



ISSN 0256-1840

INTERNATIONAL SOCIETY FOR PHOTOGRAHMTRY AND REMOTE SENSING
INTERNATIONALE GESELLSCHAFT FÜR PHOTOGRAHMETRIE UND FERNERKUNDUNG
SOCIETE INTERNATIONALE DE PHOTOGRAHMETRIE ET DE TELEDETECTION

INTERNATIONAL ARCHIVES OF PHOTOGRAHMTRY AND REMOTE SENSING
ARCHIVES INTERNATIONALES DE PHOTOGRAHMETRIE ET DE TELEDETECTION
INTERNATIONALES ARCHIV FÜR PHOTOGRAHMETRIE UND FERNERKUNDUNG

Volume
Volume
Band

26

Part
Tome
Teil

5

PROCEEDINGS OF THE SYMPOSIUM

**REAL-TIME PHOTOGRAHMTRY—
A NEW CHALLENGE**

JUNE 16-19, 1986 OTTAWA, CANADA

Published by

Publié par

Herausgegeben von

THE CANADIAN INSTITUTE OF SURVEYING

PREFACE

The mandate of Commission V of the International Society for Photogrammetry and Remote Sensing (ISPRS) is to promote and to help develop photogrammetric methods, techniques and applications in areas not related to general mapping. This definition covers a broad scope of diverse scientific and engineering disciplines and directly contributes to the thematical variety, which is so typical of the Commission's work. The theme of the 1986 Commission V Symposium, "Real-Time Photogrammetry - A New Challenge", was chosen to emphasize the current trend towards the implementation of photogrammetry within the real-time constraints of processes and operations monitored or controlled in three-dimensional space. We hope that the Symposium will provide an excellent forum for the exchange of ideas related to our mandate, will help to evaluate the corresponding developments and will ultimately result in a good preparation of the 1988 ISPRS International Congress in Kyoto.

This volume represents a collection of papers submitted in time for printing before the Symposium and does not completely coincide with the Symposium's technical program. Copies of the papers which were not available by the closing date, will be distributed by individual authors at the time of the Symposium. The proceedings are reproduced from original manuscripts as received from authors and some quality variations are due to the different typing and printing facilities available to the individual authors. The contents are structured according to the existing working groups and committees, thus thematically delineating areas of interest for the 1984-88 term of Commission V, as determined by the resolutions from the last ISPRS International Congress in 1984. An alphabetical index of authors is included for easy reference.

Sincere thanks are due to all the authors for contributing their papers and for submitting them in time to get the proceedings printed before the Symposium. We also gratefully acknowledge the grant from the National Research Council of Canada, which has helped us to cover part of the publishing costs.

Ottawa, May 1986

M.C. van Wijk
Secretary
Commission V

V. Kratky
President
Commission V

Mailing address: Division of Physics
National Research Council of Canada
Ottawa, Ontario
Canada K1A 0R6

TABLE OF CONTENTS

Preface	i
Table of Contents	ii
Index	vii

WORKING GROUP V/1.

ANALYTICS OF NON-TOPOGRAPHIC PHOTOGRAHMETRY

Altan, M.O.	1
A Super Precise Test Field for Close-Range Photogrammetric Applications	
Armenakis, C. and W. Faig	7
On-Line Data Acquisition for Multi-Temporal Photography Using the	
Analytical Plotter OMI AP-2C	
Chang, B.	14
The Formulae of the Relative Orientation for Non-Metric Camera	
Faig, W. and T.Y. Shih	23
Critical Configuration of Object Space Control Points for the Direct Linear	
Transformation	
Fryer, J. G.	30
Lens Distortion for Close Range Photogrammetry	
Fryer, J.G. and C.S. Fraser	38
Analytical Calibration Procedures for Underwater Cameras	
Huang, Y.D.	49
Application of Biased Estimation to Close-Range Photogrammetric Data	
Reduction	
Huang, Y.D.	57
More Remarks on Self-Calibration	
Madani, M. S.	68
The "InterMap Analytic" - The Analytical Stereoplotting System from	
Intergraph	
Wester-Ebbinghaus, W.	77
Analytische Kammerkalibrierung	
Ziemann, H.	85
Thoughts on a Standard Algorithm for Camera Calibration	

WORKING-GROUP V/2.

