

L I T H U A N I A

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Reported by Prof.Dr. V.Vainauskas

THE STATE OF PHOTOGRAMMETRY IN LITHUANIA

INTRODUCTION

In the mediavial ages Lithuania was one the strongest state of Europe (1236-1795).After World War I and the terrible oppression of the czarist Russian empire the Lithuanian people regained their independence and reestablished their statehood (1918).There we find the first steps in photogrammetry.The Topographic Department of the Defence Forces used the aerial images for revision of the old Russian topographic maps to the scale 1:42000.During the period 1934-1939 maps, to the scale 1:100000 covering 2/3 of the territory, were revised and published.The efforts were made to use the aerial images for making photomosaics in the territories of towns and settlements (1937-1939).The first pioneer of photogrammetry in Lithuania was Eng.J. Deksnys who attended all congresses of International Society for Photogrammetry (1930,1934,1938) and was a corresponding member to the journal "Photogrammetria". During this very short period of time few engineers-surveyors were trained in the higher schools and universities of Europe such as Austria, Germany, Czechoslovakia and France. There were held few conferences of the Baltic States for geodesists, surveyors and land use planners where the importance of photogrammetry was approved (1935,1938).

MAPPING

The great impetus to the development of the Lithuanian photogrammetry was given after the World War II.As the first step in 1949 the most important gover-

mental body "The Board of Rural Aerophotogrammetric Surveys" was established. This board carried out all surveys for the needs of Lithuanian agriculture to the scale 1:10000.With the account to the rapid changing of landscape features the aerial photography was repeated and revised systematically.Therefore this board in co-operation with the Land Planning Board mapped the territory of Lithuania to the scale 1:10000 and contour distance 1 m.In the regions where it was necessary to project the drainage the stereophotogrammetric or combined surveys to the scale 1:2000 were carried out.The Board had at its disposition photogrammetric equipment: rectifiers, stereographs and stereocomparators.The densification of control is done by means analytical block phototriangulation.This board stimulated rigorously the development of photogrammetry in Lithuania.This is very good beginning for topographic surveys to the scale 1:5000 with the contour distance of 0,5-1 m.The territories of towns and cities are mapped by the photomosaics to the scales 1:5000 and 1:2000.

EDUCATION AND RESEARCH

University level education in geodesy and photogrammetry is offered at the Vilnius technical university where lectures and practical training and finally the graduation designs are carried out.In faculty of land use planning of the Rural university of Kaunas offers a fundamental course in photogrammetry to those

studying for degree of a land use planners. Brief courses in photogrammetry are given for the students studying the architecture, geography, geology, forestry and agriculture. Education in photogrammetry on the lower level in the land surveying branches of the state technical schools is also provided.

In Lithuania only five theses for the degree of candidate of technical sciences have been written on subjects related the photogrammetry and two doctoral theses concerning the optimization, projecting, adjustment and estimation of measurement information.

Candidates of technical sciences are: V. Vainauskas "The investigation of errors in photogrammetric networks"; P. Kausakys "The aerophotogeodetic investigation of properties of landscape for the needs of melioration"; R. Vilunas "The investigation of the deformations on construction systems by means of photogrammetry"; A. Zalnierukas "The planimetric phototriangulation under use EC" and A. Pilipaitis "The improvement and investigation of photogrammetric approaches for inventory of cultural heritage".

Doctors of technical sciences are: V. Vainauskas "The optimum photogrammetric methods for solving of engineering problems with regard to the properties of geodetic measurements" and J. Skeivalas "The mathematical treatment of geodetic measurements with regard to tolerances". The scientific degrees were given in Moscow at the fundamental university for engineers of geodesy, aerial surveying and cartography.

ANALYTICAL PHOTOGRAMMETRY

In recent years digital computers are being widely used in automatization of processing of the measurement information. Therefore for processing of any information of photogrammetric measurements universal and standardized algorithms and programmes have been elaborated; that was usefull for processing of any images (aerial, terrestrial, metric, nonmetric, etc.).

