WG VII/2 Sustainable Agriculture & Eco-system Approach

Chair: Andrew K. Skidmore (The Netherlands)
Co-chair: Lei F. Tian (USA)

WG VII/2 Terms of Reference

- Improve crop monitoring and yield modelling methodology with synergistic use of space, agrometeorology and in-situ observations in GIS environment
- Investigate the interaction of agriculture with ecosystems, especially management that reduces agricultural impacts on the environment
- Geo-information and management requirements for the ecosystem approach
- Ensure optimal use of agriculture inputs for precision farming employing high spatial and spectral resolution and other data
- Improve models for assessment, efficient utilisation and conservation of water resources for agriculture using optical, thermal and microwave data with other data
- Integrated studies for cropping systems in various regional set-ups for attaining sustainable agriculture

WG VII/3 Integrated Monitoring Systems for Resource Management

Chair: Sandra Maria Fonseca da Costa (Brazil)
Co-chair: Li Yingcheng (China)

WG VII/3 Terms of Reference

- Modelling and management of natural resources using integration of RS, in-situ measurements and other data in GIS environment
- Use of spatial information systems for generating alternate scenarios to facilitate monitoring and optimal management: forestry, geology, hydrology, coastal zones, snow and ice
- Contribute to the establishment of reliable indicators of sustainability
- Co-operation with international environmental programmes such as IGBP and ICORSE for development of process-based models to sustainability

WG VII/4 Human Settlement and Impact Analysis

Chair: Gabor Remetey-Fülöpp (Hungary)
Co-chair: Carsten Juergens (Germany)

WG VII/4 Terms of Reference

- Data analysis for urban land use studies and for improved urban planning using aerial and high spatial resolution space borne data
- Remote observations for monitoring urban environment and change detection
- Use of Remote Sensing & GIS for infrastructure development for rural settlements
- Study impact of urbanisation, industrial growth, mega engineering structures on ecological and social environment, urban sustainability; tracking of disease vectors
- Documentation, conservation and management of natural heritage and cultural landscapes in co-operation with UNESCO / ICOMOS / CIPA
- Interface with IHDP

WG VII/5 Disaster Monitoring, Mitigation and Damage Assessment

Chair: H. Singhroy (Canada)
Co-chair: Michael Abrams (USA)

WG VII/5 Terms of Reference

- Identification of potential risk zones for different type of disasters such as forest fire, cyclone, floods, volcanoes, earthquake, land slides etc.;
- Integrated observation and communication strategies for disaster detection, monitoring and damage assessment in co-operation with CEOS and IGOS;
- Enhance predictive modelling capabilities;
- Development of disaster management plans for pre, during and post disaster situations;
- Foster the creation of more effective information systems to support disaster management activities

WG VII/6 Monitoring and Modelling Global Change

Chair: Yoshifumi Yasuoka (Japan)
Co-chair: Mark Imhoff (USA)

WG VII/6 Terms of Reference

- Use of long term regional and global data bases using historical and satellite data over terrestrial eco-systems, snow and glaciers, atmosphere, oceans to monitor and model global change in co-operation with WG IV/8
- Evolve standards for data exchange and quality evaluation of satellite derived bio-geophysical parameters
- Develop strategies and algorithms for assimilating remotely sensed data in global change models
- Co-operation with international programmes, e.g. International Global Change Atmospheric Chemistry (IGAC), to support implementation of international policies and treaties

Plans of Commission VII

Two international workshops on Physical Measurement and Signatures in Remote Sensing (January 8-12, 2001, Aussois, France) and on Spectral Sensing Research (June 10-15, 2001, Quebec, Canada) are planned. A close interaction with the CEOS Cal/Val group and TC I is planned.