LOW ALTITUDE AERIAL PHOTOGRAHMETRY

Georgopoulos, A. and E. Stambouloglou	94
The Photogrammetric Survey of an Archaeological Site (Cnossos-Crete);	
Focus on Special Problem	

Ogleby, C.L.	102
Applications of Non-Metric Photogrammetry in Archaeometry	
Peipe, J.	112
Differentialentzerrung von Nicht-Messbildern in der Luftbildarchäologie	
WORKING-GROUP V/3.	
UNCONVENTIONAL TECHNOLOGIES IN CLOSE-RANGE	
PHOTOGRAMMETRY	
Agnard, J.-P. and P. Grenier	118
Obtention Directe de Maquettes Tridimensionnelles a Partir de	
Stéréorestituteur	
Cherny, A.N.	122
Determination of Three-Dimensional Coordinates of the Object Points by	
Means of X-Ray Aimed Pictures	
Elghazali, M.S.	128
Two-Dimensional Transformation of Vertical Transmission Electron	
Micrographs in Micro-Range Photogrammetry	
Ghosh, S.K. and M. Adiguzel	138
Deformations in Electron Micrography and Their Relative Importance	
Ghosh, S.K. and M. Boulianne	145
La Ligne-Flottante: Principe et Applications	
Li, W. and G. Li	151
Using the Scanning Electron Microscope to Determine the Unevenness of	
Grain Surfaces and to Draw Contour Lines	
WORKING-GROUP V/4.	
CLOSE-RANGE PHOTOGRAMMETRY IN INDUSTRY AND APPLIED	
SCIENCE	
Berg, G.	159
Application of Precision Close Range Photogrammetry for Quality Control	
and Documentation in Power Station Construction	
Borutta, H. and J. Peipe	165
Deformation Analysis of Three-Dimensional Photogrammetric Point Fields	
Dorrer, E.	176
Precision Analytical Underwater Photogrammetry	
Dudek, D., P. Lužyniecki and J. Woźniak	185
Photogrammetric Method of Determining Vibrations of Multivasular	
Stripper	
Ethrog, U. and B. Shmutter	192
Determining Deformations of a Rotary Kiln	
Fraser, C.S. and P.C. Gustafson	199
Industrial Photogrammetry Applied to Deformation Measurement	

Kolondra, L.	209
Determining Tension Forces of Guy-Ropes of an Aerial Mast by Means of Terrophotogrammetric Measurements	
Madejski, P. and M. Lewandowski	217
The Measurements of the Surface Water Currents of Hornsund Fjord by Photogrammetric Method	
Rachwal, A.	225
Photogrammetric Method of Post-Constructional Survey of Ship's Hull in Shipyard Building Slip	
Robertson, G.	232
Test of Photogrammetric Accuracy for Mensuration of Aerospace Tooling	
Shortis, M.R., L.J. Price and P.J. Turner	241
Photogrammetric Monitoring of the Excavation of a Trunk Sewer Pumping Station	
Toz, G.	250
The Applicability of Close-Range Photogrammetry in Structural Model Testings	
Woźniak, J.	258
Photogrammetric Methods of Determining Industrial Objects Displacement in Mining Areas	
WORKING-GROUP V/5.	
BIOSTEREOMETRICS	
Adams, L.P. and M. Klein	263
Biostereometric Methods for the Study of Body Surface Motions During Breathing	
Baj, E.A. and G. Bozzolato	271
On Line Restitution in Biostereometrics Using One Photogram and a Metric Projector	
Bedwell, C.H. and R.B. Mahani	279
The Application of Stereo Video Photogrammetry to Visual and Related Ergonomics	
Bulstrode, C.J.K. and P.J. Scott	287
A Comparison of Stereophotogrammetry with Conventional Techniques Used to Measure Healing in Chronic Leg Ulcers	
Ding, X. and J.R. Pekelsky	294
The Ordering of Ordinary Moiré Fringes by Photometric Analysis	
Li, G., W. Li and S. Yang	303
Research on Micro-Stereophotogrammetry	
Mesqui, F., F. Kaeser and P. Fischer	310
On-Line Three-Dimensional Light Spot Tracker and Its Application to Clinical Dentistry	