For the improvement of more rigorous digit models the method of a simultaneous appliance of conditions of coplanarity and collinearity as well as the method of including the so-called quasicon- trolled points for processing images under conditions of collinearity have been elaborated. As a result the amount of information measured can easily increase, besides, without any additional means and efforts. For solution of various engineering problems, neighbouring models of an object must be together processed and photogrammetric networks established.

For the preliminary establishment of networks, the method of independent models is applied, and the final rigorous adjustment of bundles is carried out by means of successive changing of resection and intersection under conditions of perspective or projective collinearity. Topological adjustment of photogrammetric networks of this kind does not need making and solving large systems of equations; owing to this PC computers can be used. Besides, such stepfull adjustment of networks allows to use any functional stochastic model. This method of phototriangulation has especially justified itself in architectural photogrammetry when special closeness and girdleness of object investigated had to be taken into account

Considering the properties of topological processing of measurement information, an effective method has been worked out, i.e. a method including and processing additional measurements with photogrammetric ones, such as the length of lines, directional angles and azimuths, elevations of points, horizontal and vertical angles and others. All additional measurements are included into the process of computation through quasicon- trolled points, besides without any essential increase in calculation and parameters to be determined. Weight matrix (stochastic model) is formed in an empirical way. Besides, such an empirical choice of stochastic model reduces resolutely the influence of slight but gross mistakes in measurements, and as a result of this, an automatic rejection of measurements appears to

be unfit. Experimental work demonstrated that the accuracy of final results increases two or three times if empirical weights are used.

It should be pointed out that important achievements were made in the field of treatment and adjustment of measurement information in geodetic and photogrammetric networks when using the theory of probability and mathematical statistics. Consequently when we have HARDWARE and SOFTWARE and in this way one can normally work.

CLOSE-RANGE PHOTOGRAMMETRY

It was necessary to carry out complex inventory of the most valuable historical architectural monuments, to do research work in future as well as to aid the restoration in 1969 a research Laboratory of Engineering Photogrammetry was established at Vilnius University and in 1976 at The Institute of Preservation of Monuments the Laboratory of Architectural Photogrammetry was founded.

The first laboratory is occupied with provision of photographic data and complex inventory to the creation of photogrammetric archives of valuable historical architectural monuments. The latter laboratory is mainly concerned with the provision of photogrammetric data to the architects - restorers, necessary for the preparation of restorative designs. In a period of rather short time the complex inventory of the old castles of Vilnius, Trakai, Birzai, Medininkai, Kréva, the ensembles estates, the ancient ethnographic villages was carried out. The plotting of the ancient towns was made by the architectural laboratory and the front elevation drawings were plotted to a scale 1:100 and the line drawings of details were made to an enlarged scale 1:20 or 1:10.

Since 1980 in both laboratories worked out automated photogrammetric systems (APMS) for surveying small objects such as architectural monuments, landscapes and geological formations (architectural ensembles, archeological objects, slashing coasts of various water bodies, travelling dunes, etc.). The main base for the systems is photocopiers, stereocomparators, PC, a

numerical coordinatograph.

On the basis of these systems the first attempts to organize the establishment of digital photogrammetric archives of cultural monuments were made. But realization of this idea is limited by the possibilities of the technical base available.

Combination of aerial and terrestrial photogrammetry opens wide possibilities in surveying archeological heritage to the environment and enables to evaluate properly their protection.

ACTIVITIES OF THE NATIONAL COMMITTEE

The birthday of the Lithuanian Committee for Photogrammetry and Remote Sensing is said to be 1983 there was held first conference on the problems of close-range photogrammetry; they were the following:

1. The application of geodetic and photogrammetric methods in research of cultural and natural objects // Allunion / republican conference. Vilnius. 1983;
2. The problems of cartography of cultural and natural monuments // Allunion / republican conference. Vilnius. 1989;
3. The architectural photogrammetry // International conference. Vilnius. 1989.

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