

14th Congress of the International Society for Photogrammetry  
Hamburg 1980

Commission V  
Working Group V-1

REPORT ON THE ACTIVITIES OF ISP WG V-1  
(ANALYTICS OF CLOSE-RANGE PHOTOGRAMMETRIC SYSTEMS)  
1976-1980

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ABSTRACT

This report outlines the goals and discusses the achievements of ISP WG V-1 (Analytics of Close-Range Photogrammetric Systems) during the period 1976-1980. Members of the WG are identified and their areas of interests listed. The technical program of the WG planned for the 14th ISP Congress in Hamburg, 1980 is outlined.

INTRODUCTION

ISP WG V-1 was formed in 1976 in response to Resolution No. 1 of ISP Commission V at the Helsinki Congress, which recommended the formation of a Working Group on the topic, "Analytics of Close-Range Photogrammetric Systems" to follow up on the results of the 1972-1976 Working Groups V/1 and V/2.

PROGRAM

The following program for WG V-1 was agreed upon by its members:

1. Analytical solutions in close-range photogrammetry.
  - 1.1 Calibration of metric and non-metric cameras and systems.
    - 1.1.1. Methods and parameters; comparison of approaches.
    - 1.1.2. Accuracy and tolerances
  - 1.2 Object-space control requirements.
    - 1.2.1. Approaches and parameters; comparison of approaches
    - 1.2.2. Accuracy and tolerances
  - 1.3 Mathematical formulation and digital analysis.
    - 1.3.1 Off-line solutions
    - 1.3.2 On-line systems.

- 1.4 Accuracy of close-range analytical evaluations.
  - 1.4.1. Practical experience.
  - 1.4.2. Experimental research.
  - 1.4.3. Prediction models.

- 2. Analytical solutions in terrestrial photogrammetry  
(The same line of attack as above is used here.)

In differentiating between the terms "close-range" and "terrestrial" photogrammetry, the object distance was taken as a criterion. In close-range photogrammetry the range of object distance is between a few centimeters and some 300 meters, while in terrestrial photogrammetry the object distance is normally in excess of 300 meters.

#### MEMBERSHIP & AREAS OF INTEREST

Name	Country	Areas of Interest
Faig, W.	Canada	Basic theoretical and experimental studies. Metric and non-metric cameras.
Grün, A.	F.R. Germany	Basic theoretical studies. Accuracy and reliability aspects of systems.
Karara, H. M.	U.S.A.	Basic theoretical and experimental studies. Metric and non-metric cameras.
Kratky V.	Canada	Basic studies on on-line systems. Real-time photogrammetric video-system controlling the remote manipulator system in the Space Shuttle project. Close-range photogrammetric software for the ANAPLOT.
Linkwitz, K.	F.R. Germany	Basic theoretical and experimental studies. Metric and non-metric cameras.
Salmenparä, H.	Finland	Software for industrial photogrammetry. Graphical representation of results. Practical possibilities of on-line connection of monocomparators and desk calculators.
Veress, S. A.	U.S.A.	Terrestrial photogrammetry. Metric cameras.
Wong, K. W.	U.S.A.	Geotechnical studies. Non-metric cameras.

#### MEETINGS OF WG V-1

Almost all business of ISP WG V-1 was transacted by mail. A business meeting was held in Stockholm on August 16, 1978, during the Inter-Congress Symposium of ISP Commission V. During that meeting, the program of WG V-1 at the Hamburg 1980 ISP Congress was discussed and finalized.

## PARTICIPATION AT THE 1978 STOCKHOLM SYMPOSIUM

One of the sessions of the Stockholm symposium was entitled "Analytics in Industrial Photogrammetry." The following papers were presented and discussed:

- H. Bopp & H. Krauss (FRG): Extension of the 11-Parameter Solution for On-the-Job Calibration of Non-Metric Cameras.
- M.O. Altan, H. Bopp, H. Krauss (FRG): Some Accuracy Aspects of On-the-Job Calibrations Shown at the Example of a Photogrammetric Control Survey.
- A. Grün (FRG): Accuracy, Reliability and Statistics in Close-Range Photogrammetry.
- B. Wrobel (FRG): Kammerkalibrierung mit Verknüpften Bildverbänden bei nicht Formatfüllendem Testfeld.
- V. Kratky (Canada): Analytical Study of a Photogrammetric Solution for Real-Time Three-Dimensional Control.
- H.F.L. Pinkney (Canada): Theory and Development of an On-Line 30 Hz Video Photogrammetry System for Real-Time Three-Dimensional Control.