Müftüoglu, O.	318
A System for the Orientation of Non-Metric Camera Image Plane	
Peipe, J. and W. Wester-Ebbinghaus	323
Zur Anwendung der Teil-Messkammer-Technik in der Kieferorthopädie	
Robertson, G.	332
New Photogrammetric Instrumentation for Use in Medical Applications	
Scott, P.J. and C.J. Wonnacott	338
An Analytical Plotter Attachment for the Reflex Microscope	
Shih, T.Y. and W. Faig	341
An Economical Approach to Measuring Anthropological Shapes by Photogrammetry	
Takamoto, T. and B. Schwartz	349
Three-Dimensional Mapping of Retinal Vessels in Ophthalmology	
Turner-Smith, A.R. and J.D. Harris	355
Measurement and Analysis of Human Back Surface Shape	
WORKING-GROUP V/6.	
DIGITAL AND REAL-TIME CLOSE-RANGE PHOTOGRAHMETRY	
El-Hakim, S.F.	363
A Real-Time System for Object Measurement with CCD Cameras	
Haggrén, H.	374
Real-Time Photogrammetry as Used for Machine Vision Applications	
Holm, K. R.	383
Test of Algorithms for Sequential Adjustment in Close Range Photogrammetry	
Hughes, R.C.	391
Enhanced Single Camera Photogrammetry Algorithms for Real-Time Control Applications	
Luhmann, T.	400
Automatic Point Determination in a Réseau-Scanning System	
Murai, S., F. Otomo and H. Ohtani	409
Automated Three-Dimensional Measurement Using Stereo CCD Camera in the Application to Close Range Photogrammetry	
Pinkney, H.F.L. and C.I. Perratt	414
A Flexible Machine Vision Guidance System for 3-Dimensional Control Tasks	
Pocztar, L., G. Loopuyt and H. Maitre	424
Particles Flow Determination in 4-Dimensional Space	
Real, R.R.	432
Components for Video-Based Photogrammetry of Dynamic Processes	
Wester-Ebbinghaus, W.	445
CCD-Reseau-Abtastung – Ein Neues Prinzip für Digitale Bildverarbeitung	
Wong, K.W.	454
Stereo Solid State Camera Systems	

ISPRS/CIPA COMMITTEE : ARCHITECTURAL PHOTOGAMMTRY

Cundari, C., M. Fondelli, G.M. Iacobitti and L. Ippolito	459
A Survey of Caserta Royal Palace – Experiments in Method of Integrated Survey	
Fiedler, T., S. Petrović, M. Lapaine and M. Jandrić-Šare	465
Computer Aided Mathematical Modelling of a Complex 3-D Object	
Kirwin, W.C. and C. di Thiene	473
Photogrammetry and Architecture: The Anatomy of Bernini's Baldachin (1624-33)	
Kotowski, R., J. Peipe and W. Wester-Ebbinghaus	482
Photogrammetrische Bauaufnahme der "Kirchen von Siena" – Entwicklung eines Konzepts zur Vermessung von Grossbauwerken	
Patmios, E., T. Halkias and M. Lasaridou	492
Photogrammetry and Photointerpretation on the Study and Preservation of the Cultural Inheritance	
Saint-Aubin, J.-P.	502
Géométrie de l'Architecture	
Sawyer, P. and J. Bell	510
Recording and Replicating a Tsimshian Stone Mask by Close Range Photogrammetry	
Schuhr, W., E. Kanngieser and M. Medefind	516
Samples for Prediction Support of Archaeologic Monuments	
Sena, C.	524
Remarks on the Use of Analytical Orthophoto System in Non-Topographic Photogrammetry	

PAPERS RECEIVED AFTER CLOSING DATE

Forno, C.	529
High Resolution Moiré Photography	
Oldfield, S.	541
Photogrammetric Plate Measuring Facilities at NPL	