

# EDUCATION IN REMOTE SENSING AND PHOTOGRAMMETRY IN HUNGARY

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## ABSTRACT:

In Central-East Europe undergoes essential economical-political changes. Conversion to market economy requires important changes in education too. The paper gives a survey of instruction at university level in photogrammetry and remote sensing in Hungary. The present situation and the essential of developing are discussed. The author separates the education of Surveying Engineers and the education of Specialists for different domain. The place of the education of Surveying Engineers is the Technical University of Budapest. The author presents the features of Survey Engineering Education, the instruction in Photogrammetry and Remote Sensing, the material and personal condition of the education. The paper gives the characteristic of a new study program being developed aimed the information of surveying and space informatics engineers.

**KEY WORDS:** Education, Eastern Europe.

## 1. REMOTE SENSING IN HUNGARY

Central-Eastern Europe undergoes essential economical-political changes. Conversion to market economy requires important changes in education, too. This is why survey of instruction at university level in photogrammetry and remote sensing may be of interest. The specialty of photogrammetry has important traditions in Hungary. Application of photogrammetry started already by the turn of this century. Since the early '30s, photogrammetry has been systematically applied for making topographic maps. World War II brought about a significant setback in photogrammetry in this country. No important application of photogrammetry took place before the mid'50s. Actually, photogrammetric methods have been applied to make topographic maps at different scales. Photogrammetry is relatively frequently applied in large-scale mapping. Also architectural and civil engineering applications of photogrammetry have been generalized. Actually, in photogrammetry, technologies relying on analog photogrammetric instruments prevail. A wider extension of remote sensing has started by the late '70s, mainly in connection with space images. Among space images, various LANDSAT images are the most frequently applied. Also SPOT images and Soviet space photos are much used. Remote sensing has been frequently applied in cartography, agriculture, environmental engineering, geology, hydrology, and civil engineering. Among processing methods, analog interpretation and digital image processing occur in about equal proportions.

## 2. EDUCATION AT UNIVERSITY LEVEL

In Hungary, higher education in photogrammetry and remote sensing is expected to provide specialists for photogrammetric and remote sensing activities. University-level education will be discussed in two parts:

- education of surveying engineers;
- education of specialists for different domains (e.g. architecture, civil engineering, geography).

## 3. EDUCATION OF SURVEYING ENGINEERS

### 3.1 Function of the T. U. Budapest

University-level education of surveying engineers takes place at the Technical University of Budapest, originally established in 1782, beginning to surveying engineers educate in 1948. After several reorganizations, since 1959, surveying engineering education belong to the Faculty of Civil Engineering. Among three geodetic departments at

this Faculty, the Department of Photogrammetry established in 1953 imparts knowledge in photogrammetry and remote sensing.

### 3.2 Features of the Program

Education of surveying engineers at university level lasts ten semester, 32 to 36 lessons a week. Most of the subjects are mandatory, with about 6 Lesson numbers of subjects are conform to the international average. Three features of the actual education are:

- a relatively high number of lessons.
- rather rigid program.
- an essential proportion of civil engineering knowledge.

### 3.3 Education of Remote Sensing

Within the program above, photogrammetry and remote sensing are mandatory subjects for three semesters, besides of some chapters delivered as optional subjects. Semestral lesson numbers and main chapters of the mandatory subject are: Semester 5: Geometrical and optical fundamentals, Seniors, Terrestrial photogrammetry, Single-picture photogrammetry. 3 lessons + 2 exercises a week. Semester 6: Stereo-photogrammetry, Photogrammetric instruments, Aerotriangulation, Fundamentals of digital image processing. 3 lessons + 2 exercises a week. Semester 7: Remote sensing sensors, Interpretation, Digital processing. 2 lessons + 1 exercise a week. After semester 6 the subject is complemented by a 3-day photogrammetric measurement exercise. Optional subjects related to photogrammetry and remote sensing are:

- Geometrical fundamentals of photogrammetry.
- Digital image processing.
- Case studies in engineering photogrammetry.
- Case studies in remote sensing.

Certain elements of photogrammetry and of remote sensing occur also in other subjects delivered at the Department of Photogrammetry, such as:

- Topographic surveying.
- Cartography.
- Geoinformatics.

50-60 percent of the about surveying engineers graduating a year elaborate diploma works at the Department of Photogrammetry. In addition to regular education, instruction in photogrammetry and in remote sensing is delivered also at different post-graduate courses. Since 1978, so-called specialist engineering courses in the scope of remote sensing are launched every three years in the

scopes of photogrammetry or of remote sensing. Two or three doctor's theses are made in a year.