## PROGRAM FOR HAMBURG, 1980

1. Regular V-1 Session (Analytics of Close-Range Photogrammetry).
  - 1.1 "Report on Activities of WG V-1," H. M. Karara.
  - 1.2 Invited Paper 1: "An Exposé on Photographic Data Acquisition Systems in Close-Range Photogrammetry," H. M. Karara (U.S.A.) and W. Faig (Canada).
  - 1.3 Invited Paper 2: "Precision and Reliability Aspects in Close-Range Photogrammetry," A. Grün (FRG).
  - 1.4 Two Presented Papers, to be selected from the freely presented papers.
  - 1.5 Discussion.
2. Extra V-1 Session (Analytics of Close-Range and Terrestrial Photogrammetric Systems).
  - 2.1 Invited Paper 1: "Contemporary Analytical Solutions in Terrestrial Photogrammetry," S. A. Veress (USA).
  - 2.2 Invited Paper 2: "From On-Line to Real-Time Solutions in Close-Range Photogrammetry," V. Kratky (Canada).
  - 2.3 Two Presented Papers, to be selected from the freely presented papers.
  - 2.4 Discussion.

3. Extra Joint Session I-6:V-1 (Underwater Photogrammetry).
  - 3.1 "Report on Activities of WG 1/6," G. T. McNeil.
  - 3.2 Invited Paper 1: "In-Water Photogrammetry--Acquisition," L. E. Mertens (USA).
  - 3.3 Invited Paper 2: "Multi-Media Photogrammetry," K. Rinner (Austria)\*.
  - 3.4 Presented Paper 1: "Recent Developments in Aerial and Underwater Photography Systems for Marine Research Applications at the Bedford Institute of Oceanography," C. T. Schafer, J. R. Belanger, I. Larsen, N. Fenerty, and D. Heffler (Canada).
  - 3.5 Presented Paper 2: "Underwater Acquisition Systems," V. A. Siefert (USA).
  - 3.6 Discussion

#### OVERVIEW OF ACHIEVEMENTS OF WG V-1 (1976-1980)

The reporting period can be characterized as a period of consolidation for the use of analytical approaches in non-topographic photogrammetry. The activities of the WG-1 during these four years indicate mainly an evolutionary development and continual improvement without any spectacular departures from the methods and approaches reported on at the Helsinki 1976 ISP Congress.

Clearly recognizable are the following trends:

- a- The continued increase in the incorporation of stochastic treatments of reliability problems in close-range photogrammetric solutions. A statistically-founded strategy for gross error detection has shown to provide remarkable efficiency.
- b- The continued increase in the use of non-metric cameras as vehicles for data acquisition in photogrammetric projects where suitable metric cameras are not available. Yet another data reduction solution particularly suitable for non-metric imageries has been developed. Thus the user of non-metric cameras has now the luxury of being able to choose from 3 possible solutions: the DLT approach, the UNB Self-Calibration method, and the 11-parameter solution, for data reduction.
- c- While the understanding of the photogrammetric potentials of non-metric cameras has continued to improve, it has been noticed that some misconceptions about the important role of non-metric cameras in photogrammetric systems still persist. In an effort to rectify this situation, a tutorial-type invited paper on the total spectrum of photographic data acquisition systems in close-range photogrammetry has been decided upon for the Hamburg 1980 ISP Congress. It is hoped that the wide dissemination of such information would assist engineers and scientists, and others in

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\* Unfortunately, Prof. Rinner's paper had to be withdrawn because of his illness.

various disciplines, make a fuller use of the economical and technical advantages of photogrammetry.

- d- Considerable progress has been achieved in on-line and real-time systems.

Respectfully Submitted,



H. M. Karara  
Chairman, ISP WG V-1