

# **Report Of The Czech Society For Photogrammetry And Remote Sensing About Its Activities In Seven Commissions Of Isprs During 2000-2004**

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## **ABSTRACT:**

Czechoslovakia was a member of the International Society for photogrammetry and Remote Sensing in 1930 - 1986. After creating two new countries – Czech Republic and Slovakia, the Czechoslovak Society for Photogrammetry and Remote Sensing was splitted between two parts - the Czech one and the Slovak one. The Czech Society for Photogrammetry and Remote Sensing has been a continuing member since 1996. The division was performed at the XVIII congress of ISPRS in Vienna.

## **1. COMMISSION I: SENSORS, PLATFORMS AND IMAGERY**

After the last ISPRS Congress in Amsterdam an important increase of measuring techniques is evident in the private sector of photogrammetry. Companies offering aerial survey are newly equipped with cameras of 305 mm focus and with new RMK TOP cameras. The main reason is to improve angle conditions of orthophoto map productions. Recording systems and systems determining projecting centres and orientation angles (POS/AV<sup>TM</sup> 310, CCNS 4), SONY DCR TRV900E digital videocameras, and KODAK DCS 330 digital cameras including Hasselblad 550 sH25 cameras are now used in private companies. Universities own small and medium size digital cameras for research in precision farming, in forestry and in other applications. These are various cameras, e.g. Rolleimetric and Duncan. Universities have bought several small airplane and helicopter models as carriers. Aerial laserscan was rented for a part of 2002 year and practical experiences were gained for measurement and final applications of DEM and DTM. Kodak and AGFA films are used in the Czech Republic. 80 - 85 per cent of aerial photography is performed on colour films. The whole production of all producers is about 27 000 photographs of 23 x 23 cm size per year. National reference calibration laboratory for camera systems is being built by the Institute of Geodesy and Cartography at the Technical University Brno. It will be used for aerial small and medium size camera calibrations. There are about 20 experts working and being interested in this sphere.

## **2. COMMISSION II: SYSTEMS FOR DATA PROCESSING, ANALYSIS AND REPRESENTATION**

Digital photogrammetric stations passed through important progress even though not so stormy as in the previous period. The final transition from Unix platform to Windows platform seems to be a general phenomenon of these years. Simple systems using any PC with appropriate parameters play more important role in comparison with complex and more expensive systems. Easy technical adaptations of these

computers allow their change into digital photogrammetric stations.

Several photogrammetric activities have been automated, mainly the aerotriangulation and DTM/DEM data collection where tie points, DTM and DEM points are automatically generated by image correlation. Automatic edge detection of topographic elements is partly solved by detecting signalized ground control points in aerotriangulation, and by roof shape detection.

New systems for georeferencing of projection centres POS/AV 310, CCNS 4 allow further simplification and definition of external orientation parameters

Mobile GPS navigational systems and mobile GIS applications are more and more used mainly in agriculture, forestry and utility management. They allow to detect user's position, his movement or other parameters on the background of raster or vector data.

The important progress in 3D laser scanning initiated software being able to apply already processed data and software being able to process raw laser scanner data. Raw data processing systems integrate lasers canner measurements with digital photographs of, e.g. measured objects. Their goal is to achieve the maximum system effectiveness.

Important change can be found in data storage. Database systems are used instead of classical data storage. Database systems allow various data type and data source integration into one system for data presentation. It is important at the moment when data being from different coordinate systems have to be used. The Internet starts to be a new way for data presentation, data ordering and sale. There are more companies having their business activities in this form.

## **3. COMMISSION III: THEORY AND ALGORITHMS**

The research in this area is performed at universities, at the Academy of Science, and in private companies. Computer Vision Laboratory of the Electrical Engineering Faculty at the Czech Technical University is one of the most active. The laboratory develops new algorithms and techniques for object recognition, and correlation techniques for orientation processes. The hyperspectral data and multisensor data are processed from algorithm view and from practical applicability view. Radar data and their everyday practical applications are

also the subject of research. New algorithms for photograph classifications were developed at the Faculty of Civil Engineering of the CTU Prague. These algorithms use either image segmentation and object-oriented analysis, or automatic texture classification using comparison of image textures with database image textures.

#### **4. COMMISSION IV: SPATIAL INFORMATION SYSTEMS AND DIGITAL MAPPING**

Spatial information systems continued in important progress that had begun in 90s of the 20<sup>th</sup> century. The activities can be characterized by two new phenomena. The newly created Ministry of Informatics tries to coordinate private and state organisations in close co-operation with the Czech Association for Geoinformation to follow Open GIS philosophy. Spatial information systems are more and more transferred from stand-alone computers and company servers to Internet. Internet enables public users to visualize, order, buy or share various data and data sets. It is another important phenomenon of the last 4-year period.

