THE SLOVENIAN NATIONAL REPORT ON PHOTOGRAMMETRY AND REMOTE SENSING

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ABSTRACT:

The Slovenian national report presents the relevant institutions and the current situation in the field of photogrammetry and remote sensing in the country. It describes government and education institutions, institutes and firms, their research and projects. The paper also presents the current situation within the education sector as well as the post graduate studies. Plans for the future are also mentioned.

1. ORGANIZATION

In Slovenia the following institutions and firms represent and serve the photogrammetry and remote sensing industry:

Government institutions: Surveying and Mapping Authority of the Republic of Slovenia, Office for Statistics of the Republic of Slovenia.

Education institutions: the University of Ljubljana - the Faculty of Civil and Geodetic Engineering is the head of the photogrammetry and remote sensing education; the Biotechnical Faculty - the Department of Forestry, and the Faculty of Arts - the Department for Archeology.

Institutes: Institute for Surveying and Photogrammetry at the Faculty of Civil and Geodetic Engineering, the Slovenian Forestry Institute and the Center for Scientific Research of the Slovenian Academy of Science and Arts

Firms: Institute for Geodesy of the Republic of Slovenia and the company Monolit.

The Association of Slovenian Surveyors which included a section on photogrammetry and remote sensing was established but it has not been active for the last four years.

In Slovenia there are two million inhabitants, and in the field of photogrammetry and remote sensing only 45 people are actively employed, so specialization in only one subject is not possible.

2. PHOTOGRAMMETRY

2.1 Education

Study courses in the field of photogrammetry and remote sensing are organized at the University of Ljubljana at the Faculty of Civil and Geodetic Engineering - Department of Photogrammetry and Cartography. The present department has two full-time employees, a professor of cartography and a photogrammetric assistant.

The course also offers a cooperation between other professors and assistants who have contracts with the University of Ljubljana. Most photogrammetric lectures are conducted by a professor from the University of Zagreb whereas lectures in remote sensing are held by a senior lecturer from the Center for Scientific Research of the Slovenian Academy of Science. Some lectures are also given by retired professors. Students undertake practical work with the help of three assistants and a laboratory technician.

The B.Sc. course program consists of Photogrammetry I, Photogrammetry II and Numerical Photogrammetry. For the remote sensing program, the course consists of Remote sensing and Photointerpretation. The photogrammetry and remote sensing course runs for a total of 330 hours. In any one year there are 1-2 B. Sc. thesis (in photogrammetry and remote sensing) which represents 10-15% of completed thesis per year.

For the Post Graduate Course in photogrammetry, an individual course program is implemented.

Test equipment available to students: stereocomparator Dicometer connected to a PC and some old fashion analog machines. Software: Orient, Scop and in-house written software. For linking photogrammetry with GIS, students have Arc/Info, MGE and Idrisi software packages. In 1996 a VSD Digital photogrammetric package from Krakow was purchased.

At the Biotechnical Faculty - the Forestry department provides a course for the collecting, analysis and presentation of data acquired from photogrammetric images and remote sensing images. During the official study time required, students have 90 hours of lectures and practical sessions. They use the software and equipment from the Slovenian Forestry Institute. Post graduate studies linked to forestry and photogrammetry have their own specialized program.

Thirty hours of lectures are also held at the Department of archeology. Students are informed on the possibility of using photogrammetric and remote sensing images. They use nonmetric cameras and they also have a special support for taking vertical pictures of archeological excavations.

2.2. Research

Both institutes and firms are involved in research. Four photogrammetrists work at the Institute for Surveying and Photogrammetry at the Faculty of Civil and Geodetic Engineering. Most of their research is undertaken in the building of 3 D architectural models and the collection of photogrammetric data. Research is financed by the Office of cultural heritage of the Republic of Slovenia and the Office of monument building and restoration.

They use an analog Topcart machine, high capacity PCs and in 1996 they bought an accurate analytic PROMAP machine. They use Orient, Scop, DMS and Acad software and they write additional programs to make the regular software more powerful. Employees at the Institute for Surveying and Photogrammetry also work as assistants at the faculty. They undertake Post graduate studies at the Department of Photogrammetry and Cartography and at international seminars and courses.

The Slovenian Forestry Institute carries out research in the use of photogrammetric images for producing forest maps. They also study how to evaluate damage in forests disasters. The research is requested and then paid for by the Ministry of Agriculture and Forestry. Research on the forest quality based on the IR images was financed by the Ministry for Science and Technology.

There are eight employees working on photogrammetry and remote sensing. They are also included professors and assistants at the Biotechnical Faculty. The equipment which they use is mostly linked to powerful PCs and work stations. They use APY for stereorestitution, PCI and DMS for orthophoto maps. For the orientation they use GPS receivers.

2.3. Projects

In Slovenia, photogrammetric images are acquired methodically by aerophotographing. The CAS project (cyclic aerophotographing of Slovenia) has been put into operation. Images from the whole territory of Slovenia are to be taken within three years. The project started in 1984. For the last two cycles the scale of photographing has been the same for the whole area, 1 : 17 500.

The CAS project is financed by the Surveying and Mapping Authority of the Republic of Slovenia. Furthermore, it also finances the elaboration of digital orthophoto maps. Series production started in 1994. According to official recording up to now 209 sheets or 7 per cent of Slovenia have been covered. In 1996 200 new sheets shall be produced.