### 3.4 Conditions of Education

Regular and post-graduate educations essentially rely on picture matter and instruments available at the Department of Photogrammetry, such as:

- Analog instruments: Wild B8S, Zeiss Stereo Metrograph, Zeiss Technocart, Zeiss Topoflex.
- Analitic instruments: Zeiss 1818 stereo comparator, Zeiss Stecometer, Kern DSR1, Zeiss PK1.
- Image transformation: Zeiss SEG III, Wild OR-1.
- Cameras: Zeiss Photoe, Zeiss UMK, Zeiss SMK.

The stock of instruments -expected Kern DSR1 - is conform to that usual in Hungary, primarily meeting analog technologies. The stock of instruments is complemented by PC-based computer equipment. Essential software available for different computations are:

- Block triangulation: BLUE, ORIENT.
- Digital terrain modeling: SCOP, TASC.
- Orthophotoing: SORA, and other software developed at the Department.

Picture matter in education is composed of terrestrial photos made at the Department, aerial photos offered primarily by instrument factories abroad, as well as LANDSAT and SPOT pictures. (Utilization of Hungarian air photos has long been inhibited by their secrecy). Acquisition of both instruments and images has been essentially motivated by research and engineering consultation works at the Department. Teaching staff at the Department consist of one professor, two associate professors, four senior assistant. Education is shared also by research workers at the Department. Among conditions of education, mention has to be made of relatively extended foreign relations of the Department. Since about a decade, strict professional relations have been established with counterpart departments of the Technical University of Vienna, and the University of Karlsruhe. Two staff members were granted Humboldt fellowships. Every year since 1990, students elaborating diploma works have been sent out to Karlsruhe.

### 3.5 Developing the Education

It is manifest from those above that surveying engineering education at the Technical University of Budapest differs from several aspects from similar purposed educations at countries with a developed market economy. This difference has to be reduced, - keeping, however, long-time traditions alive. At present, a new study program is being developed, aimed at the formation of surveying and space informatics engineers. In the new program, the number of mandatory lessons is reduced (24 lessons a week), while the proportion of optimal subjects increases (min. 20). Built-up of education in photogrammetry and remote sensing will be modified. Within the subject matter, knowledge related to digital image processing increases, and so does the number of optional subject. Beginning with autumn 1991, organized Ph.D.-type post-graduate education has been launched, adopted by three students. The subject matter modification requires to modify material and personal conditions of education. It is endeavored to acquire up-to-date informatics equipment, helped by a winning a TEMPUS competition, where there is cooperation with universities of Karlsruhe, Delft and Strasbourg. Much of the extension of our up-to-date software stock is due to the Technical University of Vienna. Altered subsidizing of education stresses the importance of competitions. There is a continued

endeavor to the educational uses of the stock of images and instruments acquired for various research projects, as well as engineering projects. The number of enrollment is likely to decrease because of the decline of budgetary resources. It is presumed that in regular education support from Ph.D. candidate students has to be relied on. Main trends of variation are perceptible. At the same time, material conditions of a significant variation are but partly available. Many of the teaching staff functioned for decades in the earlier rigid education system. Thereby both material and personal conditions are expected not to be permit else but a protracted, step-wise transition.

## 4. USERS EDUCATION IN REMOTE SENSING

Users education in photogrammetry and remote sensing is offered at faculties of university of sciences, at various faculties of technical universities, as well as in agricultural engineering education. At regular courses, this education is involved in other subjects (e.g. surveying, monuments preservation, landscape architecture) as a rule. In post-graduate education, photogrammetry and remote sensing are self-contained subjects. In natural sciences, primarily cartographers, geographers, geophysicists and geologists are offered education in remote sensing. At technical universities, mining, forestry, civil engineers and architects are taught primarily the fundamentals of photogrammetry. In a given chapter of electrical engineering education, students are concerned with remote sensing systems. Similarly as for the surveying engineering education, also the enumerated specialties are in a phase of transformation.

## 5. FUTURE OF REMOTE SENSING

Conversion to market economy and lifting of administrative restrictions are expected to contribute to a still wider extension of photogrammetry and remote sensing. Accordingly, the demand for skilled specialists is likely to increase both in surveying and in user's domains. The proposed educational changes are expected to help meeting of arising demands. In course of these changes in addition to theoretical knowledge, the importance of present up-to-date technologies has to be reckoned with. As a result of dimensions and economical situation in this country, however, both in regular and in post-graduate education, possibilities consistent to international cooperation have to be relied on. In regular education, such a possibility may be offered by studies abroad for some semester, as well as by the elaboration of diploma works abroad-already going on. In post-graduate education, this possibility may be offered by scholarships abroad.

## 6. CONCLUSION

In this respect, the inadequate language command of student may be a drawback. A favorable change in education is expected from the conversion to market economy stressing the importance of ownership. Proprietor changes are accelerated, contributing to the appreciation of surveying engineering activities. Change in education is of particular importance.