There are two state mapping agencies – civilian and military. Since last year they have been collecting colour orthophotos for map updating as well as for IACS purposes. The major part of these orthophotos are used in public administration and for various mapping purposes. Both mapping agencies have vector and raster versions of their maps in several scales. Vector map data of both mapping agencies are stored in geodatabases. Civilian maps in raster format are distributed also via Internet. The accuracy of master database of state map series is equivalent to the map content of 1 : 10 000 scale. It is a source for map generalization for 1 : 25 000 and 1 : 50 000 scale. The civilian database ZABAGED has been being updated including 3D data since 2000. Spatial information systems in the Czech Republic use both top world software, and various Czech software. The military database DMU 25 serves as a source data for crises management. Exchange formats were defined for many data types. Private companies control commercial part of map production, e.g by offering tourist maps and atlases. All cadastral maps are in raster format. Their vectorization has not been finished yet. It is a long process due to many problems connected with the transformation of cadastral maps in fathom scale. It is the reason why only 25 per cent of cadastral maps in vector form is available in 2004.

#### **5. COMMISSION V: CLOSE-RANGE VISION TECHNIQUES**

There are no legal standards for photogrammetric documentation of historical monuments in the Czech Republic. Close range photogrammetry for documentation of architectural or historical objects is often used in last years. However, the number of projects is still small. Investors usually press budgets of object documentation due to economical reasons on minimum level. The competency to call for tenders was transferred to regional administration after reorganisation of the State Institute of Care of Historical Monuments (as an important customer) followed by several changes in legislation. Additional documentation is required (easy rectified photographs in \*.tiff or \*.bmp formats) and vector maps (\*.dxf or \*.dwg format), orthophotos (usually not true orthophoto). 3D models or rendered models were required

only in special cases. Animation or Internet presentations were newly produced (avi, vrm), but only for business or teaching reasons. Aerial orthophotos are used for documentation of large sites.

There are only several organisations and technical universities having precise photogrammetric cameras (UMK or réseau cameras such as Rollei) in the Czech Republic. Digital camera applications are not too frequent (due to resolution and calibration), but there are more projects in close range photogrammetry at universities.

Single image photogrammetry is often used for facades. Stereoscopic vectorizations on photogrammetric workstations (ImageStation, ImageStation SSK, PhoTopol, Erdas, Helava, VSD) presents basic technology up to now. Intersection photogrammetry is used in special cases with Rollei+CDW or non-metric cameras and PhotoModeler SW. Fast and cheap techniques are still more favourite (demands on their accuracy are not very high). The development of non-photogrammetric techniques is evident. Laser scanning (4 installations in the Czech Republic) and 3D scanners based on triangulation principle (1 installation) are meant in these techniques. However, their practical usage in the cultural heritage is at the beginning (due to their price, and problems with outputs). Customers are used to work with vector maps, and photos or photomaps). There are more special techniques applicable only in special cases (restoration of wall paintings- IR and UV imaging, archaeological applications: GP-radar, thermovision and others)

Close range vision techniques are connected also with other branches, which usually do not use these methods. One of them was a moment when the photogrammetric control proved the decision of one sport judgement at Olympic Games in Sydney. The judgement concerned overstep of Erki Nool. The photogrammetry proved that the jumper did not overstep and gained his gold medal by right.

Another photogrammetric application can be found in co-operation with police. Photographs are often processed by photogrammeters to describe details of accidents exactly.

Biomechanics is another sphere where photogrammetric evaluation is being used. The co-operation of the Faculty of Civil Engineering of the CTU with the Faculty of Physical Education and Sport of the Charles University in Prague was concentrated on research of foot changes during pregnancy and after pregnancy in the first phase of co-operation. The photogrammetry was used for 3D modelling of plaster footprints. The methodology for change detection of these footprints was also developed.

#### **6. COMMISSION VI: EDUCATION AND COMMUNICATIONS**

Photogrammetry forms a part of university education at three Czech universities. Students get practice in historical and modern ways of photogrammetry during their study of geodesy or geomatics. Their experience is open to public by their presentations in Internet database version where documents about small historical monuments they have collected and processed are stored. The project called FOTOPA presents already several hundreds of small such objects from the country.

Remote sensing is taught at four universities. Students are familiar with basic information about limits and possibilities of the method.

There are more conferences and meetings organized each year in the country dedicated completely or partly to photogrammetry and remote sensing. Two regular international conferences in Ostrava and Seč combine remote sensing with GIS specialists. Remote sensing and photogrammetry are presented in special sessions there. The seminar/conference organized at the Faculty of Civil Engineering CTU Prague by the Czech group of ISPRS is completely dedicated to these two specializations. Being organized in the first row for PhD students' presentations, it is always an important meeting of all interested experts.

## **7. COMMISSION VII: RESOURCE AND ENVIRONMENTAL MONITORING**

Resource and environment monitoring is mainly a part activities of special groups in the country as the Ecological Institute of Academy of Science, departments teaching remote sensing and photogrammetry etc. Environmental monitoring is not performed permanently and for the whole country. It is often a subject of individual projects supported by the Grant Agency of the Czech Republic or by other institutes. Project concerning efficiency of forest reclamation in brown coal open-cast area is an example of them.

Important photogrammetric group is responsible for brown coal open-cast change documentation in the northern Bohemia. Forestry Institute in Brandys nad Labem having a long history of forestry health state detection and mapping continues in its activities which are more oriented to inventory problems. It is due to changes after 1989. Large forest areas are in private hands now and the state administration wants to keep a certain control over all forests as the national richness. This control is defined by law where rules of forest owners are mentioned. The activities connected to the control performance were studied in a project of the Ministry of Agriculture concerning automated aerial orthophoto processing.

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