Photogrammetric projects are carried out by two institutes, the Monolit company and the Institute of Geodesy of the Republic of Slovenia.

The Slovenian Forestry Institute carries out projects by using photogrammetric images for producing forest maps which are used in the administration of forests and space planing projects.

The Institute for Surveying and Photogrammetry at the Faculty of Civil and Geodetic Engineering is mostly active in the field of production and maintenance of topographic plans and maps, photogrammetric measurements of architectural buildings, projects of industrial photogrammetry and other nontopographic applications.

The Monolit company is specialized in information systems (GIS) which are present in the market. They employed two photogrammetrists who elaborate expert's and study reports and other projects. For the time being they mostly work in the field of digital orthophoto maps from images taken by cyclic aerophotographing or images taken by Russian satellites. In their work they use software from Orient, Dopp, Intergraph modelar and own programs.

The Institute for Geodesy is the biggest company dealing with geodesy and photogrammetry as the number of employees is concerned. There are twenty two employees working in the field of photogrammetry.

They have the biggest production and maintenance of topographic plans and maps from, photogrammetry in Slovenia and do research only within an own research department which means a research unit for production purposes. They do both technological research and development of own solutions. The Institute for Geodesy carries out all photogrammetric works.

They dispose of their own aerophotographing staff who is equipped with three cameras and two airplanes. Their equipment also includes several analog stereorestitution instruments (Wild), analytic stereorestitution instruments (Leica SD2000), a digital station (Leica Hellava DSW100, DPW770) and software of Kork. They use a UMK 10/1318 camera for terrestrial photogrammetry.

Staff members are trained at the Faculty of Civil and Geodetic Engineering, post graduate studies are undertaken in seminars, conventions and other workshops.

3. REMOTE SENSING

3.1. Education

There is no special education in remote sensing, except for post graduate studies where individual programs are implemented. Post graduate studies in this field may be attended at the Biotechnical Faculty - the Department for Forestry, at the Office for Statistics of the Republic of Slovenia and the Center for Scientific Research of the Slovenian Academy of Science and Arts.

Further education is acquired on international congresses and seminars.

3.2. Research

Research is done by the Office for Statistics of the Republic of Slovenia, the Center for Scientific Research of the Slovenian Academy of Science and Arts and the Slovenian Forestry Institute.

The Office for Statistics of the Republic of Slovenia is a government institution dealing with remote sensing, especially in the field of data distribution theories. There

are four employees working in this field and doing post graduate studies at the Faculty for Electrotechnics, the Biotechnical Faculty and the Department of Geography of the Faculty of Arts. They compile statistic data on agricultural issues and urban agglomerations with sample schemes.

The computer equipment consists of work stations and high capacity PCs and ERDAS software for satellite pictures, Arc/Info for GIS applications and SAS packages for statistic analyses.

At the Center for Scientific Research of the Slovenian Academy of Science and Arts three employees work on remote sensing, especially on applications of satellite images for humanistic, sociology and natural sciences. They use TM images to determine vegetation, pedology and soil usage in connection with humanistic. They also carry out research in the production of DMR from radar images.

They use work stations and personal computers, software packages are PCI and ISAR for radar images.

Research in the field of forest satellite maps is done by the Slovenian Forestry Institute within the international COURINE project which is financed by the EU. They also run the Kočevska project where keys for surveyed classification and the inclusion in the GIS data system are produced. This research work is financed by the Ministry of Agriculture and Forestry.

3.3. Projects

The Slovenian Forestry Institute carries out projects examining the influence of highways on the environment. They use SPOT images for this project which is financed by the Ministry of Agriculture and Forestry and the Ministry of Science and Technology.

They use personal computers and work stations, software packages are above all PCI, ER-Mapper and Arc/Info.

The Office for Statistics of the Republic of Slovenia uses remote sensing mostly in the field of agriculture for quantity processing of agricultural surfaces. Projects are performed by the Office whereas funds are partially provided by the Ministry of Agriculture. They also introduce different controls in statistics. The registration of house numbers (EHIS) on the basis of satellite images is in preparation.

The Center for Scientific Research of the Slovenian Academy of Science and Arts cooperates in international projects of the EU in Middle Dalmatia, furthermore in projects of the Ministry of Science and Technology and the Ministry of Environment and Space.

4. CONCLUSIONS

Photogrammetry in Slovenia is in no enviable position, even less on a level it should have in comparison with the stage of development of the society. Important for photogrammetrists is the fact that during the last two years there is a tendency turning the development into the right direction. Trends indicate that Slovenia will overjump the stage of analytic photogrammetry from the analog photogrammetry to digital photogrammetry.

Already today a wide choice of cyclic remote sensing images forms the basis for producing orthophoto plans and maps. We believe that in the coming five years most of Slovenian's surface will be covered by orthophoto maps 1:5000. The highest demand for information and modifications is in this sector. This year the second three years term after Slovenia' s independence will come to an end. We assume to continue with CAS to a new updated and improved level.

Also promising are the prospects in the field of remote sensing as the higher resolution of satellite images result more and more successful applications based on satellite images. Slovenia with 20.250 sqKm in size and a surface 50 per cent covered by forests and 30 per cent by mountains which are more than 600 m above sea level and 5 mio. plots is highly dismembered. Research done up to the moment was mostly directed into applications which were on the edge of existing possibilities. Taking into account international trends, on the basis of home knowledge and experience acquired in research and the performance of projects, future developments indicate upward tendencies.